MAGYAR TUDOMÁNYOS AKADÉMIA
KÖZGAZDASÁGTUDOMÁNYI INTÉZET

INSTITUTE OF ECONOMICS
HUNGARIAN ACADEMY OF SCIENCES

MŰHELYTANULMÁNYOK **DISCUSSION PAPERS**

MT-**DP – 2011/16**

Minimum Taxes and Repeated Tax Competition

ÁRON KISS

INSTITUTE OF ECONOMICS, HUNGARIAN ACADEMY OF SCIENCES
BUDAPEST, 2011

Discussion papers
MT-DP – 2011/16

Institute of Economics, Hungarian Academy of Sciences

Minimum Taxes and Repeated Tax Competition

Author:

Áron Kiss
analyst
National Bank of Hungary
E-mail: kissa@mnb.hu

April 2011

ISBN 978-615-5024-50-4
ISSN 1785 377X

Minimum Taxes and Repeated Tax Competition

Áron Kiss

Abstract

An agreement about a lower bound for admissible tax rates can reduce the equilibrium tax rate (and thus welfare) in tax competition among fully symmetric countries. This is shown in an infinitely repeated game where the stage game describes the standard tax competition model with source-based taxes and symmetric countries. Repeated interaction may allow countries to sustain cooperation through implicit contracts. Lower bounds on tax rates ('minimum taxes') restrict the ability of countries to punish deviators. This makes cooperation harder to sustain. The introduction of a lower bound on feasible tax rates may thus harm all countries.

Keywords: tax competition, tax harmonization, minimum tax, tax floor, repeated games

JEL: F21, H87

Minimális adókulcsok és ismételt adóverseny

Kiss Áron

Összefoglaló

A tanulmány elméleti keretében két ország verseng ismételten, periódusról-periódusra egy mobilis adóalapért (amely lehet például tőke). Ha egy ország csökkenti az adókulcsát, az adóalap egy része telephelyet vált. Ebben az elméleti keretben előfordulhat, hogy egy minimális adókulcsot bevezető szabály csökkenti az egyensúlyban előálló adókulcsokat és az országok jólétét. Az eredményt az okozza, hogy az ismételt interakció lehetővé tesz olyan dinamikus stratégiákat, amelyek eredményeként mindkét országnak előnyös, koordináltan magas adókulcs áll elő. Az országok e stratégiák alapján arra számítanak, hogy ha eltérnek a koordinált adószinttől, a továbbiakban az egyszeri interakció Nash-egyensúlyának megfelelő alacsony adókulcsok következnek. A minimális adókulcs megnehezítheti, hogy az országok nagyon alacsony adókulcsot helyezhessenek kilátásba 'büntetésként' a koordinációtól való eltérésért. Ez megnehezítheti a kooperációt. Így a minimális adókulcs bevezetése árthat mindkét országnak.

Tárgyszavak: adóverseny, adóharmonizáció, minimális adókulcs, ismételt játékok

JEL kód: F21, H87

Minimum Taxes and Repeated Tax Competition*

Áron Kiss†

March 23, 2011

Abstract

An agreement about a lower bound for admissible tax rates can reduce the equilibrium tax rate (and thus welfare) in tax competition among fully symmetric countries. This is shown in an infinitely repeated game where the stage game describes the standard tax competition model with source-based taxes and symmetric countries. Repeated interaction may allow countries to sustain cooperation through implicit contracts. Lower bounds on tax rates ('minimum taxes') restrict the ability of countries to punish deviators. This makes cooperation harder to sustain. The introduction of a lower bound on feasible tax rates may thus harm all countries.

Key words: tax competition, tax harmonization, minimum tax, tax floor, repeated games

JEL classification: F21, H87

*I would like to thank Kai A. Konrad, Johannes Münster, Christos Kotsogiannis, Florian Morath, and Salmai Qari for useful comments and suggestions. All remaining errors are mine.

†National Bank of Hungary. Email: kissa@mnb.hu. Postal address: Szabadság tér 8-9., Budapest, H-1054, Hungary. Tel: +36 1 428 2600 (app. 1309). Fax: +36 1 428 2590.

1 Introduction

The recommendation for countries to agree on a lower bound to admissible corporate tax rates (a 'minimum tax') has been made repeatedly in recent years, especially in the context of the European Union. As a prominent example, the so-called Ruding Committe (Report of the Committee of Independent Experts on Company Taxation, 1992) proposed setting a minimum corporate tax rate of 30% in the EU. The recommendation for a minimum tax is based on the view that countries, engaged in a competition for mobile resources like capital investement, are forced to lower their corporate tax rates to sub-optimal levels. A minimum tax, in this view, could halt the 'race to the bottom' and thus make all countries better off.

This argument rests on a static theory of tax competition as presented in the first theoretical analyses of the subject.[1] In these models countries finance a public good by raising revenue from a mobile tax base (capital) at source. Departing from a global-welfare maximizing uniform tax rate, an individual country can raise its own tax revenue (and welfare) by reducing its own tax rate, attracting a larger share of the global tax base at the expense of other countries. Countries thus face a collective action problem: each profit by individually lowering the tax rate but all suffer after all others lowered theirs as well. As a consequence, the Nash equilibrium is not Pareto efficient, and a lower bound on admissible tax rates (a 'minimum tax') that raises tax rates above the Nash equilibrium is welfare-improving.

But is a minimum tax Pareto improving if tax competition occurs repeatedly rather than as a one-shot interaction? This appears to be a natural question since countries are indeed long-lived, if not immortal, entities. The present paper analyzes tax competition as an infinitely repeated game to address this question.

The main result of this paper is that a minimum tax above the one-shot

[1] See, e.g., Zodrow and Mieszkowski (1986), Wilson (1986) and Wildasin (1988). A detailed survey is provided by Fuest et al. (2005).

Nash-equilibrium tax rate may reduce the highest tax rate that can be the outcome of the repeated interaction, and thus may reduce the welfare of all countries. The reason is that repeated interaction allows countries to sustain cooperation through implicit contracts. A lower bound on tax rates restricts the ability of countries to punish deviators. This makes cooperation harder to sustain.

The analysis relies on the view that countries optimize within the framework of binding international agreements. One might question this point of departure asking why countries keep international agreements in the first place or, if they keep them, why these agreements are not designed to reach a global welfare optimum. The example of the policy recommendations cited in the beginning gives an answer to these questions. The Ruding committee based their recommendation of a minimum tax on the view that countries would play by the rules and that the induced behavior would increase overall welfare compared to a projected future scenario. It is reasonable to assume that countries play by rules they accept upon entering clubs like the EU and the WTO as these clubs have mechanisms to enforce the rules. As to the optimality of the rules in the clubs, this paper consideres these as exogeneous policy interventions, coming from a political process not modeled here. This is an old tool in the economist's toolbox and it is based on the idea that politicians might adopt a rule that is based on the wrong model of the economy. This paper considers that possibility: if the static model of tax competition is not the correct one, previously plausible policy recommendations might turn out to be harmful.

The present work is related to three strands of literature. First, the static theory of tax competition, as described above, implies that a minimum tax cannot be harmful (except, perhaps, at an extremely high level). An instance of harmful minimum taxes has, however, been described by Konrad (2009) in a one-shot setting of Stackelberg structure.

Second, this paper contributes to the small literature studying repeated tax competition. In an early study in dynamic tax competition, Coates (1993) uses a dynamic setting to introduce long-term effects of capital movements to a model with two tax instruments. Kessing et al. (2006) analyze the effect of vertical tax competition on foreign direct investment, where repeated interaction allows the parties to overcome the hold-up problem. Most related to the present analysis is the work of Cardarelli et al. (2002) and Itaya, et al. (2008) who study tax harmonization sustained by implicit contracts. As a difference to the present analysis, none of these studies analyzes the effect of a minimum tax.

Finally, the argument that a minimum tax can be harmful in repeated tax competition has parallels in the study of oligopoly in industrial organization. Known in that context as the 'topsy-turvy principle' (see Shapiro 1989), the observation has been made that market conditions making very competitive behavior feasible may actually promote collusion.

2 Analysis

Consider an economy with infinite time horizon with periods $s = 1, 2, ...$ There are N ex-ante identical countries. In each period each country takes a single action, setting a tax rate on a mobile tax base (capital) at source. The tax rate set by country $i \in \{1, ..., N\}$ in period s is t_i^s, taken from the compact set $T_i \equiv [0, 1]$.

Let the one-period payoff of country i be $V_i(t_1, ..., t_N)$. Countries discount the future by a common discount factor $\beta \in (0, 1)$. The present discounted value of payoffs for country i in period 1 is then

$$PV_i = \sum_{s=1}^{\infty} \beta^s V_i(t_1^s, ..., t_i^s, ..., t_N^s). \tag{1}$$

The following assumptions impose some structure on the stage game. The stage game is modeled as a reduced form with properties of a simple price competition framework with differentiated goods. This is justified as tax competition is viewed by the theoretical literature in such terms.[2] Let $V_i(t_1, ..., t_N)$

[2] A similar reduced-form approach has been taken by Konrad and Schjelderup (1999) and Konrad (2009). The present setup is compatible with the properties of the standard model by Zodrow and Mieszkowski (1986).

be twice continuously differentiable and strictly quasi-concave in all tax rates. This implies that the iso-payoff curves are convex to the origin. Also, let $V_i(t_1, ..., t_N)$ be increasing in all t_j with $j \neq i$. The payoff of a country is increasing in the tax rate of the other countries, reflecting one of the main insights of standard tax-competition models, the so-called 'tax base effect'. If a country increases its tax rate, leaving the tax rates in other countries unchanged, some (but not all) of its capital relocates to the other countries. Further, let $\arg\max_{t_i \in [0,1]} V_i(t_1, ..., t_N) \in (0, 1)$ be single-valued and increasing in all t_j, $j \neq i$. Thus, reaction functions $t_i(t_1, ..., t_{i-1}, t_{i+1}, ...t_N) \equiv t_i(t_{-i})$ are well-defined and tax rates are strategic complements.[3]

Under these assumptions a symmetric Nash equilibrium of the stage game exists, and in what follows it will be assumed to be the unique Nash equilibrium.[4] Let t^N denote the Nash-equilibrium tax rate. Note that the Nash equilibrium does not maximize the countries' joint welfare: since one country's higher tax rate has a positive external effect on all others, a concerted increase of tax rates from t^N would leave all countries better off. (Formally, $\partial V_i(t, ..., t)/\partial t > 0$ for $t = t^N$ because $\partial V_i(.)/\partial t_i = 0$ and $\partial V_i(.)/\partial t_j > 0$, $j \neq i$.)

A jointly welfare-maximizing tax rate $t^C = \arg\max_{t \in [0,1]} V_i(t, ..., t)$ exists by virtue of the boundedness of the range of possible tax rates; and by strict quasiconcavity, it is unique. Hence, it must be that $V_i(t^C, ..., t^C) > V_i(t^N, ..., t^N)$; that $\partial V_i(t, ..., t)/\partial t > 0$ for all $t < t^C$; and therefore $t^C > t^N$. In what follows, t^C will be referred to as the efficient tax rate, and a situation where each country sets the efficient tax rate will be called full cooperation.

Figure 1 depicts a simple graphic representation of the stage game. It gives the intuition why the assumptions of positive tax externality and strategic complementarity (both of which are natural in price competition) imply that the cooperative tax rate will lie above the one-shot Nash equilibrium, and that an optimal deviation from full cooperation at t^C will lie between t^N and t^C.

[3] Strategic complementarity is a common feature of tax competition models; see, e.g., Wildasin (1991), Wilson (1991) and Kanbur and Keen (1993).

[4] Uniqueness is not crucial for the results of this paper, but it simplifies the exposition.

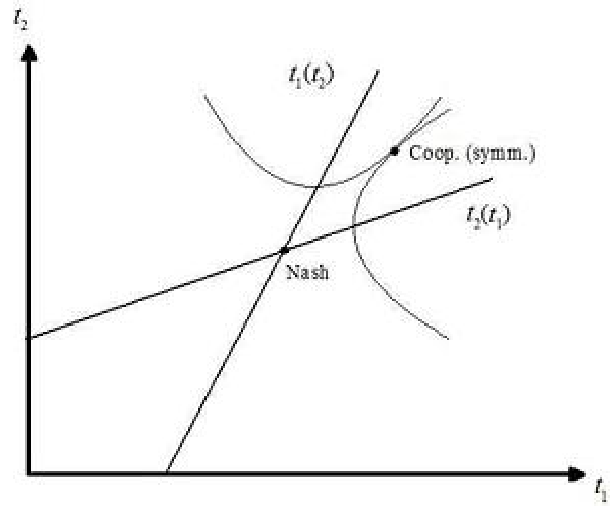

Figure 1: Reaction functions, equilibrium and cooperation in the stage game.

We introduce some more definitions to describe strategies in the repeated game.[5] An action *profile* $(t_1^s, ..., t_N^s)$ describes the actions (tax rates) chosen by all countries in a given period. The set of action profiles is defined as $T \equiv \prod_i T_i$. The set of period s *histories* is given by $H^s \equiv T^s$, where T^s is the s-fold product of T, and the initial history is the null set $T^1 = \{\oslash\}$. A history $h^s \in H^s$ is thus a list of s action profiles, identifying the tax rates chosen by all countries up to period $s - 1$. The set of all possible histories is

$$H \equiv \bigcup_{s=1}^{\infty} H^s. \tag{2}$$

A *pure strategy* for country i describes what tax rate the country would set after all possible histories; it is thus a mapping from the set of possible histories into the set of pure actions,

$$\sigma_i : H \rightarrow T_i. \tag{3}$$

Note that 'Nash forever', the strategy profile in which all countries set the

[5] The concepts and definitions related to the repeated game are used in a standard way, see Mailath and Samuelson (2006, Ch 2).

static Nash equilibrium tax rate t^N after all possible histories in all periods $s = 1, 2, ...$, constitutes a subgame-perfect equilibrium of the repeated game. Also, reversion to 'Nash forever', a strategy profile in which all countries set the static Nash equilibrium tax rate t^N in periods $s = s', s'+1, ...$ if a certain history $h^{s'}$ was reached, constitutes a subgame-perfect equilibrium of the subgame starting with that history.

Based on these observations, we concentrate on trigger strategies used by Friedman (1971). Such trigger strategies prescribe countries to set the efficient tax rate as long as no deviation is observed; and set the static Nash-equilibrium tax rate forever after a deviation is observed. Formally, the Friedman-type trigger strategy σ_i^F prescribes country i to set $t_i^1 = t^C$; while for periods $s > 1$:

$$t_i^s = \begin{cases} t^C & \text{if } s = 1 \text{or } t_j^\tau = t^C \text{ for all } j \text{ and } \tau = 1, ..., s-1 \\ t^N & \text{else} \end{cases} . \tag{4}$$

We examine under what circumstances the efficient tax rate t^C can be supported by strategy profile $\sigma^F = (\sigma_1^F, ...\sigma_N^F)$ as an outcome of a subgame-perfect equilibrium; and how the results are affected by the introduction of a legally binding minimum tax.

Proposition 1 *There exists a threshold discount factor* $\underline{\beta} \in (0,1)$ *such that for all discount factors* $\beta > \underline{\beta}$ *the profile of trigger strategies* $\sigma^F = (\sigma_1^F, ...\sigma_N^F)$ *constitutes a subgame-perfect equilibrium of the infinitely repeated game. In this equilibrium, all countries set the efficient tax rate* t^C *in every period.*

Proof. Let t_i^d denote the optimal deviation of country i from cooperation, that is, $t_i^d = t_i(t_{-i}^C)$. Country i finds it optimal not to deviate if the following incentive condition holds:

$$V_i(t_i^d, t_{-i}^C) - V_i(t_i^C, t_{-i}^C) \leqslant \sum_{t=1}^{\infty} \beta^t [V_i(t_i^C, t_{-i}^C) - V_i(t_i^N, t_{-i}^N)]. \tag{5}$$

The left hand side gives the immediate gain of deviation; the right hand side gives the cost of foregone future cooperation. Clearly, as β approaches 1 the right hand side grows without bounds, while the left hand side remains constant.

Therefore, there exists a $\underline{\beta} < 1$ for which the condition holds with equality. For all $\beta > \underline{\beta}$ it will hold as strict inequality. ■

The next step is to show that a minimum tax $\underline{t}$ in the interval $(t^N, t^d]$ reduces the sustainability of the efficient tax rate. First note that strategic complementarity implies that this interval is non-empty. Note also that the one-shot Nash equilibrium becomes $(\underline{t}, \underline{t})$.

Proposition 2 *The introduction of a minimum tax $\underline{t} \in (t^N, t^d]$ restricts the range of discount factors for which the efficient tax rate t^C can be supported by trigger strategies as a subgame-perfect equilibrium outcome in the infinitely repeated game.*

Proof. For a minimum tax $\underline{t} \in (t^N, t^d]$ the country i finds it optimal not to deviate from the efficient tax rate if the following incentive condition holds:

$$V_i(t_i^d, t_{-i}^C) - V_i(t_i^C, t_{-i}^C) \leqslant \sum_{t=1}^{\infty} \beta^t [V_i(t_i^C, t_{-i}^C) - V_i(\underline{t}_i, \underline{t}_{-i})] \qquad (6)$$

The only difference to inequality (1) appears in the last term. From $\underline{t} \in (t^N, t^C)$ it follows that $V_i(\underline{t}_i, \underline{t}_{-i}) > V_i(t_i^N, t_{-i}^N)$; the right hand side becomes smaller for a given β. Therefore, the incentive condition is now violated for $\underline{\beta}$. There exists $\beta' \in (\underline{\beta}, 1)$ that makes the condition hold with equality. For $\beta \in [\underline{\beta}, \beta')$, in the presence of the minimum tax, it is optimal for any country to deviate from t^C in the first period. Full cooperation at t^C can be sustained for the restricted range of discount factors $[\beta', 1)$. ■

The result has a clear intuition. A minimum tax between the 'punishment' and the 'temptation' tax rate restricts the punishment for a deviation to be milder while leaving the deviation no less tempting.

The result is significant because it shows that there exist values of the patience parameter β for which the introduction of a lower bound of admissible tax rates (a minimum tax) in a given range makes full cooperation break down. Subgame-perfect equilibria supporting cooperation at lower tax rates than t^C

will still extist, but even in these equilibria the welfare of all countries is lower than it is without the minimum tax.

Proposition 2 concentrated on a range $\underline{t} \in (t^N, t^d]$ where the comparative statics effect was unequivocal. In contrast, a higher minimum tax $\underline{t} > t^d$ affects both the temptation and the punishment. Still, under plausible assumptions it is possible to show that a minimum tax is sometimes harmful even in this case.

The argument is based on the observation that Proposition 2 would also hold for values of the minimum tax that are somewhat above t^d and also for values close to t^C. To see the first of these statements, consider a patience parameter β for which cooperation is not sustainable with a minimum tax equal to t^d. Then compare the effect of this minimum tax with the effect of one equal to $t^d + \epsilon$. The prospective punishment is now less severe but also the temptation is less tempting. However, while the temptation changed only by a second-order effect (remember that t^d was the optimal deviation; there is very little lost in deviating to $t^d + \epsilon$), the punishment changed by a first-order effect. Thus, if cooperation was not sustainable with a minimum tax of t^d, it is not sustainable with one slightly higher either.

We can also notice that there is no 'temptation' or 'punishment' if the minimum tax is set equal to t^C, but that, at the same time, the value of the punishment is much less sensitive to chages in the minimum tax close to t^C (since $\partial V(t, ..., t)/\partial t = 0$ for $t = t^C$), than the value of the temptation. We just need the temptation and punishment payoffs to be 'smooth' enough not to cross each-other in the middle to be able to generalize Proposition 2 for higher minimum taxes as well. As Proposition 3 shows, simple weak-concavity assumptions are sufficient.

Proposition 3 *The introduction of a minimum tax $\underline{t} \in (t^d, t^C)$ restricts the range of discount factors for which the efficient tax rate t^C can be supported by trigger strategies as a subgame-perfect equilibrium outcome in the infinitely repeated game if both $V_i(t, ..., t)$ and $V_i(t, t^C_{-i})$ are weakly concave in t (sufficient condition).*

Proof. Without a minimum tax, cooperation at t^C is sustainable for $\beta \geqslant \underline{\beta}$ (Proposition 1). It has to be shown that countries always have an incentive to deviate from t^C in the infinitely repeated game with discount factor $\underline{\beta}$ and a minimum tax $\underline{t} \in (t^d, t^C)$. Define $A(t) = [V_i(t, t^C_{-i}) - V_i(t^C_i, t^C_{-i})]$ and $D(t) = \frac{\underline{\beta}}{(1-\underline{\beta})}[V_i(t^C_i, t^C_{-i}) - V_i(t, ..., t)]$. For a minimum tax $\underline{t} \in [t^d, t^C]$, $A(\underline{t})$ represents the advantage of deviation from cooperation, while $D(\underline{t})$ represents the cost (or disadvantage) of deviation. Proposition 2 established that $A(t^d) > D(t^d)$. At the same time, $A(t^C) = D(t^C) = 0$. Therefore, for any minimum tax $\underline{t} = \alpha t^d + (1-\alpha)t^C$ with $\alpha \in (0,1)$ it holds that:

$$A(\underline{t}) \geqslant \alpha A(t^d) + (1-\alpha)A(t^C) > \alpha D(t^d) + (1-\alpha)D(t^C) \geqslant D(\underline{t}). \qquad (7)$$

The first inequality follows from the weak convexity of $A(t)$ (implied by the weak concavity of $V_i(t, t^C_{-i})$), while the last inequality follows from the weak concavity of $V_i(t, ...t)$. ■

The weak-concavity assumptions are reasonable. Intuitively, $V_i(t, t^C_{-i})$ is the payoff of a deviation from full cooperation, and will be concave around t^d because t^d maximizes the function. Thus, the second derivative is negative at t^d and there is no economic reason why it should not be negative at higher deviation tax rates. Considering the other condition, $V_i(t, ..., t)$ will be concave around t^C since the uniform tax rate of t^C maximizes $V_i(t, ..., t)$. Again, there is no economic reason why concavity should not hold at other tax rates. Intuitively, the function $V_i(t, ..., t)$ shows how the payoff of a country changes if all countries raise their tax rates in concert. As all countries raise their tax rates symmetrically the allocation of capital will not change, because there are no tax differentials. The only effect of such a concerted rate increase is a proportionally higher tax revenue in all countries. If public projects have decreasing returns to scale, or if the public's marginal valuation of public spending is decreasing, $V_i(t, ..., t)$ will be strictly concave.

It is no surprise, then, that in previous models of the literature these conditions are satisfied. In particular, the specification with quasilinear preferences and quadratic production functions of the tax competition model of Zodrow and Mieszkowski (1986) would exhibit *strict* concavity of $V_i(t, ..., t)$ and $V_i(t, t^C_{-i})$. The model considered by Itaya, et al. (2008) for their repeated tax-competition analysis, exhibiting a quadratic production function and linear utility, would also satisfy the above conditions, leaving $V_i(t, ..., t)$ linear and $V_i(t, t^C_{-i})$ strictly concave.

The implication of this result is that, under plausible conditions, there are cases where the introduction of a minimum tax makes implicit cooperation break down in a repeated interaction framework. In these cases a minimum tax reduces welfare in all countries involved. Under the assumptions of Proposition 3 any minimum tax between the static Nash equilibrium and the cooperative tax rate can have that effect.

3 Conclusion

Viewing tax competition as repeated interaction reverses the common assessment of the desirability of agreements on a lower bound on admissible tax rates (a 'minimum tax'). If tax cooperation is sustained by implicit contracts, a minimum tax may trigger a 'race to the bottom' making all countries worse off. The reason is that a minimum tax restricts countries from punishing deviators. Eliminating the worst possible outcomes makes the best ones harder to obtain.

The discussion of some limitations of the analysis is in order. The analysis looked at the case of symmetric countries. The generalization to asymmetric countries promises few new insights but poses some problems of principle. It is a robust result of asymmetric tax competition models that smaller countries set lower tax rates in one-shot Nash-equilibrium. Departing from a symmetric cooperative solution it is expected that the smaller country's deviation tax rate is lower than the larger one's but higher than the smaller country's Nash tax rate. In this case a minimum between the smaller country's Nash tax rate and its deviation tax rate would, as in the symmetric case, make the punishment milder without restricting the temptation, and a result similar to Proposition

2 would carry through. It is not clear, however, whether it is as reasonable to concentrate on symmetric cooperative outcomes as in the symmetric case. More generally, the reduced-form approach taken here, while appealing for its clarity, is not suitable to deal with the asymmetric case, as asymmetry could only be introduced by somewhat arbitrary assumptions.

The present analysis is based on powerful and simple dynamic strategies involving 'Nash reversion'. Further research could investigate dynamic strategies that are more severe, and extend the present results to the case where countries threaten deviators with 'optimal punishments' of the type described by Abreu (1986).

References

[1] Abreu, D. (1986). Extremal equilibria of oligopolistic supergames. Journal of Economic Theory 39, 191-225.

[2] Cardarelli, R., Taugourdeau, E. and Vidal, J.-P. (2002). A repeated interactions model of tax competition. Journal of Public Economic Theory 4(1), 19–38.

[3] Coates, D. (1993). Property tax competition in a repeated game. Regional Science and Urban Economics 23, 111-119.

[4] Friedman, J. W. (1971). A non-cooperative equilibrium for supergames. Review of Economic Studies 38, 1-12.

[5] Fuest, C., Huber, B. and Mintz, J. (2005). Capital mobility and tax competition: A survey. Foundations and Trends in Microeconomics, 1(1), 1-62.

[6] Itaya, J., Okamura, M., Yamaguchi, C. (2008). Are regional asymmetries detrimental to tax coordination in a repeated game setting?, Journal of Public Economics 92(12), 2403-2411.

[7] Kanbur, R. and Keen, M. (1993). Jeux sans frontières: tax competition and tax coordination when countries differ in size. American Economic Review 83(4), 877-892.

[8] Kessing, S. G., Konrad, K. A. and Kotsogiannis, C. (2006). Federal tax autonomy and the limits of cooperation. Journal of Urban Economics 59, 317-329.

[9] Konrad, K. A. (2009). Non-binding minimum taxes may foster tax competition. Economics Letters 102(2), 109-111.

[10] Konrad, K. A. and Schjelderup, G. (1999). Fortress building in global tax competition. Journal of Urban Economics 46, 156-167.

[11] Report of the committee of independent experts on company taxation (1992). Commission of the European Communities.

[12] Samuelson, L. and Mailath, G. J. (2006). Repeated Games and Reputations. Oxford University Press.

[13] Shapiro, C. (1989). Theories of oligopoly behavior. In: R. Schmalensee and R.D. Wittig (eds.), Handbook of Industrial Organization, Volume I., Elsevier.

[14] Wildasin, D. E. (1988). Nash equilibria in models of fiscal competition. Journal of Public Economics 35, 229-240.

[15] Wildasin, D. E. (1991). Some rudimentary 'duopolity' theory. Regional Science and Urban Economics 21, 393-421.

[16] Wilson, J. D. (1986). A theory of interregional tax competition. Journal of Urban Economics 19, 296-315.

[17] Wilson, J. D. (1991). Tax competition with interregional differences in factor endowments. Regional Science and Urban Economics 21, 423-451.

[18] Zodrow, G. R. and Mieszkowski, P. (1986). Pigou, Tiebout, property taxation, and the underprovision of local public goods. Journal of Urban Economics 19, 356-370.

Discussion Papers published in 2011

Mihályi Péter: Utolérési kísérletek Magyarországon, 1870-2030. MT-DP 2011/1

Zsolt Darvas - Jean Pisani-Ferry: The Threat of 'Currency Wars': A European Perspective. MT-DP 2011/2

Zsolt Darvas: Beyond the Crisis: Prospects for Emerging Europe. MT-DP 2011/3

Barnabás M. Garay - András Simonovits - János Tóth: Local Interaction in Tax Evasion.
MT-DP 2011/4

Maria Csanadi: Varieties of System Transformations and Their Structural Background Based on the IPS Model. MT-DP 2011/5

Mária Lackó: The Poor Health Status of the Hungarians; Comparative Macro-Analysis of the Likely Explanatory Factors on Hungarian and Austrian Data, 1960-2004. MT-DP 2011/6

Fazekas Károly: Közgazdasági kutatások szerepe az oktatási rendszerek fejlesztésében. MT-DP 2011/7

Gábor Kézdi - Gergely Csorba: Estimating the Lock-in Effects of Switching Costs from Firm-Level Data. MT-DP 2011/8

Antal-Pomázi Krisztina: A kis- és középvállalkozások növekedését meghatározó tényezők - A különböző finanszírozási formák hatása a vállalati növekedésre. MT-DP 2011/9

Zsolt Darvas - Jean Pisani-Ferry - André Sapir: A Comprehensive Approach to the Euro-Area Debt Crisis. MT-DP 2011/10

András Simonovits: International Economic Crisis and the Hungarian Pension Reform. MT-DP 2011/11

András Simonovits: The Mandatory Private Pension Pillar in Hungary: An Obituary. MT-DP 2011/12

Horn Dániel: Az oktatási elszámoltathatósági rendszerek elmélete. MT-DP 2011/13

Miklós Koren - Márton Csillag: Machines and machinists: Capital-skill complementarity from an international trade perspective. MT-DP 2011/14

Áron Kiss: Divisive Politics and Accountability. MT-DP 2011/15

Discussion Papers are available at the website of Institute of Economics Hungarian Academy of Sciences: http://econ.core.hu