Tax compliance and firms' strategic interdependence ☆

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ABSTRACT

We focus on a relatively neglected area of the tax-compliance literature in economics, the behaviour of firms. We examine the impact of alternative audit rules on receipts from a tax on profits in the context of strategic interdependence of firms. The enforcement policy can have an effect on firms' behaviour in two dimensions — their market decisions as well as their compliance behaviour. An appropriate design of the enforcement policy can thus have a "double dividend" by manipulating firms in both dimensions.

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1. Introduction

The behaviour of firms is sometimes glossed over in the economic analysis of tax policy. In the analysis of tax compliance it is often omitted altogether. This omission is rather odd: tax inspectors typically use background knowledge about markets and industries in order to refine the monitoring and auditing process and, even if this knowledge is exercised in rule-of-thumb fashion, one would expect it to be in conformity with rational economic principles. Of course, firms do make an appearance in the standard compliance literature, but only in a rather specialised manner and in connection with rather specialised questions. In this paper we take a step toward a richer analysis.

What makes the tax-compliance problem different for firms or corporations in contrast to individual taxpayers? There are two main areas of difference: (1) the nature of the internal organisation of corporations that may affect important aspects of their external activity including tax reporting (Crocker and Slemrod, 2005; Chen and Chu, 2005), (2) the nature of the firm's external activities in the market. This paper concentrates on the second of these two areas and focuses on corporate tax-evasion and market decisions in an oligopolistic setting. We examine the

impact of alternative audit rules on receipts from a tax on profits, allowing for both compliance responses and market responses by the firms. Why does this alternative focus make such a difference to the analysis?

Most models in the literature focus on a simple proportionate audit rule in an adapted version of the Allingham and Sandmo (1972) model, as though firms habitually play the dual roles of producers and gamblers.[1] In many of the standard models of corporate compliance there is a fundamental separation result between the production and concealment activities. This conclusion appears to be robust to alternative assumptions about market structure and the specifications of firms' objectives. However, taxes are not neutral in a setting where the behaviour of the tax authority depends on all the declarations in a particular market. The tax authority can exploit this market-based information and so, in the light of this, we investigate the implications of using a more intelligent audit rule that is easily implementable. Specifically we focus on a relative audit rule — where the probability of audit of a particular firm depends on that firm's observable behaviour relative to others operating in the same market.[2]

Our aim in this paper is to provide an economic rationale for relative audit rules that are used by some tax authorities and to explain why it is

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[1] See Nur-tegin (2008) and Slemrod (2004) for recent overviews of the literature.
[2] This type of audit rule and the associated compliance behaviour has been examined in the laboratory (Alm et al., 1993; Clark et al., 2004; Collins and Plumlee, 1991). In order to be effective it is necessary that the tax-payer's environment be one that permits observation by each agent of a signal related to the tax liability of others. In the laboratory this can be artificially arranged: within an industry this may occur naturally from specialised knowledge of market conditions.

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to a tax authority's advantage to use a relative rule. We also demonstrate the advantages of such a policy beyond the authority's narrow tax-compliance objectives: the idea is that introducing a relative audit rule would introduce a regime where tax enforcement can influence output decisions. By conditioning an individual audit on the declaration of all firms the authority creates an externality. The externality can be seen as generating two dividends: (a) less tax evasion and (b) an efficiency improvement. The reduction in tax evasion is a direct result of the tax authority's making better use of available information from all firms taken together. The move toward static efficiency arises because of an induced increase in output generated by the switch in enforcement regime.

The paper is organised as follows. Section 2 reviews the story of corporate tax compliance as conventionally presented in the literature and outlines the model presented here; Section 3 examines the equilibrium behaviour of firms in the two main dimensions of decision-making and Sections 4 to 6 present the main results, for both non-collusive and collusive behaviour. Finally, Section 7 concludes. Proofs of propositions and lemmas are provided in Appendix A.

2. The setting and model outline

2.1. Background

The literature on models of corporate tax compliance usually focuses on one of two relatively simple market structures — competitive price-taking or monopoly. The elements of such a model are as follows: a risk-neutral price-taking firm with constant marginal costs and a determinate demand curve faces a proportionate profits tax. The sole source of uncertainty is created by a combination of the firm's actions (the firm can conceal profit, but at a cost) and the government's tax audit (a given audit probability with a known penalty proportionate to the amount concealed). The firm conceals up to the point where the marginal cost of concealment equals the marginal reduction of expected tax rate, a rule that is independent of the firm's output level (Cowell, 2004).

The advantage of this approach is its simplified behavioural analysis of the tax-evading firm: the "production department" can get on with determining the level of output in the light of market conditions; the "tax-management department" separately decides on matters of profit declaration. But there are three causes for concern:

- The separability result is artificial and it is not clear that it would survive in a more interesting model of the industry.[3]
- The type of audit rule used is naive in that it does not make use of low-cost or costless information that would be available to the tax authority from the firms' reports.
- The argument that taxation policy has no effect on output seems inappropriate in the light of the perception that corporate taxation does influence firms' activities. Of course this perception may be misplaced, but it would be useful to know whether there is a good theoretical case for considering a real effect of taxation and tax-enforcement policy.

To address these questions we develop a simple model that will permit a somewhat richer version of market structure and behaviour by the tax authority. The model consists of a conventional story of individual firms, an industry with a given number of firms, a simple tax function and an audit rule. We will briefly examine each of these in turn.

2.2. The industry

We focus on an oligopolistic market with a fixed number of firms each producing a single output; the outputs of the firms in the market are substitutes. The firms compete in a standard quantity-competition (Cournot) model of market interaction. The details of each firm's simple production technology are subsumed within a conventional profit function. It faces a requirement to pay tax and knows that it has opportunities for evasion. This enables us to focus on perhaps the most appealing and relatively uncomplicated case of strategic interdependence amongst firms in order to examine the potential role of taxation policy in a market form that is not purely mechanistic. One consequence of this is that we would expect the standard Cournot–Nash equilibrium to emerge in which output is above the level corresponding to joint-profit maximisation but below that characterising economic efficiency. In what follows we describe the environment for firms competing in quantities — for the case where firms compete in terms of prices see Bayer and Cowell (2006).

2.3. Taxation and firms' objectives

Let us set out the role of the tax system in the objective function for the firms. Assume a given population $N := \{1,\ldots,n\}$ of firms. Firm i makes gross profit $\Pi_i(\mathbf{q})$ where

$$\mathbf{q} := (q_1, q_2, \ldots, q_i, \ldots q_n)$$

is the vector of quantities produced. Each firm i makes a declaration of profits d_i on which taxes and any penalties are based. There is no loss-offset or compensation: subsidies are not given for losses, nor are bonuses paid for revealed over-compliance. For simplicity we impose the condition that gross profits and declaration are non-negative;[4] we also assume a linear profits tax t so that the legal tax liability is $t\Pi_i(\mathbf{q})$ and the tax actually paid in the absence of an audit is td_i. Profit net of taxes if no audit takes place is therefore:

$$\bar{\pi}_i(d_i, \mathbf{q}) := \Pi_i(\mathbf{q}) - td_i. \tag{1}$$

After an audit, if a firm is found to have underpaid tax, it is required to make up the shortfall and also to pay a fine. We assume that this fine is proportional to the concealed profit although this is not essential for our results. Net profit if there is an audit is therefore

$$\underline{\pi}_i(d_i, \mathbf{q}) := \Pi_i(\mathbf{q}) - t\Pi_i(\mathbf{q}) - f[\Pi_i(\mathbf{q}) - d_i], \tag{2}$$

where f is the proportionality factor of the fine.

Creating the opportunity for evasion requires that the firm incur a real resource cost covering fees for specialist advice, reorganising transaction patterns or purchasing avoidance schemes. The cost can also be interpreted as the cost of effective concealment. A firm spends real resources in order to hide evasion. Incurring these costs becomes mandatory for an evading firm, since evasion without concealment effort would lead to a discrepancy between book profit and declared profit, which may be easy for the authority to pick up; the marginal cost of concealment will be higher for more "visible" firms and visibility may increase with the scale of the firm's operations. In the light of this it is reasonable to assume that the concealment-cost function may differ from one firm to another and is a non-negative function of

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[3] See Goerke and Runkel (2006) for a recent treatment of this issue: they examine a simple Cournot model with entry.

[4] In the absence of these restrictions the legal tax liability and tax paid become max $\{0, t\Pi_i(\mathbf{q})\}$ and max$\{0, td_i\}$ respectively and corresponding adjustments need to be made to expressions (1) and (2); but this does not affect any of the results that follow.