Equilibrium conditions in corporate tax competition and Foreign Direct Investment flows

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ABSTRACT

We consider a collection of countries which attempt to maximize their corporate tax revenue, the latter being viewed as a function of Foreign Direct Investment (FDI) inflow and the Effective Average Tax Rate (EATR) which each country sets for itself. Under a model that assumes a direct influence of tax differentials on the flow of FDI, each country's decisions are naturally 'coupled' to those of others, leading to a non-cooperative game in which countries–players compete for FDI inflows by sequentially altering their tax rates. Their decisions are made via a differential equation-based model used to predict the effect of tax rate changes on a player's share of FDI inflows. Our model, calibrated using empirical data from 12 OECD countries for the period 1982–2005, combines FDI inflow and tax-rate differentials to arrive at a "steady-state" FDI inflow share for each player, given its competitors' corporate tax rates. We explore the game's equilibrium, including the question of whether equilibrium necessarily implies a 'race to bottom', with low corporate tax rates for all players.

1. Introduction

The elimination of trade barriers in the world economy during the last decade has resulted in the liberalization of capital flows, making corporate profit taxation and Foreign Direct Investment (FDI) important factors in the tax competition which exists among economies. This has created opportunities for multinational firms, which transfer prices and benefit from intra-firm debt and profit shifting practices to countries with lower taxes. Thus, tax differentials among countries may play a role in distorting the optimal global allocation of resources and, consequently, international trade. Adherents of the view that tax differentials heavily affect the allocation of international capital flows could be roughly categorized into two groups. One supports coordinated action in order to reach a common corporate tax basis. The other advances open market rules as a means of arriving at "optimal" tax differentials. In the context of EU tax regulation actions, corporate tax coordination has been debated most actively during the last two decades. Viewpoints range from the Ruding Report (1992), to the Code of Conduct for business taxation (European Communities,1998) and Formula Apportionment (European, 2001), with the last two deviating significantly from the tax-rate harmonization proposals advanced in the first.

This work extends the literature on corporate tax differentials and FDI, with an eye towards corporate tax competition and Nash-style games. Our main contribution centers on a computational model for tax competition, in which a collection of self-interested countries attempt to maximize corporate tax revenue by manipulating their corporate tax policy in order to attract FDI. We describe a non-cooperative multiplayer game for the distribution of FDI inflow, which captures the competition within the group. The game's equilibrium corresponds to the optimal Effective Average Tax Rates (EATRs) and FDI inflow levels for the group in a particular year. This allows us to study the game's equilibria for various amounts of FDI to be distributed, and to explore alternative scenarios, e.g., whether it is advantageous for some players to collude, and whether the competition leads everyone to very low tax rates.

The computational game described above will require us to define along the way i) an objective function based on which the countries–players make decisions on their EATR, and ii) a model for how FDI "distributes itself" among countries, given their EATR and other parameters. These two component models will be developed and calibrated using data for a group of 12 OECD countries during the period 1982–2005. Corporate tax revenue, determined by EATR and FDI inflow, will play the role of the objective function. We will construct such a function by empirically replicating the Laffer curve for the countries under consideration, based on an OLS panel model. One of the novelties of our approach will be the assignment of a unique Laffer curve for each competing country, as determined by the country's individual "characteristics". The second component in our game will be a differential equation-based model for how FDI inflow reacts to tax differentials. We will develop this based on the strand of

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the literature which advocates the existence of nonlinear reaction functions of FDI inflows to tax-rate differentials, with EATR, EATR^2 and GDP ratios used as control variables. Unlike the standard view in the literature where countries are competing in pairs for bilateral FDI inflows, competition in our setting takes place against the entire group simultaneously, and not "pairwise". This scenario is viewed as more realistic, and may thus be more useful in terms of policy making.

The remainder of the paper is organized as follows. The next section reviews the literature on corporate taxes, corporate tax competition and FDI. Section 3 discusses the two basic components needed to formulate our game. These include a model for the behaviour of competing countries, with empirical analysis and data for the specification of objective functions (i.e., corporate tax revenue), and also the response of FDI inflows to tax differentials. Section 4 formulates a computational corporate tax competition game, whose equilibria under alternative scenarios for FDI flow levels are then examined in Section 5. In particular, the game's equilibria suggest that, ultimately, tax competition does not lead to zero (or very low) corporate tax rates for all players, and that collusion (either among "large" or "small" players) does not seem to be preferable over free competition. Section 6 summarizes our results and discusses some policy implications.

2. Literature review

2.1. Direct versus indirect tax competition studies

Following the viewpoint in Griffith and Klemm (2004) the tax competition literature can be divided into so-called direct versus indirect studies. The first examine the responsiveness of investment incentives to tax rates. Examples from this group include Hines (1999) and De Mooij and Ederveen (2003), both of which surmise that foreign capital is very sensitive to taxation.[1] It is difficult to extract any policy implications from the concluding remarks of these studies, and there is only a vague reference to the ongoing process of tax competition. Representative studies from the second category include those of Devereux et al. (2002a,b), and Haufler and Schjelderup (2000). These attempt to estimate whether one jurisdiction's tax rate reacts to changes in the tax rate of another, and conclude that an interdependence does exist, with ambiguous conclusions regarding its driving process.

2.2. Capital tax competition

The idea of an international capital tax competition was the first in the field of tax competition to be investigated theoretically, initially by Tiebout (1956), Oates (1972), and later by Zodrow and Mieszkowski (1986), Gordon (1986), and Wildasin (1988). The "standard" model in the tax competition literature was that of Zodrow and Mieszkowski (1986) which investigated the effects of capital mobility on capital income taxation in a quite restrictive framework. New contributions thereafter were based on a relaxation of that model's restrictive assumptions, and the examination of additional aspects of capital mobility, such as governments being either Leviathan or Benevolent, economies of agglomeration, and differential economic rents across countries.

2.3. Corporate taxation and FDI flows

There is generally no dispute that the rapid growth of FDI in the recent past has led to a subsequent use of tax differentials as a tool for attracting FDI. The recent analysis of corporate tax-rate competition and investment capital mobility by Hines (2005) has its roots in the study of Diamond and Mirrlees (1971) who conclude that small, open economies should avoid taxation of income earned by foreign

investors as an incentive to attract international investment capital. This seems to "mirror" the common practice of multinational firms to use debt to finance foreign affiliates in high-tax countries, and to use equity to finance the affiliates in low-tax countries, in other words to accumulate income in low tax-rate countries and tax deductions in high tax-rate countries. This is described by Desai et al. (2004) and others, who report that affiliates belonging to the same US parent companies tend to adjust their debt levels lower or higher according to the lower or higher corporate tax rates of the host countries.

Other studies which are relevant to the present work have examined the relationship between FDI, corporate tax rates, and corporate tax revenues. Studies such as Hartman (1984), Boskin and Gale (1987), Young (1988), Slemrod (1990), and Swenson (1994) concerned themselves with time series estimation of the correlation between the level of FDI and the annual variation of after-tax rate of return, focusing mainly on the US. An alternate approach has been to explore the location of FDI based on cross-sectional estimations, as is done in Grubert and Mutti (1991), Hines and Rice (1994), Desai et al. (2004), and Altshuler and Grubert (2004), among others.

The relationship of corporate taxation to FDI has also been studied by Slemrod (1990) who is critical of previous works, e.g., Hartman (1984), and marks a point of departure for subsequent studies by considering pooled bilateral FDI flows in aggregate time series data and quantifies tax rates by means of the Effective Marginal Tax Rate (EMTR, proposed by Auerbach and Hines (1988)). Thereafter, Cassou (1997) explored bilateral FDI flows for individual countries for the period 1970–1989 and found tax effects on FDI to be statistically non-significant for the most part. Other pooled bilateral FDI flow studies include Jun (1994), and Devereux and Freeman (1995), which examined a group of OECD countries, also finding statistically non-significant effects. Pain and Young (1996) focused on FDI flows from Germany and the UK into 11 countries for the period 1977–1992, and found elasticities which were significant (and negative) for the UK but non-significant for Germany. Bénassy-Quéré et al. (2005) using a panel of bilateral FDI flows among 11 OECD countries investigated further agglomeration-related factors, with nonlinearities in the impact of tax differentials on FDI location. Finally, Razin and Sadka (2006), in their study of bilateral FDI inflows in a two-country tax competition model with asymmetric Nash equilibrium noted the importance of tax differentials in determining the direction and magnitude of FDI flows.

In this paper, we will consider countries that attract FDI inflow by adjusting their tax rates, the latter being expressed in terms of the Effective Average Tax Rate (EATR). The EATR was first proposed as an appropriate measure of the tax rate in the context of investment and mobile profit allocation among countries by Devereux et al. (2002b). That work used nonlinear tax reaction functions to make the case for an asymmetric competition in which countries that have set their EATR above the total average seem to react more evidently to changes in the "opponent" countries' tax rates. Devereux (2006), in his survey of empirical studies on the influence of taxes on discrete capital and profit location choices, concluded that the EATR (as opposed to the alternative, EMTR) tends to play a significant role in discrete location choices, and hence in the overall allocation of capital. The same study suggests that statutory tax rates appear to significantly affect financial policy, the location of taxable income, the repatriation of income, and transfer.

A meta-analysis of the empirical literature on the impact of corporate taxes on the allocation of FDI performed by De Mooij and Ederveen (2003), estimated that the median tax-rate elasticity of foreign capital was negative (-3.3) and found FDI to be more responsive to EATR than to statutory tax rates, with no systematic differences between the responsiveness of investors to tax credit versus tax exemption countries. In later extensions, De Mooij and Ederveen (2005) studied the effects of openness and agglomeration tendencies on the tax-rate elasticity values, and explored (De Mooij

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[1] De Mooij and Ederveen (2003) reach this conclusion via meta-analysis.