UNIVERSITÀ POLITECNICA DELLE MARCHE

DIPARTIMENTO DI ECONOMIA

INCOMPLETE INFORMATION IN TAX SETTING OF LOCAL GOVERNMENTS: A THEORETICAL FRAMEWORK

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QUADERNI DI RICERCA n. 295

Agosto 2007

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Abstract

In the literature, tax interaction is mainly due to tax and yardstick competition. However, we suppose that tax interaction appears when the local policy maker conforms his fiscal policy to decisions taken by his neighbourhood to fill information gaps. Theoretical results show that incomplete information leads to tax mimicking and a higher level of tax rate. Moreover, leviathan governments are more sensitive than benevolent ones to changes in neighbours' tax rates (horizontal tax interaction) but less to changes in the central government tax rate (vertical tax interaction). Finally, there is no tax rate internalization effects because an increase in the central government tax rate is not followed by an equivalent decrease of local government tax rate.

JEL Classification: • H 30 Fiscal Policies and Behaviour of Economic Agents – General • H71 - State and Local Taxation, Subsidies, and Revenue • H77 - Intergovernmental Relations; Federalism; Secession.

Keywords: informative trend; political trend; incomplete information; tax mimicking.

**The author is grateful to Fabio Fiorillo, David Bartolini, Antonio Palestrini, and Alberto Zazzaro for helpful comments and suggestions.*

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1. Introduction

Strategic interaction in tax setting of local governments is mainly due to tax competition (Oates, 1972; Wilson, 1986; Zodrow and Mieszkowski, 1986; Wildasin, 1988) or, alternatively, to yardstick competition (Salmon, 1987, Besley and Case, 1995). Tax competition derives from the strategic behaviour of the policy maker who attracts mobile tax base from other jurisdictions decreasing his tax rate (Wilson, 1999 for a review). Yardstick competition depends on asymmetrical information problems between voters and the politician incumbent. Voters are less informed on costs and benefits of public goods and services than their own politician; therefore, they use information from other jurisdictions to evaluate his performance. The politician incumbent, well informed about comparisons made by voters, chooses a tax rate in line with other jurisdictions to indicate a good performance to them, reducing citizens' voice and increasing his re-election chances. Both phenomena produce inter-jurisdictional tax interaction, called *tax mimicking* in the empirical literature.

The first empirical study on tax mimicking was conducted by Ladd (1992). She defines this phenomenon as follows: «*local officials consider the tax burdens of neighboring counties when making their own decisions about taxes on residents*», (Ladd, 1992: 450). Ladd tests the presence of tax mimicking in tax burdens of the US counties finding some evidences. Nevertheless, the source of tax interactions is not clear in her analysis as well in following studies (Heyndels and Vuchelen, 1998; Brett and Pinkse, 2000; Bureckner and Saavedra, 2001; Hernández-Murillo, 2003; Rork, 2003; Feld et al., 2003; Feld and Reulier, 2005). However, significant contributions have been obtained by empirical investigation of yardstick competition testing the impact of neighbours' tax rates on the probability of incumbent re-election (Case, 1993; Besley and Case, 1995) or on the popularity of the incumbent (Revelli, 2002b). Other empirical studies conclude that yardstick competition is absent where mayors are backed by large majorities or face a term limit (Bordignon et al., 2003). Solé-Ollé (2003) indicates some relationships between tax mimicking and electoral accountability to detect yardstick competition. Finally, Allers and Elhorst (2005) test some hypotheses of Solé-Ollé (2003), finding that large majorities are less sensitive to neighbouring tax rate changes than small ones, confirming previous empirical evidence on yardstick competition.

Tax and yardstick competition are not the only sources of tax mimicking. In the literature, public expenditure spill-overs can affect tax setting of jurisdictions, producing this phenomenon (Allers and Elhorst, 2005). However, Revelli (2002a) is not agree with this hypothesis, asserting that: *«copy-catting of local tax rates might engender a spatial dependence process in public spending levels that could wrongly be attributed to public expenditure spill-overs»* (Revelli, 2002a:1723).

An alternative source of tax mimicking is defined by Redoano (2003) following suggestions of Manski (1993). She defines it as a *«common "intellectual" trend that drives countries fiscal choices in the same directions»* (Redoano, 2003:10). Intellectual trend does not depend on strategic behaviour of the policy maker but only on his propensity to behave in the same way of his reference group. In this paper, we suppose that this behaviour essentially depends on the incomplete information on the costs and benefits of local public services. The policy maker prefers to conform his fiscal policies to those of his neighbouring jurisdictions in order to fill the lack of information (Case et. al. 1989). Recently, an Italian study tests this hypothesis as *informative trend* (Santolini, 2007). It tests tax mimicking among municipalities ruled by coalitions without a clear political identity (heterogeneous coalitions) because they most likely copy-cat fiscal decisions of the other ones to fill information gaps. However, empirical evidence shows that informative trend is not present in tax setting of municipalities but only on their public spending decisions. Therefore, new empirical evidences deserve to be investigated in future studies.

In presence of incomplete information, it is also possible that the policy maker prefers to conform his fiscal decisions to those of his political party. In this case, his reference group consists in jurisdictions ruled by the same political affiliation party. We named this phenomenon as *political trend*. Recently, two empirical studies tested the political ideology affiliation as source of fiscal interdependence. Foucault et al. (2006) show that public spending interaction in French municipalities exists among mayors who share the same political affiliation. Another study (Santolini, 2007) concludes that tax setting interaction is present among Italian municipalities which are ruled by the same political coalition. This study concludes that tax mimicking among contiguous coalitions is probably produced by political trend.

After this introduction, we present in section 2 a theoretical model in

order to show the effects of incomplete information on local government's tax setting in case of leviathan and benevolent policy maker. Finally, section 3 concludes.

2. Theoretical framework

We consider N local policy makers. Each policy maker *i* (*i*=1,…, N) chooses an income tax rate t_i from a closed set of alternative choices Ω_i between zero and one, including ($t_i \in \Omega_i$ [0,1]), maximizing several components of his objective function. The first component corresponds to the citizen aggregate utility $U(C,G)$ that depends on private (C) and public (G) goods. In particular, private aggregate consumption coincides with the citizens' disposable income $(1-t_i-t_a)Y$ after local (t_i) and central government (t_a) income (Y[1]) taxation.

We suppose that the citizen aggregate utility function is additive and strictly concave[2] based on Lockwood's (2001) which allows to investigate the effects of taxation when the local policy maker is leviathan or benevolent. Equation 1 summarizes this utility function. Differently from Lockwood's (2001), we consider infinite degrees of benevolence of the policy maker *i* imposing $0<\alpha<1$. When α goes to zero the policy maker *i* is less benevolent *vice versa* when α goes to one.

$$\alpha U(C)+\upsilon(G) \tag{1}$$

Another component of the objective function is the utility of the local policy maker *i* to conform his fiscal decisions to those of his neighbouring policy makers to fill information gaps. Accordingly, utility function is represented by a quadratic distance between the local policy maker *i*'s tax rate and the expected value of the average tax rate $\bar{t}_i^e$ of his neighbourhood. Assuming that the local policy maker *i* assigns to every member of his neighbourhood an identical weight $J_{i,j}=J$ nonnegative

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[1] An aggregate good is produced and then normalized to one ($Y= f(L)=1$). It is used in private consumption and as input to produce public good using labour, supposed fixed and immobile among jurisdictions and, therefore, not modelled explicitly in the model.

[2] $U'_{C_i}>0$, $U''_{C_i}<0$, $\upsilon'_{G_i}>0$, $\upsilon''_{G_i}<0$.

($J_{ij}>0$), $\bar{t}_i^e$ corresponds to the arithmetic mean: $\bar{t}_i^e = J \sum_j^{N-1} t_j = \bar{t}_i$ [3]. This assumption is named as *global interaction hypothesis*.

The conformity utility function is illustrated in equation 2. We can observe that the quadratic distance is weighted by β corresponding to the conformity degree of the policy maker *i* to neighbours' choices. This weight is assumed to be nonnegative ($0 \leq \beta < 1$) and identical for all local policy makers.

$$-\frac{\beta}{2}(t_i - \bar{t}_i)^2 \tag{2}$$

In his objective function, the policy maker *i* takes also into account the utility of listening to the citizen's voice (Hirschman, 1970). This utility is expressed as the distance between the policy maker *i*'s tax rate squared and the optimal tax rate squared. The latter tax rate is obtained by the maximisation of the citizen aggregate utility function i.e. $t_i^{\circ} = argmax\ U(C_i, G_i)$. The citizen's voice function is weighted by the degree of nonconformity ($1-\beta$) as reported in equation 3.

$$-\frac{(1-\beta)}{2}\left(t_i^2 - t_i^{\circ 2}\right) \tag{3}$$

Finally, an idiosyncratic taste shock, θi *i.i.d.* (Glaeser and Scheinkman, 2001), with zero mean and constant variance (σ_θ^2) across agents, is introduced in the objective function of the policy maker *i*.

In order to determine the optimal tax rate t_i^*, the problem of the local policy maker *i* consists in maximizing the objective function under public budget constraint $t_i + TR_i = G_i$. In this case, local public revenues, corresponding to income tax revenue (t_i) and lump sum grant (TR_i) given to policy maker *i* from the central government, must be equal to local public expenditure (G_i). In addition, we assume that lump sum grant is equal to tax yield collected by the central government ($TR=t_a Y$).

[3] It follows $\sum^{N-1} J \equiv 1$ which is equivalent to $J \equiv 1/(N-1)$.

$$\begin{cases} t_i^* = argmax_{t_i \in [0,1]} aU(C_i) + \upsilon(G_i) - \dfrac{\beta}{2}(t_i - \bar{t}_i)^2 - \dfrac{(1-\beta)}{2}\left(t_i^2 - t_i^{\circ 2}\right) + \theta_i t_i \\ s.t. \quad t_i + TR_i = G_i \\ \qquad TR_i = t_a Y_i \\ \qquad C_i = (1 - t_i - t_a) Y_i \\ \qquad Y_i = 1 \end{cases} \tag{4}$$

A sufficient condition is necessary to guarantee uniqueness of the equilibrium given a shock $\theta \in \Theta^N$ (Glaeser and Scheinkman, 2002). This condition is reported in equation 5 and it consists in the absolute value of the cross partial derivative between *i*'s own tax rate and the average tax rate of the neighbourhood is lesser than the absolute value of the second derivative of utility with respect to *i*'s own tax rate.

$$\left| \frac{V''_{t_i, \bar{t}_i}}{V''_{t_i}} \right| = \left| \frac{\beta}{aU''_{C_i} + \upsilon''_{G_i} - 1} \right| < 1 \quad V''_{t_i} < 0 \tag{5}$$

The equilibrium tax rate level $t_i^* = t_i^*(a, \beta, \bar{t}_i, TR_i, \theta_i)$ is obtained by the fist order condition (FOC) indicated by equation 6. It depends on the degree of benevolence and conformity, average tax rate of neighbourhood, lump sum grant, and taste shock.

$$V'_{t_i} = -aU'_{C_i} + \upsilon'_{G_i} - t_i + \beta \bar{t}_i + \theta_i = 0 \tag{6}$$

From equation 6, it follows that the leviathan government has a higher optimal tax rate than the benevolent one.

Proposition 1 – An increase in "a" corresponds to an equilibrium tax rate reduction.

▪ Proof - Proof in appendix (A.1).

The slope of reaction function (Eq. 6) measures the size of tax mimicking (ϱ) corresponding to the change in the policy maker *i*'s tax

rate following his neighbourhood changes. It is less than 1 when the policy maker *i*' tax rate is in line with his neighbours' tax rate, otherwise it is zero. This result depends on the strong hypothesis $V''_{t_i} < 0$ reported in equation 5.

Equation 7 highlights that tax mimicking depends crucially on β, outlining the presence of strategic complementarity (Cooper and John, 1988) among policy makers. Strategic complementarity is equivalent to an increase in the marginal utility of the policy maker following neighbours' tax rates increase[4].

$$0 \leq \varrho = \frac{\beta}{1 - a U''_{C_i} - \upsilon''_{G_i}} < 1 \tag{7}$$

From equation 7 results that the leviathan government is more sensitive to changes in tax rate of neighbouring policy makers (*horizontal tax interaction*) than the benevolent government.

Proposition 2 – The leviathan government is, ceteris paribus, more sensitive to changes in tax rate of neighbouring policy maker than the benevolent government.

Let us consider taxation effects of the same tax base from multi-tiered levels of government (*vertical tax interaction*). An increase in the central government's tax rate is not internalized by an equivalent decrease in the local tax rate. Equation 8 shows that the policy maker reduces his tax rate less than the increase in the central government tax rate.

$$-1 < \frac{\partial t_i}{\partial t_a} < 0 \tag{8}$$

Proposition 3 – An increase in the central government's tax rate is not internalized by an equivalent reduction in the local government's tax rate.

- Proof - Proof in appendix (A.2).

[4] The Strategic complementarity is equal to $V''_{t_i,\bar{t}_i} = \frac{\partial^2 V_i}{\partial t_i \partial \bar{t}_i} = \beta$.

As regards internalization aspects, another result is achieved. The leviathan government is less sensitive to changes in up-tiered government's tax rate than the benevolent one. Together with proposition 3, this is true in absence of conformity behaviour of the policy maker and, therefore, these results are valid in a general context.

Proposition 4 – The leviathan government is less sensitive to changes in the central government's tax rate than the benevolent one.

- Proof - Proof in appendix (A.3).

3. Conclusion

Some different explanations are given in the literature to explain tax setting interdependence. In this paper, we study the propensity of the policy maker to behave in the same way of his neighbourhood to fill information gaps. This behaviour leads to tax mimicking and a higher equilibrium tax rate. Moreover, the leviathan government imposes a tax rate higher than the benevolent one as well is more sensitive to changes in neighbours' tax rates but less to changes in up-tiered government tax rate.

Finally, there is not tax rate internalization effect because an increase of central government tax rate is not followed by an equivalent decrease of local government tax rate.

Appendix

Proof. A.1 - *Differentiating equation 6 with respect to t_i and a, we obtained* $\frac{\partial t^*_i}{\partial a} = -\left(\frac{\partial V_i}{\partial t_i \partial a} \Big/ \frac{\partial V_i}{\partial^2 t_i} \right) = \frac{U'_{C_i}}{a U''_{C_i} + \upsilon''_{G_i} - 1}$ *which is negative supposing* $U'_{C_i} > 0$, $U''_{C_i} < 0$, *and* $\upsilon''_{G_i} < 0$ *for hypothesis.*

Proof. A.2 – *By total differentiation of equation 6 with respect to t_i and t_a, we*

obtained $\frac{\partial t_i}{\partial t_a} = -\left(\frac{\partial V_i}{\partial t_i \partial t_a} \Big/ \frac{\partial V_i^2}{\partial t_i^2} \right) = \frac{a U''_{C_i} + \upsilon''_{G_i}}{1 - a U''_{C_i} - \upsilon''_{G_i}}$ *which is negative supposing* $U''_{C_i} < 0$ *and* $\upsilon''_{G_i} < 0$. *Resolving* $\partial t_i / \partial t_a \leq -1$, *we get* $a U''_{C_i} + \upsilon''_{G_i} \leq -1 + a U''_{C_i} + \upsilon''_{G_i}$ *that is equivalent to* $0 \leq -1$, *which is never true. Therefore, the size of internalization effect is* $-1 < \partial t_i / \partial t_a < 0$.

Proof. A.3 – *Considering proof A.2, we differentiate* $\partial t_i / \partial t_a$ *with respect to* a. *We obtain* $U''_{C_i} / (1 - a U''_{C_i} - \upsilon''_{G_i})^2$ *that is less than zero because* $U''_{C_i} < 0$ *for hypothesis.*

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