A spatial tax harmonization model

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Abstract

Policies to harmonize value-added tax rates are controversial in the European Union. This paper formulates a multi-country model over a one-dimensional space as a non-cooperative Nash game, in which each country aims at maximizing its tax revenue, subject to the constraint that its tax rate lies within a given common band. Then we examine the effects of changes in the common band on tax rates, tax revenues and the number of cross-border shoppers at Nash equilibrium. We also analyze the effects of geographical variation in country size and location.
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1. Introduction

Each member country of the European Union (EU) imposes a different value-added tax (VAT) rate. Since there is free movement across borders, this induces consumers to shop abroad when the difference in VAT rates are large enough relative to their travel cost. Cross-border shopping shifts VAT revenues abroad. VAT revenues are important component of the government revenues, accounting for more than 10% of government revenues. This has induced proposals for tax harmonization among EU countries: for example, see Sinn (1990), Christiansen (1994), Gordon and Nielsen (1997), Robson (1998).

Tax systems can be placed in three categories according to the degree of harmonization: an absolute tax equalization with a common rate; a tax approximation with a range from which each country is allowed to choose its tax rate; and a competitive tax. The first two tax policies are often called *tax harmonization*. As pointed out by Frey

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and Eichenberger (1996), and Robson (1998), there is a trade-off between tax harmonization and tax competition. Controlling tax rates not only stabilizes tax revenues, but is also sometimes necessary for moving forward with economic and political integration. On the other hand, deregulating tax rates maintains the autonomy of member countries in tax matters for their own short-term economic and social policy purposes. In addition, it mitigates political distortions. The EU has employed a minimum VAT rate of 15% for standard goods since January 1993. But many countries do not comply with this system in full and further changes are likely in the near future. As part of the current political agenda to move toward greater economic and monetary integration, the EU will bring the differences in VAT rates into line, step by step, until they are within a close margin.

Presently, VAT rates range widely from 15% in Luxembourg, having the smallest country size in the EU, to 25% in Denmark and Sweden, at the periphery of the EU. Portugal, which is adjacent only to Spain, charges higher VAT rates than Spain, which also shares a border with France. Although Ireland and the United Kingdom are neighbors, Ireland imposes higher VAT rates than the United Kingdom. Germany, Holland and Luxembourg at the center of European economic network, have similar tax rates. Based on these data, EU VAT rates seem to be subject to the geographical location and configuration of its member countries.

Thus, it is important to examine tax rates, tax revenues and cross-border activity corresponding to possible new VAT harmonization systems, taking into account spatial elements such as country size and location. This paper formulates a multi-country model over a linear space as a non-cooperative Nash game, in which each country aims at maximizing its tax revenue, subject to the constraint that its tax rate lies within a given common band. Varying the width of the common band results in a restructuring of taxation by member countries. Evidently, with a very wide band our formulation reduces to tax competition, and with a very narrow band it reduces to tax equalization. The width of the common band corresponds to the degree of tax harmonization. We examine the effect of the width of tax band on tax rates, revenues and the number of tax-induced cross-border shoppers. We also analyze effects of geographical variables such as country size and location.

Several analytical models of commodity tax competition and harmonization have been proposed by Kanbur and Keen (1993), Trandel (1994), Haufler (1996) and Ohsawa (1999). However, theoretical models which encompass both tax equalization and tax competition systems as extreme cases have received little attention. Two closely related papers are by Kanbur and Keen (1993) and Ohsawa (1999). Both papers formulated Nash games by considering the geographical nature of the market rather than treating the market as spaceless, and demonstrated that country size and location play an important role in tax competition. Kanbur and Keen (1993) modeled a Nash game between two equal sized countries lying on a line but differing in the density of consumers. They examined the impact of a minimum standard rate. The present research extends their model in at least two directions. First, we consider more than two countries, so that we can explore the effect of their locations. Second, we impose not only minimum standard rates but also maximum standard rates, so we can evaluate a variety of tax harmonization schemes. Ohsawa (1999) considered more than two countries on