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Regional centrality and tax competition for FDI☆

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ABSTRACT

We examine a trade model where three countries compete for an exogenous number of firms. In our *hub-and-spoke* framework, one country is the hub through which all trade with and between spokes takes place. We establish the distribution of industrial activity in the absence of taxes and compare it to the equilibrium when countries compete to attract firms. Even when all countries have the same *size*, the *centrality* of the hub sets it apart. We determine how this trading pattern matters, comparing it to a structure with direct trade between all countries. The implications of international tax competition are also examined.

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1. Introduction

This paper examines international tax competition to attract foreign direct investment (FDI) in a regional model with trade costs between countries. Our innovation lies in the geography of the region. If there are only two countries in a region, international trade would take place across the common frontier of the countries.[1] If there are three countries or more, past work (e.g., Haufler and Wooton, 2006) has assumed a "triangular" geography, where each country pair shares a frontier and trade between these two nations takes place across this line. But this excludes the possibility that, in regions composed of three or more countries, the most direct or cheapest route for goods traded between two nations might be through the territory of a third. Thus a 3-country region may be composed of one *hub* country and two *spoke* nations, where each spoke accesses the market of the other spoke by shipping its products through the hub. Clearly, this implies an asymmetry in international transport costs, apparently favouring the centrally placed hub. We wish to investigate how the adoption of this *hub-and-spoke* geography affects the established results for the outcome of tax competition for FDI.

This paper was motivated by the debate regarding increased autonomy for the devolved administrations in the UK. There are strong political pressures to devolve corporate tax-setting powers to the Scotland, Wales and Northern Ireland. Given the geography of the UK, this raises questions as to how such fiscal independence might affect the level and geographic distribution of economic activity and impact on the welfare of citizens.[2] Thus the hub-and-spoke geographic structure we have adopted is an attempt to reflect the economic and spatial relationships within the UK and between it and the wider European market. However, despite the genesis of our modelling endeavour, the analysis is readily applicable to many situations where trade costs between countries are not symmetric. For example, North America is an obvious case of hub-and-spoke geography. The USA is the hub nation that both

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[1] Of course, the countries may be islands in which case a body of water separates them but there is still a common frontier to be crossed at some cost.

[2] The Scottish Government argues "that a unified UK rate of corporate tax is neither desirable nor economically efficient. (…) Given the competitive advantages of London relative to other parts of the UK (such as London's position as one of the largest financial centres in the world, and its transport links with major cities worldwide etc.) there is clear evidence that London (and indeed the South East of England) already has an in-built competitive advantage over not only Scotland but also other parts of the UK. Scotland needs the lever of corporate tax to consider a wider array of options that is currently the case to help address this imbalance." Scottish Scottish Government (2011, p34).

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trades with each of the two spokes of Canada and Mexico, and it is also the conduit for trade between the spokes.

At the centre of our analysis are the attempts by governments to attract inward FDI. FDI results increased local production and employment within the industry concerned, and we assume that this local production of the good yields higher social benefits than imports. This reflects what seems to be a widely-held government view. There are many possible reasons why, independently of capital income and tax/subsidy payments, host countries may favour local production. In the analysis of this paper, trade between any two countries is costly whilst production costs are the same in all countries. As a result, the market price is lower (and consumer surplus higher) when goods are locally produced as compared to being imported from another country in the region. Benevolent governments will recognise this and seek to attract FDI.[3]

Our starting point is Haufler and Wooton's (2010) model of international competition to attract the FDI of firms in an oligopolistic industry.[4] In 2-country models of this type, the existence of international trade costs confers an advantage on the larger country in the competition for firms, as a large country offers a bigger domestic market that can be served without trade costs. Thus size matters. We increase the number of countries to three and allow for different configurations of the population across the region.

Crucially, what further distinguishes the current analysis is our assumption that one of the three countries occupies a central point geographically, such that all traded goods must pass across its frontiers at least once. This hub country can trade directly with each of the other two nations but, in contrast, firms located in either spoke country can only access the consumers in the other peripheral spoke country by shipping their goods through the hub.[5] As shipping goods across national frontiers is assumed to be costly, firms located in the spokes are at a disadvantage in serving each other's markets, as compared to those firms located in the hub. Consequently, we are adding *centrality*, in addition to *size*, as a determinant of national *geographic advantage* within the region.

There are alternative interpretations or applications of the model that might shine some light on current policy questions. One is that the model represents a single country whose geography means that trade between some provinces is more expensive than others. Thus it could represent industrial activity in a country such as the UK, where trade between Scotland and Wales must take place through much-larger England. The model could then be used to analyse the potential for the two relatively disadvantaged provinces to use devolved corporate tax-setting powers to offset their geographic disadvantages. Another modelling possibility would be to consider a two-country setting where one of the countries is "bicentric", having two centres of economic activity that are physically distant from one another. This might characterise trade within the UK (between Scotland and England) and between the UK and the wider European market. The implication of this is that movement of goods between nodes within the bicentric country will also be costly and the location of firms within such a country, as well as their number, will play a role. If one of this country's nodes (England) is closer to the foreign market, this will be the hub through which all exports and imports pass. The other node (Scotland) is therefore geographically disadvantaged, both by its smaller size and by its peripheral location, in its chances of attracting the FDI of firms aiming to service consumers across the entire region. This has the potential to create a tension between citizens resident in one node and those in the other, and may lead to calls for different rates of corporate taxation of firms in order to offset the locational disadvantages of one centre relative to the other.[6]

Our analysis develops as follows. In Section 2 we present the basic hub-and-spoke model and examine the geographic distribution of firms in the absence of any corporate tax competition. We then, in Section 3, consider the non-cooperative tax equilibrium in the region resulting from national attempts to attract additional firms. Section 4 examines the importance of the trading structure by comparing it to one in which all three countries trade directly with one another. In Section 5, we compare the outcome of tax competition with that where a single regional tax authority is empowered to set the corporate taxes for all three countries. Finally, Section 6 concludes.

2. The baseline model

We consider an economic region whose countries compete to attract a fixed number of firms. These firms produce a homogeneous good, labelled x, in an oligopolistic industry. A second good, the numeraire commodity z, is produced under conditions of perfect competition. The numeraire industry, which uses labour as its only input, is freely traded, resulting in the international equalisation of the wage in that industry as w. Trade costs play an important role in the model. It is assumed that z is freely traded whilst x is subject to trade costs.[7]

The region is composed of 3 countries, a hub country H, and two spoke countries S_1 and S_2. The internationally immobile population is divided into households, each of which supplies labour effort and consumes both of the goods produced in the region. Every household in the region supplies a single unit of labour, and we normalise the total number of households across the region to 1. We allow the countries to differ in size such that there are n households in the hub. In order to facilitate the examination of the relative importance of being at the core of the region as opposed to being on the periphery, it will be useful to introduce symmetry across the spoke countries. Thus, we suppose that the two spokes are identical in size, each having a population of $(1-n)/2$.

The cost of shipping a unit of good x between the hub and either spoke is equal to τ. There is no direct trade route between the two spokes (or it is prohibitively expensive). Hence all shipments of good x between the two spokes must pass through the hub and, consequently, face a higher cost for the transhipment of 2τ.[8] This regional trading situation is illustrated in Fig. 1.[9]

2.1. Consumers

Consumers in all countries are assumed to have identical preferences for the goods, given by

$$u_i = \alpha x_i - \frac{\beta}{2} x_i^2 + z_i, \tag{1}$$

[3] Beyond this motivation, there may be labour market benefits from inward FDI. MNEs may offer wage premia above workers' outside options, a polar case of which occurs when inward FDI relieves involuntary unemployment (Haaparanta, 1996; Bjorvatn and Eckel, 2006). Alternatively, inward FDI may be associated with localised technological spillovers to indigenous firms (Fumagalli, 2003; Olsen and Osmundsen, 2003).

[4] Haufler and Wooton (1999) initially consider competition for a single firm. This was extended to two firms by Ferrett and Wooton (2010) and to an oligopolistic industry by Haufler and Wooton (2010).

[5] Haufler and Wooton (2006) have a 3-country, single-firm model of tax competition in a regional setting where the focus is on the implications of tax harmonisation between two of the nations. In our companion paper, Darby et al. (2012), we examine the outcome of tax competition between m heterogeneous countries but without a hub-and-spoke trading pattern.

[6] It is clear that many of Scotland's key exports do pass through England to access the European markets. For example, Scottish Government (2009) reports that oil exports "are piped to England (or via England to Continental Europe)" (p. 46) whilst "much of the whisky destined for the European consumption is transported by road to cross the Channel at Dover" (p. 52), and in the case of fish "significant road freight movement (…) is to the south of England before being transported to mainland Europe for distribution around the World" (p. 55).

[7] Our assumption that the numeraire good is freely traded is common to much of the literature in "new" economic geography as it allows the focus to be on location and production of a particular, imperfectly competitive industry and isolates this discussion from issues of comparative advantage and the determination of relative prices.

[8] To keep the analysis relatively simple, we have assumed that there are no economies from long-distance shipping and that the cost of trade between the two spokes is the sum of the costs of each hub-to-spoke trade.

[9] In our working paper, Darby et al. (2013), we consider hub-and-spoke trade with less symmetry in the model.

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