



The Friedman rule in an overlapping-generations model with nonlinear taxation and income misreporting[☆]



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ABSTRACT

This paper models a two-period overlapping-generations economy with money populated with individuals of different skills. They face a nonlinear income tax schedule and can engage in tax evasion. Money serves two purposes: the traditional one, modeled through a money-in-the-utility-function; it also facilitates tax evasion. The main message of the paper is that income tax evasion in this framework leads to the violation of the Friedman rule. The paper also shows that even in the absence of tax evasion, when optimality requires differential commodity taxation, complementarity of real cash balances and labor supply does not guarantee the optimality of the Friedman rule as a boundary solution. An additional assumption is required.

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1. Introduction

This paper brings two strands of public finance literature to bear on the question of the [Friedman rule \(1969\)](#) for the optimal money supply.¹ One is the optimal Mirrleesian taxation that started with [Mirrlees \(1971\)](#) and was popularized by [Stiglitz \(1982\)](#) in its simplified two-group version; the second is the tax evasion literature that followed the pioneering work of [Allingham and Sandmo \(1972\)](#). Our paper

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¹ The Friedman rule calls for a deflationary change in money supply that ensures the nominal interest rate – the opportunity cost of money holding – is zero (equal to the marginal cost of printing money). The classic reference for the Friedman rule is [Friedman \(1969\)](#). The earlier literature referred to it as the Chicago rule; see [Niehans \(1978\)](#).

differs from the previous contributions on this topic with the “same” three ingredients in that it adopts a Mirrleesian rather than a Ramsey approach to optimal taxation.²

It is now well-known that the Friedman rule is a first-best prescription and may or may not hold in second-best settings. This depends on the nature of the second-best (existence of distortionary taxes or intrinsic reasons for market failure), the set of tax instruments available to the government, and the structure of individuals' preferences.³ [Chari et al. \(1991, 1996\)](#), in the context of a model with identical and infinitely-lived individuals, related the optimality of Friedman rule in

² See [Arbex and Turdaliiev \(2011\)](#) and the references therein for examples of the literature that examines the relevance of tax evasion for the Friedman rule from a Ramsey tax perspective.

³ Non-optimality of Friedman rule in the presence of distortionary taxes was first discussed by [Phelps \(1973\)](#). A selective reference to other sources of distortion include: [van der Ploeg and Alogoskoufis \(1994\)](#) for an externality underlying endogenous growth; [Ireland \(1996\)](#) for monopolistic competition; [Erceg et al. \(2000\)](#) and [Khan et al. \(2003\)](#) for nominal wage and price settings; [Schmitt-Grohé and Uribe \(2004\)](#) for imperfections in the goods market; and [Shaw et al. \(2006\)](#) for imperfect competition as well as externality.

the presence of distortionary taxes to the uniform commodity tax result of Atkinson and Stiglitz (1972) and Sandmo (1974). This latter result states that if preferences are separable in labor supply and non-leisure goods, with the subutility for goods being homothetic, optimal commodity taxes are proportionately uniform. They showed that deviations from Friedman rule violate this tax principle.⁴

These studies, being carried out in an environment with identical individuals, are by construct silent on the validity of the Friedman rule when monetary policy has redistributive implications.⁵ A second related drawback of these studies is their reliance on the Ramsey tax framework, which assumes that all tax instruments, including the income tax, are set linearly.

In a recent contribution, da Costa and Werning (2008) break with this tradition and consider the optimality of the Friedman rule in a model with heterogeneous agents and allow the government to levy nonlinear income taxes. Interestingly, they show that the Friedman rule is optimal in their setting (for any social welfare function that redistributes from the rich to the poor). As with Chari et al.'s (1991, 1996) earlier result, da Costa and Werning's (2008) finding is also related to the uniform taxation result in public finance, albeit a different one. Whereas Chari et al. (1991, 1996) draw on Sandmo's tax uniformity (1974) result derived within a Ramsey setting, da Costa and Werning's (2008) has its roots in Atkinson and Stiglitz (1976). This classic paper on the design of tax structures was particularly concerned with the usefulness of commodity taxes in the presence of a general income tax in economies with heterogeneous agents.⁶

Atkinson and Stiglitz (1976) proved that with a general income tax, if preferences are weakly separable in labor supply and goods, then commodity taxes are not needed as instruments of optimal tax policy. With non-separability, one wants to tax the goods that are "substitutes" with labor supply and subsidize those that are "complements" with labor supply. In da Costa and Werning (2008) the uniformity result, which implies a zero nominal interest rate, holds with preference separability. With non-separable preferences, da Costa and Werning assume that real cash balances and labor supply are complements so that cash balances should be subsidized. This implies that the optimal nominal interest rate is negative. But given the non-negativity of nominal interest rate, the zero interest rate emerges as the "optimal" policy.

da Costa and Werning's (2008) results as well as the earlier Chari et al.'s (1991, 1996) results are all derived in settings that disregard tax evasion. Yet many empirical studies over the past few decades confirm that tax evasion is a widespread phenomenon all over the world; see Shaw et al. (2011) for a recent survey. Now it is also the case that introducing tax evasion into the optimal tax problem often invalidates policy lessons drawn ignoring this phenomenon. For example, in the context of the uniform taxation results, Cremer and Gahvari (1993) prove that the Ramsey results are no longer valid. Similarly, Boadway et al. (1994) show how the presence of tax evasion destroys the celebrated Atkinson and Stiglitz (1976) theorem on the redundancy of commodity taxes in the presence of Mirrleesian optimal income tax if preferences are weakly separable in labor supply and goods. One would then expect the same fate for the Friedman rule. This is indeed the case and there are a number of papers that make this. However, they are all

written in the context of Ramsey taxes. There are no such studies to date using the Mirrleesian tax framework. Demonstrating this point constitutes the major contribution of this paper; it is not, however, the only contribution of the paper.

The paper first examines the robustness of da Costa and Werning's (2008) results. It re-examines these results in the context of a two-period overlapping-generations economy populated by two types of individuals: high-skilled and low-skilled. This is in contrast to da Costa and Werning (2008) who posit an economy populated by a continuum of infinitely-lived individuals. It shows that for their results to go through an additional assumption is required. In particular, contrary to their result, complementarity of real cash balances and labor supply alone does not guarantee the optimality of the Friedman rule as a boundary solution. We derive an additional condition to ensure this result. We argue that da Costa and Werning's (2008) result to the contrary arises because there are no differential commodity taxes in their model.

Having examined the robustness question, the paper turns to the discussion of its main message; namely, that the absence of tax evasion is crucial for da Costa and Werning's (2008) results. When agents have access to a misreporting technology, which allows them to shelter part of their earned income from the tax authority, monetary policy becomes another useful instrument for redistribution. In particular, income tax evasion invalidates the uniform commodity tax result of Atkinson and Stiglitz (1976) thus rendering the monetary growth rate a redistributive power that otherwise it does not possess. As a result, the presence of tax evasion invalidates da Costa and Werning's (2008) first result on the optimality of the Friedman rule as an interior solution if the conditions for Atkinson and Stiglitz (1976) theorem hold. da Costa and Werning's (2008) second result, on the optimality of the Friedman rule as a boundary solution if real cash balances and labor supply are complements, is no longer guaranteed either. This is because, in the presence of tax evasion, one does not know which type of agents supplies more labor (at the same level of reported income). Hence the complementarity assumption does not identify the type who demands more real cash balances.

2. The model

Consider a two-period overlapping generations (hereafter OLG) model wherein individuals work in the first period and consume in both. There is no bequest motive. Preferences are represented by the strictly quasi-concave utility function $U = u(c_t, d_{t+1}, x_t, L_t)$ where c denotes consumption when young, d consumption when old, x real money balances (held for non-evading activities)⁷, and L labor supply; subscript t denotes calendar time. While the utility function is assumed to be strictly increasing in c_t and d_{t+1} , and strictly decreasing in L_t , the possibility of satiation in real balances is not ruled out (i.e. $\lim_{x \rightarrow x^{sat}} \partial u / \partial x = 0$ at the "satiation level" x^{sat}). Each generation consists of two types of individuals who differ in skill levels (labor productivity). High-skilled workers are paid w_t^h and low-skilled workers w_t^ℓ ; with $w_t^h > w_t^\ell$. The proportion of agents of type j , π^j , $j = h, \ell$, remains constant over time. Denote the number of young agents of type j born in period t by n_t^j and the total number of young agents by N_t . We have $n_t^j / N_t = \pi^j$. While π^j remains constant, population grows over time at a constant rate, g .

Production takes place through a linear technology with different types of labor as inputs. Transfer of resources to the future occurs only through a storage technology with a fixed (real) rate of return, r .⁸ We thus work with an OLG model à la Samuelson (1958) and assume away the issues related to capital accumulation.

⁴ This uniformity result is derived within the context of the traditional one-consumer Ramsey problem. As such, the result embodies only efficiency considerations. Redistributive goals do not come into play.

⁵ With the exception of intergenerational redistributive issues that arise in overlapping generations models; see, e.g., Weiss (1980), Abel (1987), and Gahvari (1988, 2007, 2012).

⁶ The ineffectiveness of commodity taxes and their proportionately uniform structure boil down to the same thing. In the absence of exogenous incomes, the government has an extra degree of freedom in setting its income and commodity tax instruments. This is because all demand and supply functions are homogeneous of degree zero in consumer prices. In consequence, the government can, without any loss of generality, set one of the commodity taxes at zero (i.e. set one of the commodity prices at one). Under this normalization, uniform rates imply absence of commodity taxes.

⁷ Additionally, we will allow for money to have a separate "evasion-facilitating" usage; see subsection 2.1.1 below.

⁸ An alternative assumption is that agents borrow and lend on international capital markets at an exogenously fixed interest rate.

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