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COMPETITION BETWEEN REGIONS WITH RESPECT TO INDUSTRIAL SUPPORT – A THEORETICAL MODEL

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INDUSTRIAL SUPPORT - A THEORETICAL MODEL

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Abstract

In recent years it seems that both regions and cities appear to have become more eager to present themselves as regions or cities in which new or mobile firms in certain industrial sectors (especially perhaps biotechnology) should locate. At the same time, in the UK at least, there has been devolution of the administration of regional policy, albeit with specific targets being set by the national government. Thus cities and regions have become, at least in part, more able to combine their publicity with financial support for the particular industrial sector they wish to foster.

In this paper a model is developed which has the following properties. Cities allocate monies between two types of expenditure, (i) support for a nascent industry and (ii) support for social policies, with payoffs that differ for different cities. It is shown that, if firms in the nascent industry are attracted by relatively high levels of support, cities will generally spend more on industrial support than the national government would.

This simple model is similar to those developed in the literature on Tax Competition. This feature allows a commentary to be made on both the policy implications and possible extensions of the model.

1. INTRODUCTION

In many economies regional or urban authorities take the responsibility of fostering, to some extent at least, the development of new industries by encouraging start-ups and supporting small firms through awarding grants or tax relief and through providing advice. In the U.K. as elsewhere, such industrial support is common and, although many industries benefit from the support offered by regional authorities, in the recent past attention has been directed towards the bio-technology industries. The local authorities are encouraged to support such nascent industries because they perceive that the rewards to the locality from a flourishing industry will repay their investment at the early stage of development.

However it is not clear that such intervention in the market is necessarily beneficial to the nation at large. Whilst accepting that support for such nascent industries at early stages in their development may well be worth while, entrusting the intervention to the local agents may lead to a competition between jurisdictions. In this paper a model is developed that captures this possibility. Government can choose to support initiatives which have no regional spillovers or to support initiatives which do have an inter-regional dimension. It is shown that, when supporting nascent industrial development has a negative affect on the efficacy of other jurisdictions' industrial support, then local governments will not divide their support between the two categories of expenditure in the same proportion as would be chosen by the national government.

This result is similar to results to be found in the literature on tax competition. Wilson (1999) provides a useful overview of that literature, whilst

Wildasin (1989) considers directly the problem of fiscal externalities. In the UK recently there has been a shift towards more a decentralised regional policy (HM Treasury, 2003). However this shift has been accompanied by the imposition of targets for local regional policy set by the national government. Learmonth and Swales (2005) using a similarly motivated model as that developed in this paper consider the operation of such target driven regional policy in situations where there are fiscal externalities. At the outset it should be noted that here it is assumed that all regional finance is disbursed from the national government. Thus local government does not raise its own revenue. The model would therefore be more applicable to local authority behaviour in the UK, where much local finance comes in the form of a block grant from central government, rather than to a system involving a more highly devolved tax raising structure.

2. THE MODEL

It is assumed that any region can choose to spend its budget in one of two ways. First it may choose to spend money on region specific social policies. It is assumed that if x_r is the level of this type of expenditure in Region r then the returns to such expenditure are given by $\alpha_r.S\{x_r\}$,. The value of α_r reflects the degree of deprivation of the region, the larger is α_r the greater is the effect of any level of expenditure. It is assumed that the function S is a monotonic increasing function of x_r and that it is subject to decreasing returns. Further it should be noted that this type of expenditure exhibits no spillover effects.

Second the region may choose to support a nascent industry (or industries). If it commits y_r to this it will achieve a return of $\beta_r.T\{y_r\}$, where β_r is a

measure of how well endowed the region is to exploit the potential of the nascent industry. So, for example, β could be higher in regions within which there are universities researching in the area or where there is already a flourishing small firm network. Again the function, T, exhibits positive and decreasing returns to expenditure.

However there is another dimension of this expenditure that should be captured. New firms in nascent industries are assumed to be somewhat footloose. Thus, other things being equal, they will be attracted to regions where support levels are higher. This suggests that the returns to this type of expenditure in Region r will additionally depend on whether the expenditure by Region r is above or below the average expenditure of all regions. This additional factor may be written as $D\{y_r - \overline{y}\}$. It is assumed that the function D is common across all regions and is strictly increasing in $\{y_r - \overline{y}\}$. It is further assumed that this distributional effect sums to zero over the complete set of regions in the nation.

i.e $\qquad \sum_{r=1}^{R} D\{y_r - \overline{y}\} = 0$

We may write the gains to be derived by a region from its expenditure as

$$B_r = \alpha_r.S\{x_r\} + \beta_r.T\{y_r\} + D\{y_r - \overline{y}\}$$

2. A NATIONAL POLICY

In this section a solution is given to the question of what allocation of resources a national government would make when faced with the returns functions given in the previous section. For the nation consisting of R regions the returns to regional expenditure are given by

$$B = \sum_{r=1}^{R} \left[\alpha_r . S\{x_r\} + \beta_r . T\{y_r\} + D\{y_r - \overline{y}\} \right]$$

$$= \sum_{r=1}^{R} \alpha_r . S\{x_r\} + \sum_{r=1}^{R} \beta_r . T\{y_r\}$$

It is supposed that the national government has determined the total amount that it is prepared to devote to regional assistance. Let this amount be z. The national government's problem then is to maximise the returns subject to a budget constraint.

i.e.

$$MAX \quad \sum_{r=1}^{R} \alpha_r S\{x_r\} + \sum_{r=1}^{R} \beta_r . T\{y_r\}$$

$$subject\ to \quad \sum_{r=1}^{R} x_r + \sum_{r=1}^{R} y_r \leq z$$

Constructing the Lagrangean function gives

$$L = \sum_{r=1}^{R} \alpha_r . S\{x_r\} + \sum_{r=1}^{R} \beta_r . T\{y_r\} + \lambda \left[z - \sum_{r=1}^{R} x_r - \sum_{r=1}^{R} y_r \right]$$

This has to maximised with respect to $x_1 ..... x_R$, $y_1 .... y_R$ and λ giving

$$\frac{\partial L}{\partial x_r} = \alpha_r \frac{\partial S}{\partial x_r} - \lambda = 0 \qquad for\ r = 1,...,R$$

$$\frac{\partial L}{\partial y_r} = \beta_r \frac{\partial T}{\partial y_r} - \lambda = 0 \qquad for\ r = 1,...,R$$

$$\frac{\partial L}{\partial \lambda} = z - \sum_{r=1}^{R} x_r - \sum_{r=1}^{R} y_r = 0$$

Solving these implies that for any two regions r and s,

$$\alpha_r \frac{\partial S}{\partial x_r^*} = \alpha_s \frac{\partial S}{\partial x_s^*}$$

$$\beta_r \frac{\partial T}{\partial y_r^*} = \beta_s \frac{\partial T}{\partial y_s^*}$$

$$If \quad \alpha_r > \alpha_s \quad then \quad \frac{\partial S}{\partial x_r^*} < \frac{\partial S}{\partial x_s^*} \quad \Rightarrow \quad x_r^* > x_s^*$$

$$If \quad \beta_r > \beta_s \quad then \quad \frac{\partial T}{\partial y_r^*} < \frac{\partial T}{\partial y_s^*} \quad \Rightarrow \quad y_r^* > y_s^*$$

So the national government gives relatively more monies to those regions who are in greatest social need (high α) and to those regions that are well placed to benefit from the nascent industries (high β).

3. REGIONAL POLICY

Suppose that the nation decides on the total levels of disbursement $\left(z_r^* = \left[x_r^* + y_r^*\right]\right)$ as determined in the previous section but allows the regional authorities to have discretion on how to allocate their budget between social and industrial policies. It is assumed that, although the returns to industrial policy are interdependent, any particular region will assume that the industrial policy expenditures of other regions will remain fixed irrespective of what that particular region chooses to do. In other words the regions are assumed to operate in a manner equivalent to standard Cournot oligopolists in industrial economics. The region's problem may be written as

$$MAX \qquad \alpha_r.S\{x_r\} + \beta_r.T\{y_r\} + D\{y_r - \bar{y}\}$$
$$subject\ to \quad x_r + y_r \leq z_r^*$$

The Langrangean is

$$L = \alpha_r.S\{x_r\} + \beta_r.T\{y_r\} + D\{y_r - \bar{y}\} + \lambda_r\left[z_r^* - x_r - y_r\right]$$

and the first order conditions are

$$\frac{\partial L}{\partial X_r} = \alpha_r \frac{\partial S}{\partial x_r} - \lambda_r = 0$$

$$\frac{\partial L}{\partial Y_r} = \beta_r \frac{\partial T}{\partial y_r} + \frac{\partial D}{\partial y_r} - \lambda_r = 0$$

$$\frac{\partial L}{\partial \lambda_r} = z_r^* - x_r - y_r = 0$$

Suppose the solution of this optimisation is given by $x_r^{\#}, y_r^{\#}, \lambda_r^{\#}$. Notice that the sum of $x_r^{\#}$ and $y_r^{\#}$ will be z_r^* as in the case when the national government decides on the local allocations between social and industrial policy expenditures. However when the regional authority is responsible for the allocation the division is determined by the equation

$$\alpha_r \frac{\partial S}{\partial x_r} = \beta_r \frac{\partial T}{\partial y_r} + \frac{\partial D}{\partial y_r}$$

When the national government takes responsibility for the allocation the division is given by the equation

$$\alpha_r \frac{\partial S}{\partial x_r} = \beta_r \frac{\partial T}{\partial y_r}$$

As
$$\frac{\partial D}{\partial y_r} > 0$$

it follows that
$$\beta_r \frac{\partial T}{\partial y_r} + \frac{\partial D}{\partial y_r} > \beta_r \frac{\partial T}{\partial y_r} \quad \textit{for all } y_r$$

Thus the division arrived at by the regional authority ($x_r^{\#}$, $y_r^{\#}$) will be one in which the expenditure on industrial policy is greater and the expenditure on social policy less than in the case when the division is made by the national authority. This is entirely due to the interregional feature of the model. The national

government is not concerned with the relative position of regions. However regions are conscious of their comparative position with respect to industrial support.

4. COMMENTARY

In this paper a model has been built which has the property that regions compete with each other in the fostering of nascent industries. This competition stems from the fact that the returns to expenditure at a regional level depend not only on the amount of support a region allocates to nascent industries but also on the support offered by the region relative to the support offered by other regions. Given the interdependence of the returns functions, any region would choose to spend more of a given budget on support to this nascent industry and consequently less on local social policies that have no spill-over effects. Such "distortion" might be lessened if local authorities were constrained by the centre to spend a predetermined sum on such social needs or if they had to meet fixed outcome targets in that sphere of operation.

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