



Optimal monetary and audit policy with imperfect taxation

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ABSTRACT

We study optimal monetary and fiscal policy in the presence of informal activities and tax evasion in a cash-and-credit model where identical households are audited to determine their compliance with the tax code. Taxation of informal labor is imperfect, but the government has tools to deal with informal activities and can choose them optimally to reduce fiscal distortions. We characterize both the optimal monetary (optimal interest rate) and fiscal policy (optimal income tax, evasion penalty and audit probability). When auditing is costless, a nominal interest rate equal to zero is optimal and attained when all agents are audited and both types of labor are taxed at the same rate. In the presence of auditing costs, the optimal audit policy does not follow the Friedman rule, and we report the welfare costs of implementing this monetary policy prescription. We derive conditions under which the Friedman rule can be recovered in an economy with informal activities.

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1. Introduction

A central issue in monetary theory is the question of the optimal interest rate. Friedman (1969) argued that the optimal monetary policy is characterized by a nominal interest rate equal to zero. Many studies focus on the conditions under which this policy, known as the Friedman rule, is optimal. We study optimal monetary and fiscal policy in the presence of informal activities and tax evasion in a cash-and-credit model where identical households are audited to determine their compliance with the tax code. Taxation of informal labor is imperfect. When auditing is costless, the Friedman rule is the optimal monetary policy, which is attained when all agents are audited and both types of labor, formal and informal, are taxed at the same rate, as efficiency requires. In the presence of auditing costs, the optimal audit rate and evasion penalty do not implement the Friedman rule, and the optimal monetary policy is to deviate from it. When informal activities are only imperfectly taxed and auditing is costly, we show that there are welfare costs of implementing the Friedman rule prescription. A key feature of our model is the recognition that the government has tools to deal with informal activities and can choose them optimally to reduce fiscal distortions.

It has been shown in the literature that in the presence of an informal sector or tax evasion the Friedman rule is not optimal.¹ Nicolini (1998) studies the optimal monetary policy in an economy with an underground sector where cash is used for transactions. Money is introduced by means of a cash-in-advance constraint, and the Friedman rule is not the optimal monetary

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¹ There is a growing literature on the impact of the informal sector on macroeconomy and resource allocation. See for instance, Friedman et al. (2000), Fugazza and Jacques (2003), and Choi and Thum (2005).

policy. Introducing money via a shopping-time constraint, [Cavalcanti and Villamil \(2003\)](#) show that in the presence of informal activities, the Friedman rule is not optimal and the government raises revenue through a second-best inflationary tax. [Koreshkova \(2006\)](#) investigates quantitatively the importance of the public-finance motive for inflation in the presence of a tax-evading sector and finds a positive relationship between the size of the underground economy and the inflation rate.

Another frequently advocated reason to deviate from the Friedman rule is the presence of tax collection costs (see [Aizenman, 1983](#); [Vegh, 1989](#)). [De Fiore \(2000\)](#) explores conditions under which the Friedman rule is optimal despite costs of collecting taxes. [Yesin \(2004\)](#) studies an economy with an informal sector and shows that costs of collecting formal income taxes can partly explain the observed deviations from the Friedman rule across countries.

There is some empirical evidence that governments incur costs to collect formal and informal taxes. According to [OECD \(2004\)](#), national revenue authorities compute and publish “cost of collection” for formal sector taxes. This cost can be expressed as the amount the government spends to collect 100 units of revenue. For instance, in 2002, the governments of the United States, Canada, France, Portugal and the Czech Republic spent US\$0.52, 1.20, 1.44, 1.68 and 2.08 to collect US\$100 of formal taxes, respectively. Data on cost of auditing and collection of informal taxes is scarce. According to IRS Commissioner Mark Everson ([Kenney, 2005](#)), enforcement of the tax code is expected to pay for itself and the benefit/cost ratio is more than four-to-one. This means that the tax authority would spend US\$25 to collect US\$100 of informal taxes. In the United States, spending to collect formal taxes can be interpreted as the cost to run the Internal Revenue Service and carry out its main tasks. Enforcement spending requires additional effort and resources.

Several other papers also investigate the optimality of the Friedman rule in overlapping generation models ([Gahvari, 1988](#); [Bhattacharya and Haslag, 2003](#); [Bhattacharya et al., 2005](#); [Palivos, 2005](#); [Gahvari, 2007](#)), under imperfect competition ([Schmitt-Grohé and Uribe, 2004](#)), in the context of a small open economy ([Arseneau, 2007](#); [Cunha, 2008](#)) and in the presence of heterogenous agents ([Albanesi, 2002](#); [de Costa and Werning, 2008](#)). [Correia and Teles \(1996\)](#) and [De Fiore and Teles \(2003\)](#) discuss the relevance of the transactions technology in the determination of the optimal monetary policy. [Chari et al. \(1991, 1996\)](#), [Correia and Teles \(1999\)](#) and [Ellison and Rankin \(2007\)](#) study optimal monetary policy in different monetary models when the government must finance its expenditures without access to lump-sum taxation. [Chari and Kehoe \(2006\)](#) emphasize that the robust finding is not that nominal interest rates should be literally zero, but that nominal interest rates and inflation rates should be low.

The model is built on [Lucas and Stokey \(1983\)](#) and [Chari et al. \(1991, 1996\)](#). The economy is populated by a large number of ex-ante identical agents that can work in two sectors of the economy, the formal or informal one. Labor is the only factor of production in this economy. Output is produced using both formal and informal labor (or, output can be thought of as a composite of the output of the two sectors). Instruments to tax formal labor and punish tax evaders are available. The government uses proportional income taxes in the formal sector to finance its purchases. Agents try to evade taxes by working in the informal sector. Informal activities are defined as all income generating activities which do not comply with the tax obligations, i.e. tax evasion and non-compliance with economic legislation are assumed to be the main activities involved in it. We use the terms tax evasion and informal activities interchangeably. The government audits a certain fraction of the population and imposes an evasion penalty proportional to the tax evaded. We assume that agents are ex-ante identical and thus all provide labor services in the informal sector. Auditing everybody is not optimal because it is costly.

[Chari and Kehoe \(1999\)](#) define an economy's tax system as complete if the number of tax rates the social planner can select is equal to the number of commodities in question, and incomplete if the number of tax instruments is smaller than the number of commodities. Previous studies have assumed that the government cannot observe and tax transactions in the informal sector, thus the tax system is incomplete (see for instance, [Nicolini, 1998](#); [Cavalcanti and Villamil, 2003](#); [Yesin, 2004](#); [Koreshkova, 2006](#)). In our economy, where the government has instruments to tax (a portion of) the economy's informal labor income but not everyone is audited and thus taxed on the informal labor services, we treat the tax system as complete but imperfect. In our model, the nature of the informal sector is such that agents can reduce their exposure to the audit risk by reducing their time allocated to informal activities.

This paper departs from the existing literature in two key aspects. First, unlike most of the previous work, the source of idiosyncratic shocks in our economy is the government and its imperfect taxation of informal labor income – in any period of time only a fraction of the population is audited. That is, the government audit policy creates heterogeneity in the otherwise homogenous population. Second, we characterize both the optimal monetary and fiscal policy, that is, the optimal interest rate and the optimal income tax, evasion penalty and audit probability, respectively. This feature of our model enriches the discussion about optimal policies for environments with labor distortions. We extend the results for the optimality of the Friedman rule obtained in the existing literature and, in particular, derive conditions under which this monetary policy can be recovered in an economy with informal activities.

Our main findings are as follows. When the audit cost is zero and the audit policy (the audit rate and the penalty rate) is fixed, the Friedman rule may or may not be the optimal monetary policy. If the government can optimize the audit policy, the Friedman rule is recovered. The Friedman rule is not optimal in this environment as long as the audit cost is positive. It is only in the limiting case of zero audit cost that the Friedman rule becomes optimal. The intuition of this limiting case is that when audit is costless it is optimal to audit everybody. Then the penalty rate plays the role of the usual tax rate, and the tax system becomes complete and perfect. The optimality of the Friedman rule is well known in this kind of environment (e.g., see [Chari and Kehoe, 1999](#)). However, when the cost of audit is positive, the benefit of auditing more people should be traded off against the cost of this activity. Since auditing everybody is not optimal, the tax system becomes imperfect. The audit introduces uncertainty, which, other things being equal, lowers welfare. The government's inability to perfectly tax informal

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