Available online at www.sciencedirect.com
SCIENCE DIRECT®
ELSEVIER
Regional Science and Urban Economics 35 (2005) 353–373
regional SCIENCE & urban ECONOMICS
www.elsevier.com/locate/econbase

Capital tax competition and returns to scale

John Burbidge[a], Katherine Cuff[b,*]

[a] Department of Economics, University of Waterloo, Waterloo, ON, Canada N2L 3G1
[b] Department of Economics, McMaster University, Hamilton, Canada L8S 4M4

Received 30 August 2002; accepted 12 May 2004

Available online 12 February 2005

Abstract

That some capital importing regions subsidize units of capital is inconsistent with the standard models of the capital tax competition literature. We maintain the assumption of capital homogeneity and relax the assumption of constant returns to scale. Among other things, we show that symmetric regions in a Nash equilibrium may subsidize capital as may a capital importing region in an asymmetric Nash equilibrium. We also prove that any inefficiencies in asymmetric Nash equilibria with both capital and head taxes arise entirely from regions' incentives to manipulate the terms of trade, and not from increasing returns. We also show that the existence of increasing returns can reverse the result that small regions have higher per capita utility in Nash equilibria with only capital taxes.

JEL classification: H71; H77; R30
Keywords: Capital tax competition; Competing regions; Increasing returns

1. Introduction

Today's newspapers are filled with articles relating the subsidization of capital investment by state, provincial, and municipal governments. Consider the following quotation from a recent issue of the Wall Street Journal:

> In 2000, Mississippi went hog wild in outbidding neighboring states for the Nissan factory by offering a fat package of close to $300 million in subsidies and tax breaks.

* Corresponding author. Fax: +1-905-521-8232.
E-mail addresses: cuffk@mcmaster.ca (K. Cuff), jburbidg@watarts.uwaterloo.ca (J. Burbidge).

0166-0462/$ - see front matter © 2005 Elsevier B.V. All rights reserved.
doi:10.1016/j.regsciurbeco.2004.05.003

> The deal included $80 million from the state to train Nissan's new workers. (extracted from "Mississippi Churning", Friday 4th January 2002, p. A12)

Mississippi is a capital importing state that subsidizes some profitable firms. There are other examples of capital importing states or regions that subsidize some, but not all, firms or units of capital. Likewise, many magazines offer cheaper subscriptions to their new customers than to their existing customers. Our objective in this paper is to start from the standard tax competition model and move towards a more general model that is consistent with this observation.

The capital tax competition literature assumes that each region's production function exhibits constant returns to scale, capital is homogeneous and each region only uses proportional instruments to tax or subsidize capital. We contend that the construction of a model consistent with the above quotation requires the relaxation of all three of these assumptions. That regional governments tax one profitable firm and subsidize another suggests both that firms are not homogeneous and that governments use other instruments in addition to a proportional tax rate to achieve their objectives. In this paper, we set aside the issues of capital heterogeneity and alternative sets of policy instruments and focus on the consequences of relaxing the assumption of constant returns to scale.

In the capital tax literature, each regional government uses its proportional capital tax to fund (or underfund) a publicly provided private good and to manipulate the after-tax price of capital to output (see Wilson, 1999). We study the effects of introducing increasing returns to scale, or agglomeration, into this model. As a first step, we begin by looking at an older, simpler capital-tax model where in addition to the capital tax, each regional government has access to a head tax. It is well known that in this model the head tax guarantees the provision of the efficient level of the publicly provided private good. Here the Nash equilibrium with symmetric regions is efficient—there is no trade and therefore no incentive to manipulate the terms of trade so each regional government sets its capital tax rate to zero. The assumption of constant returns to scale implies that when we scale up one of the regions by increasing the capital and labour endowment proportionately in that region the resulting Nash equilibrium is efficient. Prices depend only on capital–labour ratios and in the Nash equilibrium the amount of capital employed in each region is equal to the region's capital endowment. Capital tax rates are still zero and the Nash equilibrium is efficient. How do these results change if the regions' production technologies exhibit increasing return to scale (IRTS)?

In a symmetric Nash equilibrium with head taxes and increasing returns to scale, each region subsidizes capital to correct (properly) for the positive externality capital generates. As we move away from symmetry by increasing labour and capital endowments proportionately, say in region 1, increasing returns to scale implies that total output will increase in an efficient allocation. Moreover, in such an allocation, capital employed in region 1 should rise more than in proportion to region 1's capital endowment-efficiency requires that region 1 become a capital importer. Starting from symmetry, the Nash equilibria set out in this direction but as region 1 becomes a capital importer it taxes capital, or subsidizes it at too low a rate, to drive down the cost of its capital imports. Likewise, region 2, as a capital exporter, subsidizes capital at too high a rate. As a consequence of the regions' actions, the amount of capital employed in region 1 falls