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## Economic Modelling

journal homepage: [www.elsevier.com/locate/econmod](http://www.elsevier.com/locate/econmod)Temptation and taxation with elastic labor<sup>☆</sup>

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## ABSTRACT

In this paper we study the corrective role of income taxation in a model with the Gul and Pesendorfer type of temptation and self-control preferences embedded with labor/leisure choice. “Excessive” impatience created by the presence of temptation in preferences causes a bias in favour of present consumption and a two-dimensional problem: under-saving and over-supply-of-labor. In such an environment, the two-dimensional problem requires two-dimensional tax policy tools. In particular, we first show that subsidizing savings alone improves welfare because it mitigates the under-saving problem i.e. inter-temporal allocation distortion. However, the optimal subsidy rate is not as high as in [Krusell et al. \(2010\)](#) because the savings subsidy amplifies the over-supply-of-labor problem, i.e. intra-temporal allocation distortion. Next, we find that labor income tax policy alone improves welfare because it mitigates the intra-temporal allocation distortion; however, its welfare gains are constrained by its adverse effects on savings. Finally, we demonstrate that a combination of capital and labor income taxation appears to be a more effective policy.

## 1. Introduction

It has been documented in the literature that some individuals suffer from self-control problems regularly.<sup>1</sup> [Gul and Pesendorfer \(2001, 2004\)](#) and [Gul and Pesendorfer \(2005\)](#) provide a theoretical foundation to formalize the ideas of self-control problems. In their environment, the presence of temptation in preferences creates an urge for potentially tempting alternative which is costly to control. Individuals with temptation and self-control preferences have lower utility in an ex ante sense if tempting allocations are available in their choice set. Yet, different from a standard preference case, the size and shape of the choice set matter for individuals’ well-being. Individuals with Gul and Pesendorfer type of preferences would be better off if choosing from a smaller set.<sup>2</sup>

In the absence of mechanisms for commitment, the urge of temptation and cost of self-control give rise for government interven-

tion. Most notably, [Krusell et al. \(2010\)](#) embed the Gul and Pesendorfer type of preferences into a standard macroeconomic setting and show that the optimal policy is to subsidize savings when consumers are tempted by “excessive” impatience. In the [Krusell-Kuruscu-Smith](#) framework, “excessive” impatience caused by the presence of temptation in preferences distorts individuals’ inter-temporal allocation in favour of present consumption and undermines incentives to save for future consumption (inter-temporal channel). In the [Krusell-Kuruscu-Smith](#) model, the optimal tax policy prescribes as savings/investment subsidies to make savings more attractive. The [Krusell-Kuruscu-Smith](#) result provides a simple, potentially verifiable condition: negative capital taxation is socially desirable if individuals display temptation and self-control problems.

It has been documented in the macro/public finance literature that a key variable in the design and assessment of government policies is labor supply. However, [Krusell et al. \(2010\)](#) assume inelastic labor

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<sup>1</sup> [Ameriks et al. \(2007\)](#) develop a survey instrument to measure self-control problems and find that self-control problems are smaller in scale for older than for younger individuals. [Frederick et al. \(2002\)](#) provide an overview of experimental studies documenting that individuals indeed exhibit bias toward immediate gratification. [Fang and Silverman \(2009\)](#) estimate the structural parameters of a dynamic labor supply model and empirically identify the existence of time-inconsistency that stems from self-control problems. [Buccioli \(2012\)](#) tests the empirical relevance of self-control preferences using household-level data from the Consumer Expenditure Survey; and his estimates support the presence of temptation in preferences.

<sup>2</sup> The theoretical analysis of preferences reversal is dated back to [Strotz \(1956\)](#). Later, [Phelps and Pollak \(1968\)](#) to analyze inter-generational altruism to model preference reversals. [Laibson \(1997\)](#) adopts that structure and incorporates an additional discounting factor that captures the present-bias. The new discounting factor distorts the time-consistent feature of the standard exponential model. Laibson’s preference structure is often called as time-inconsistent preferences. [Gul and Pesendorfer \(2004\)](#) attempt to explain the same phenomenon by creating self-control preferences that depend not only on an agent’s actual consumption but also on the agent’s hypothetical temptation consumption. [Krusell et al. \(2010\)](#) show that the Phelps–Pollak–Laibson multiple-selves model is nested in the Gul–Pesendorfer self-control model as a special case.

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supply and focus only on the temptation distortion operating through inter-temporal trade-off channel. Arguably, relaxing the inelastic labor assumption introduces intra-temporal trade-off between consumption and leisure, which induces a potentially important mechanism through which temptation influences allocation and welfare. In particular, the urge of temptation can influence an individual's consumption-leisure choice and the size and shape of choice sets, which matters for welfare. Inclusion of elastic labor is essential to fully characterize the potential distortions caused by temptation so that a government can design an effective intervention policy that helps individuals to overcome the cost of self-control problems.<sup>3</sup>

To that end, we embed labor/leisure choice into the class of preferences developed by Gul and Pesendorfer. More specifically, we formulate a standard two-period overlapping generations model populated with individuals who supply labor elastically while facing temptation and self-control problems. Our model captures essential features of dynamic interactions between temptation and individuals' intra- and inter-temporal allocation, while it is simple enough to obtain an analytical insight. We first characterize the corrective role of capital and labor income taxation. Next, we conduct a quantitative analysis and analyze the importance of general equilibrium channels. Our key results are summarized as follows:

First, we find that inclusion of elastic labor, qualitatively and quantitatively, matters for allocation and welfare. More specifically, inclusion of elastic labor introduces in a new channel of effects operating through consumption-leisure trade-off (intra-temporal channel). The presence of temptation in preferences triggers "excessive" impatience and results in a bias in favour of present consumption. The urge of temptation induces individuals to work longer when inter-temporal elasticity of substitution is relatively small i.e. less than 1. This further amplifies the bias toward present consumption, but partially mitigating the adverse effect on savings. Intuitively, the temptation distortions working through the inter- and intra-temporal channels create a two-dimensional problem: under-saving and over-supply-of-labor, which lowers welfare. In our simple setting, we are able to isolate analytically three channels behind welfare losses: inter-temporal channel, intra-temporal channel and self-control cost channel. Our quantitative results indicate that intra-temporal and self-control cost channels are the main driving forces at work.

In absence of any mechanism for commitment, the intra- and inter-temporal allocation distortions caused by the presence of temptation in preferences call for government intervention. In the second part, we examine whether a government can eliminate such distortions. We first analyze the corrective role of capital income taxation and find that subsidizing savings/investments is socially desired because it makes succumbing to temptation less attractive. However, the optimal subsidy rate is not as high as in Krusell et al (2010). The intuition is that the distortions created by a savings subsidy program introduce two opposing effects: one mitigating the under-saving problem and one worsening the over-supply-of-labor problem. The latter counteracts the former. The welfare gains resulting from eliminating the adverse effects on savings are constrained by the welfare losses resulting from inducing individuals to work longer. Therefore, the optimal subsidy rate is lower when the intra-temporal channel is present.

Next, we demonstrate a new role for labor income taxation in our framework. The underlying reason is that taxing labor income provides a mechanism to eliminate the temptation distortion to the intra-temporal trade-off, i.e. the over-supply-of-labor problem. Notably, the labor income tax policy amplifies the temptation distortion to the inter-temporal trade-off, i.e. the under-saving problem. This adverse saving effect subsequently limits the welfare benefit from inducing

individuals to work less. Yet, the labor income tax policy potentially improves welfare in the Gul-Pesendorfer self-control model embedded with labor/leisure choice.

Finally, we study a mix of capital and labor income taxation and find that a combination of these two tax instruments appears to be a more effective policy. Indeed, the two-dimensional problem created by "excessive" impatience requires a two-dimensional tax policy. More importantly, we find that general equilibrium channels amplify the distortions caused by temptation and induce strong demand for income taxation as a corrective device.

Our study is related to several branches of the taxation literature. First, our paper is connected to the theory of optimal capital taxation. Since the well-known zero capital income taxation (e.g. see Atkinson and Stiglitz, 1976; Judd, 1985 and Chamley, 1986), the optimal taxation literature have shown that the optimal capital income tax can be non-zero. Aiyagari (1995) and Chamley (2001) show that the optimal capital income tax is positive because it is a mechanism to redistribute from those with no credit constraints to those with credit constraints. Conesa et al. (2009) find that the optimal capital income tax is rather high at 36% in an overlapping generations model with earning risks and imperfect capital markets. In such a framework filled with rational agents having standard preferences, the optimal capital tax rate is positive because it is a way to redistribute wealth across agents. Differently, there is an alternative approach that views capital income taxation as a corrective tool to help individuals to overcome their behavioral issues. Notably, Laibson (1996) studies capital income taxation in an environment in which individuals suffer from self-control problem due to time-inconsistent preferences and find that optimal capital income tax rate is negative. Krusell et al. (2010) incorporate Gul-Pesendorfer type of self-control preferences into a standard macroeconomic setting and prove that the optimal capital tax rate is also negative. Tran (2016) conducts a welfare decomposition exercise and isolates the mechanics behind negative capital income taxation in a simplified version of the Krusell-Kuruscus-Smith model. In this paper, we extend the Krusell-Kuruscus-Smith model to incorporate labor/leisure choice. We show that the negative capital tax rate result is carried on to our new setting. However, the optimal subsidy rate is relatively smaller because of the extra distortion operating through the intra-temporal channel when labor/leisure choice is in play.

Our paper contributes to the optimal labor income tax literature. That literature studies design of income taxation and transfer systems to distribute fairly and efficiently the tax burden across individuals with different earnings. Social welfare is larger when resources are more equally distributed, but redistributive tax and transfers negatively affect incentives to work. The optimal labor income taxation as a redistributive device is socially desired because welfare gains from redistributing resources dominate welfare losses from distorting incentives to work. That literature shows that the optimal labor income tax rate can be measured in terms of elasticities (Shenshiski, 1972; Diamond, 1980, and Saez, 2001). Similarly, we find that the optimal labor income tax rate depends on inter-temporal elasticity of substitution. However, the underlying mechanism is different. The labor income tax policy in our setting prescribes as a corrective device that helps to eliminate the distortions to the consumption-leisure wedge rather than a redistributive device. Indeed, the optimal tax rate is driven by severity of temptation and self-control problems in our environment.

There is a parallel literature on optimal commodity taxation when self-control issues are present (e.g. see Gruber and Koszegi, 2001, 2004; O'Donoghue and Rabin, 2003 and O'Donoghue and Rabin, 2006). That literature includes "sin good" as goods for which preferences are time-inconsistent. Individuals optimally choose to consume more now and less in the future. However, next period they also optimally choose to consume more now and less in the future in a model with "sin goods". Yet, individuals are rational, but over-consume due to lack of self-control. These behavioral issues give rise for

<sup>3</sup> Diamond and Koszegi (2003) add endogenous retirement to Laibson (1996)'s consumption-savings model with time-inconsistent preferences and find that inclusion of retirement choice changes consumption pattern and policy implications.

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