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The Dynamics of the Location of Firms –
A Revisit of Home-Attachment
under Tax Competition

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The Dynamics of the Location of Firms– A Revisit of Home-Attachment under Tax Competition

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Abstract

We revisit the investment home-bias situation of firms and extend the home attachment setting of Mansoorian and Myers (1993) and Ogura (2006) into a dynamic framework. We locate firms based on their home attachment preferences, which is also changing over time based on some updated spillover information. Some applications, in static and dynamic tax competition, are presented following our home-attachment principle.

Keywords: Dynamic tax competition, Home attachment, Foreign direct investment-disinvestment.

JEL classification: C61, F21, H21.

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1   Introduction

In the conclusion of their seminal paper, Zissimos and Wooders (2008) mention that *"Although our model can explain in static terms why taxes and public goods provision may be higher in one country than another, it is silent on the dynamics of how taxes have evolved over time. ... An agenda for future research is to explain how average tax rates fall over time as markets become more integrated while still maintaining a stable differential between the core and the periphery."* Actually, the lack of a dynamic setting is not only in their work, rather for most contribution in tax competition literature do not explicitly study the dynamics (for systematic survey and additional references, see, for example, Wilson, 1999; Wilson and Wildasin, 2004; Keen and Konrad, 2012.). And, as to dynamic framework, Wildasin[1] (2003, 2011) are the few exceptions, besides the repeated games by studying the tax coordination problem between symmetric regions (Cardarella *et al.*, 2002; Catenaro and Vidal, 2006; Itaya *et al.*, 2008).

In both seminal contributions of Wildasin (2003, 2011), the author studies the dynamic processes of firms under given and fixed-tax-rate framework and demonstrates the importance of (endogenously-determined) adjustment costs. However, all firms are identical. Therefore, under a tax competition framework, it will mean that, if there is one firm from one jurisdiction relocating to the other one, all the other firms will follow. In other words, when the tax competition game starts, the competing jurisdictions will set the tax rates to a fixed equilibrium level which will not change over time. Therefore, these symmetric settings can not be applied to answer the precise question of Zissimos and Wooders (2008). Furthermore, Zissimos and Wooders (2008) present that the asymmetric distribution of firms in competing regions are essentially important if we do not want to study only corner situations, that is, (1) symmetric setting where each jurisdiction has the same share of firms[2]; or (2) all firms stay in one jurisdictions and none in the other.

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[1] There are quite some literature on dynamic taxation, see for example Acemoglu et al. (2011) and more references therein. However, that setting is very complicated to apply to dynamic tax competition.

[2] For more asymmetric reasoning and setting, see Han et al. (2013)

The main difficulty of dynamic (symmetric and asymmetric) tax competition comes from the ranking of firms in the first place which determines the way firm relocation takes place. In a dynamic setting, the two directions of relocation of firms are possible; however, the direction is not an issue at all in a static setting. Nevertheless, there are empirical observations about the dynamic patterns of foreign investment and disinvestment of firms. Based on data from German manufacturing firms, Kinkel and Maloca (2004) document that about 17% of the firms who have moved (parts of) their production abroad in 2000-2001 re-transferred those parts back to Germany within the following five years. Obviously, such a pattern of investment followed by disinvestment might be due to incorrect expectations about production conditions in the foreign country or actual changes in these conditions, such as, tax rates , public inputs or regulations and so on (in home and/or foreign countries). And Dawid et al. (2010) prove that this pattern of foreign investment-disinvestment could be the optimal strategy of a firm.

Therefore, to study the dynamics of tax and public goods, without a dynamic setting where firms can take foreign investment and disinvestment into consideration, it is impossible. In this paper, we would like to revisit the setting of *home attachment of firm* and dedicate that this home-attachment principle can be used to study not only the static games or two(or three)-stage games, but also non-repeated and non-coordinate, dynamic-tax competition games.

The rest of the paper is organized as follows: In the next section we present the main principle– home-attachment preference and then we briefly revisit some examples using home-attachment as the ranking principle for firms. Section 3 concludes and points to possible extensions of the setting.

2 Firm ranking principle and applications

Consider a world with two countries (or jurisdictions or regions) where country size may be defined by population, area, or national income (Streeten, 1993). In this study,

we use entrepreneur population to define country size. More precisely, the size of one country is defined as number of capital owners in that country. We assume that capital owners are simultaneously entrepreneurs and workers. Throughout the rest of the paper, we thus use firms and entrepreneurs interchangeably. Furthermore, capital owners, their associated activities and capital can be relocated to the other country at any point in time.

At time $t = 0$ capital flows have not yet taken place, so the country size in each country coincides with its native entrepreneurs. And suppose the population of jurisdictions is evenly distributed with unit density on the interval $[-S_1(0), S_2(0)]$, where the subscripts 1 and 2 read jurisdictions 1 and 2, respectively. Country 1 extends from $-S_1(0)$ to the origin 0 and the rest of the world extends from 0 to $S_2(0)$. Thus, economy 1 has a size of $S_1(0)$ and economy 2 has a size of $S_2(0)$. We assume that the total number of firms is constant over time and is normalized to one. That is, for any future time $t \geq 0$, $S_1(t) = S(t)$ and $S_2(t) = 1 - S(t)$. For simplicity, in the following, we call country 1 as home country and country 2 as foreign country.

2.1   The ranking principle–Home attachment

The firms are distributed at their respective sub-interval according to their disposition to establish a firm outside of their home location. In other words, we assume that entrepreneurs are heterogeneous in the degree of their attachment to their home country. This idea is first introduced by Mansoorian and Myers (1993) in fiscal competition then applied by Ogura (2006). There are empirical evidences which suggest that there is significant home bias in investment decisions. As early as 1980, Feldstein and Horioka (1980) present their findings, after studying the data of OECD countries, that investment rates are highly correlated with domestic saving rates. The home bias in equities is first documented by French and Poterba (1991) and Tesar and Werner (1995). Later, Coval and Moskowitz (1999) notice that home bias is not limited to international portfolios, but that the preference for investing close to home also applies to portfolios of domestic stocks. Specifically, from the U.S. data, they find that U.S.

investment managers exhibit a strong preference for locally headquartered firms, particularly small, highly leveraged firms that produce non-tradeable goods. Recently, Figueiredo et al.(2002) also realize a significant advantage of the home region in the location choice of new industrial investments in Portugal, though Helliwell and McKitrick (1999) did not find the same correlation across Canadian provinces.

Within this framework, we dictate that the closer entrepreneurs are located to extremes of the interval, the more they are attached to their current location. Conversely, the closer that firms are to the border 0, the less they are attached to their territory and the easier it will be for them to relocate abroad. For simplicity, we assume that firms can only relocate to their neighboring jurisdiction. In other words, a firm from country 1, after relocating, she is still closer to its original country 1 compared to one originally from country 2. Furthermore, there is also some kind of information spillover as to investment in a foreign country; that is, the information about the relocation of other firms will change the attitudes of entrepreneurs' home preferences, which will be clear later.

As the empirical evidences showed, firms are not always perfectly mobile, for there is home bias and there is relocation (or mobility, or adjustment) costs. These costs could be direct costs, such as, new investment costs, seeking and renting a new location, selling the original one, being familiar with new tax (and other civil) codes and so on. It also includes indirect costs-- learning a new local culture, making new friends, looking for new schools for families, joining new clubs and new activities, efforts of entering a new environment, emotional needs and so on, which are not easy to measure by money profit. In our setting, this means that a firm of type $\alpha \in [-S_1(0), 0]$ located in the home country incurs a disutility of relocating abroad equal to kx where x is the distance between 0 and α. The coefficient k represents the unit cost of moving capital abroad and can also be interpreted as the degree of international openness or stickiness to home which may change over time as well.

For simplicity, we take linear output function[3], such that, each firm produces $q + a_i$ $(i =$

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[3]In our setting nonlinear output function does not make any difference, given the capital owner owns one unit capital and one unit labor. See also Pieretti and Zanaj (2011). For nonlinear output setting, see

$1, 2)$ units of a final good where q is the private (gross) productivity which is indifferent to where the firm locates. The fraction a_i of the produced goods depends on the public input supplied by the home (foreign) jurisdiction. Therefore, $S_i \cdot (q + a_i)$ represents the total output produced in country $i = 1, 2$. Outputs are sold in a world competitive market at a given price normalized to one, thus, the smaller jurisdiction does not suffer from a reduced home market. We further consider that the unit production cost is constant and equal to zero without loss of generality.

Suppose that, at time t, an entrepreneur of type α is located in country 1 and considers staying at home or investing her physical capital abroad. If the entrepreneur decides to stay at home, the profit is given by[4]

$$\pi_1(t) = q(t) + a_1(t) - T_1(t),$$

and if she invests abroad, her profit becomes

$$\pi_2(t) = q(t) + a_2(t) - T_2(t) - kx(t).$$

where $T_i (i = 1, 2)$ read capital tax the entrepreneur pays which are levied in the country $i(= 1, 2)$ where the output activity takes place.

It follows that the marginal entrepreneur x, who is indifferent between investing abroad or staying at home, is determined by

$$q(t) + a_1(t) - T_1(t) = q(t) + a_2(t) - T_2(t) - kx(t).$$

Therefore, we have

$$x(t, a_1, a_2, T_1, T_2) = \frac{a_2(t) - T_2(t)}{k} - \frac{a_1(t) - T_1(t)}{k}. \tag{1}$$

In other words, country 2 attracts capital $(x > 0)$ from country 1 if the net gain of investing abroad, $a_2(t) - T_2(t)$, is higher than the net gain of staying at home, $a_1(t) -$

Wildasin (2003, 2011).

[4]For the sake of simplicity, we consider that q is such that the profit of each firm is positive for all equilibrium levels of public goods and taxes.

$T_1(t)$ after taking into account the mobility cost kx. If $x < 0$, capital moves from country 2 to country 1.

The inter-temporal perspective of the current setting described above is the following. For each period $t \in [\Delta t, +\infty)$ and for any $\Delta t > 0$, governments update their choices in terms of the public services offered and/or taxes levied. And the action of the government may lead the firm to reconsider the investment activities, such reconsideration can be seen for example in the report of Kinkel and Maloca (2004) mentioned in the introduction.

Therefore, the law of motion of the size of country 1, $S(t)$, is given by

$$\dot{S}(t) = -x = \frac{a_1(t) - T_1(t)}{k} - \frac{a_2(t) - T_2(t)}{k}. \tag{2}$$

As mentioned above, the relocation of a subset of firms at each period alters the ranking of the attachment to home of firms. In other words, there is a kind of spillover of information or knowledge of the investment environment. Based on the neighbors' investment behavior, entrepreneurs adjust their preferences and activities.

We adopt the following rule. For any time $t \geq 0$, for all $\widetilde{\alpha}(t) \in [-S_1(t), S_2(t)]$, we define $\widetilde{\alpha}(t) = \widetilde{\alpha}(t - \Delta t) + x$ as following:

$$\widetilde{\alpha}(t) = \begin{cases} \alpha(t) \in [-S_1(t), O(t)], \\ \alpha(t) \in [O(t), S_2(t)], \end{cases} \tag{3}$$

and $O(t)$ stands for the origin at period t. We thus assume that the preferences for the home location will change according to the following rule. For the firms that do not move, attachment to home will increase by x if the economy 1 is attractive to foreign investors ($x < 0$) and it will decrease if the foreign location attracts capital from the country 1 ($x > 0$). For the capital owners who move abroad, the higher their attachment to the country they leave, the lower will be the attachment to the new location.

We conclude the above setting in the following.

Proposition 1 *For any time $t \geq 0$, for given unit mobility cost $k(t)$, public good $a(t)$ and tax*

rate $T(t)$, equation (1), (2) and (3) form the home-attachment principle of the location dynamics of firms.

To close this subsection, we notice that, at time t, the tax revenue of country $i = 1, 2$ is $S_i(t)T_i(t)$. Thus, the aggregate discounted tax revenue will be $\int_0^{\widehat{T}} e^{-\rho t} S_i(t)T_i(t)dt$ with ρ constant social discounting rate and $\widehat{T}$ terminal date of consideration which could be finite or infinite.

2.2 Applications

The application of this home attachment principle could be two-folds– on one side, it can be applied to the static tax competition model, which could keep most properties of the classical studies in tax competition literature, and, on the other side, the dynamic character could be exploited.

As to the static application, the first two examples come directly from the original work of Mansoorian and Myers (1993) and Ogura (2006) where they creatively introduce this kind of setting in fiscal competitions. In the present notation, it means the equilibrium situation where $\dot{S} = 0$ and the relocation of a firm is given by equation (1). Similarly, the recent work of Han et al. (2013) is also a static study of tax and infrastructure competition. And, as a by product, they show that with this kind of home attachment ranking of firms, the classical results, such as Zissimos and Wooders (2008), Kanbur and Keen (1993) and Bucovetsky (1991), still hold true.

Pieretti et al. (2012) introduce the dynamic setting which is the one we extend and present here. In that paper, the authors try to study a small open economy's long-run performance where the small open economy faces the dynamic big world competition. Han et al. (2012) apply a similar home-attachment principle of a firm's location and study some dynamic tax competition with very asymmetric players, and hence, they introduce a differential game with asymmetric players and heterogenous strategies.

3 Conclusion

This short discussion introduces a setting which can be used to study the dynamic tax (and/or infrastructure) competition where firms could change their production location during the total time period. We, therefore, extend the home-attachment framework of Mansoorian and Myers (1993) and Ogura (2006) into a dynamic form. Under this new dynamic ranking for the location of firms, competing jurisdictions' tax revenue will be easier to study.

Though in this discussion we present the case where all firms have the same technology of production, different technology can be introduced. The main change is that the tax revenue is no longer as easy as total entrepreneur multiplies the tax rate; rather it will be an integral with population size as an interval of integration and the boundaries of this interval change over time.

Several research directions for future research can be based on this setting. First, a dynamic game model similar to the one of Han et al. (2012) could be studied and answer the question of Zissimos and Wooders (2008) about how tax rates change over time. Second, we could answer the question that "Is tax coordination desirable if countries compete in infrastructures and play Stackelberg strategy, such as Konrad (2011) or Wang (1999)?". Third, with dynamic location of firms, will asymmetric-competing countries converge or diverge in the long run under tax and other instruments competition? All these are interesting area for future research.

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