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Dynamic nonlinear income taxation with quasi-hyperbolic discounting and no commitment[☆]

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ABSTRACT

This paper examines a dynamic model of nonlinear income taxation in which the government cannot commit to its future tax policy, and individuals are quasi-hyperbolic discounters who cannot commit to future consumption plans. The government has both paternalistic and redistributive objectives, and therefore uses its taxation powers to maximize a utilitarian social welfare function that reflects individuals' true (long-run) preferences. Under first-best taxation, quasi-hyperbolic discounting exerts no effect on the level of social welfare attainable. Under second-best taxation, quasi-hyperbolic discounting increases (resp. decreases) the level of social welfare attainable when separating (resp. pooling) taxation is optimal. In stark contrast to previous studies, this result implies that some individuals can actually be better-off in the long run as a result of their short-run impatience.

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1. Introduction

The aim of this paper is to examine the effects of incorporating quasi-hyperbolic discounting by individuals into a dynamic model of optimal nonlinear income taxation without commitment. There is by now an extensive empirical and theoretical literature on quasi-hyperbolic discounting, which captures a preference many individuals have for immediate gratification.² This leads agents to make short-run decisions that they later regret as not being consistent with their long-run preferences. Such behavior is often described as an individual imposing a negative “internality” on their future self, which potentially justifies corrective (or paternalistic) policy intervention.³ There is, in effect, preference heterogeneity between individuals and the government, as the government's preferences are the same as the individuals' long-run preferences, but not their short-run counterparts. In our model economy, an individual's need for immediate gratification leads them to make labor,

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² See, e.g., the survey article by Frederick et al. (2002).

³ For example, O'Donoghue and Rabin (1999) examine optimal “sin taxes”, i.e., taxes on consumption goods that individuals consume too much of, relative to their long-run preferences. See also O'Donoghue and Rabin (2003, 2006), Krusell et al. (2002, 2010), Diamond and Koszegi (2003), and Amador et al. (2006).

consumption and savings decisions that are not in their long-run interest. The policy instrument available to the government to offset the effects of quasi-hyperbolic discounting is dynamic nonlinear income taxation, applicable to both labor and savings.

There is currently a great deal of interest in dynamic nonlinear income taxation, such as the “new dynamic public finance” literature that extends the static [Mirrlees \(1971\)](#) model of optimal nonlinear income taxation to a dynamic setting.⁴ The second-best nature of the Mirrlees model stems entirely from the assumption that an individual’s skill type is private information, which is what prevents the government from implementing first-best taxation based on skills as the Second Welfare Theorem would recommend. In dynamic versions of the Mirrlees model, however, taxation in earlier periods may result in skill-type information being revealed to the government, which would then enable first-best taxation in latter periods. To avoid this possibility and some associated complications, the new dynamic public finance literature typically assumes that the government can commit to its future tax policy. That is, the government continues to implement second-best (incentive-compatible) taxation even after skill-type information has been revealed. However, the commitment assumption overlooks an important feature of the Mirrlees approach to optimal taxation—that no ad hoc constraints be placed on the nature of the optimal tax function, and that the tax instruments available to the government be constrained only by the information structure. Indeed, one of the motives behind the development of the new dynamic public finance literature is to avoid the need for ad hoc constraints on the tax system, as are typically imposed in the classic representative-agent Ramsey model (see [Golosov et al., 2006](#)). Therefore, we assume that the government cannot commit to its future tax policy. This means that both individuals and the government in our model cannot commit to future plans, though both would be better-off in the long run if they were able to do so.

The main complication associated with relaxing the commitment assumption is that it may no longer be social-welfare maximizing for the government to design a (separating) nonlinear income tax system in which individuals are willing to reveal their skill types. Instead, it may be optimal to pool the individuals so that skill-type information is not revealed.⁵ To minimize the problems that the possible optimality of separating or pooling taxation present, we adopt the simple two-type (high-skill and low-skill) version of the Mirrlees model introduced by [Stiglitz \(1982\)](#),⁶ and analyze a three-period model, which is the shortest time horizon that can capture the effects of quasi-hyperbolic discounting. Individuals work and save in periods 1 and 2, and live-off their second-period savings in period 3. The government imposes nonlinear taxation on labor and savings in periods 1 and 2 such that a utilitarian social welfare function based on individuals’ true (long-run) preferences is maximized. Hence, the social welfare function captures a corrective or paternalistic motive for dynamic taxation, as well as the usual redistributive motive embedded in utilitarianism.

Our main result is that quasi-hyperbolic discounting increases the level of social welfare attainable when separating taxation is optimal, but decreases social welfare when pooling is optimal. This immediately implies that, under separating taxation, at least one type of individuals are actually better-off in the long run as a result of their short-run impatience. Moreover, our numerical simulations reveal that, even under pooling taxation, one type of individual is better-off in the long run. These findings stand in stark contrast to the usual result that quasi-hyperbolic discounting makes individuals worse-off in the long run. The intuition for our results, in a nutshell, can be summarized as follows. Nonlinear income taxation gives the government the power to ensure that only two allocations, one intended for low-skill individuals and the other intended for high-skill individuals, may potentially be chosen, by making the tax burden associated with all other allocations sufficiently severe. This, in effect, means that the government can override the individuals’ short-run (quasi-hyperbolic) preferences. The only challenge then that the government faces is to ensure that each type chooses the allocation intended for them. Given the government’s redistributive objective, low-skill individuals will never want to choose the high-skill type’s allocation, but high-skill individuals may want to mimic low-skill individuals by choosing their allocation. The government can deter mimicking behavior by making sure that the allocations offered satisfy the high-skill type’s incentive-compatibility constraint. Quasi-hyperbolic discounting does, however, affect the incentive-compatibility constraint, as high-skill individuals will compare the high-skill and low-skill allocations using their short-run preferences. We then show that quasi-hyperbolic discounting relaxes the high-skill type’s incentive-compatibility constraint under separating taxation, but tightens it under pooling taxation. It also follows from the preceding discussion that quasi-hyperbolic discounting exerts no effect on social welfare under first-best taxation, since in this case the allocations need not be incentive compatible.

In terms of previous studies, [Aronsson and Sjögren \(2009\)](#), [Bassi \(2010\)](#), and [Aronsson and Granlund \(2011\)](#) are most closely related to our work, with the primary distinction being that we analytically and quantitatively demonstrate how quasi-hyperbolic discounting can actually raise long-run utility and social welfare. In Aronsson and Sjögren’s model, individuals consume an unhealthy commodity when young, which in turn leads to adverse health outcomes when old. Since individuals are quasi-hyperbolic discounters, they consume too much of the unhealthy commodity. Within this setting,

⁴ A survey of the new dynamic public finance literature is provided by [Golosov et al. \(2006\)](#), while [Kocherlakota \(2010\)](#) provides a textbook treatment. Earlier papers that extend the Mirrlees model to dynamic settings include [Roberts \(1984\)](#) and [Brito et al. \(1991\)](#).

⁵ The reason that either separating or pooling taxation may be optimal when the government cannot commit is explained in detail in [Section 4](#).

⁶ It does not seem feasible to consider more than two types of individuals, because the number of tax regimes that must be considered increases exponentially. For example, assuming merely three types results in five regimes: complete separation, complete pooling, and three cases of pooling two types against the remaining type. Moreover, even in the two-type model that we study, there is a third possibility of partial pooling in which some, but not all, of the high-skill individuals are pooled with the low-skill individuals. However, for the sake of analytical simplicity, we restrict attention to the “pure strategy” policies of complete separating or pooling taxation.

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