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Economic geography with tariff competition

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ABSTRACT

A simple two-country model of economic geography is constructed in order to examine the effect of tariff competition on the spatial distribution of manufacturing activities as well as on welfare. We show that when the transport cost is small, tariff competition with firm migration leads to a core-periphery economy, where one of the two countries imposes no tariff in Nash equilibrium. We also show that when the transport cost is sufficiently large, both countries impose a positive tariff, which decreases the welfare of both countries.

1. Introduction

Ever since Krugman (1980), trade costs, which include tariffs and transport costs, have been important features of new trade theory and new economic geography (e.g. Fujita et al., 1999; Baldwin et al., 2003). It has long been believed that trade costs have fallen significantly over time. Baier and Bergstrand (2001) estimate that income growth explains 67%, tariff-rate reductions 25%, transport-cost declines 8% of the average growth of world trade among OECD countries between the late 1950s and the late 1980s. Nevertheless, there still exist large border costs even between Canada and the United States having the Free Trade Agreement (FTA) as shown by McCallum (1995) and his successors.

According to Anderson and van Wincoop (2004), "trade costs are broadly defined to include all costs incurred in getting a good to a final user other than the production cost of the good itself. Among others this includes transport costs (both freight costs and time costs), policy barriers (tariffs and non-tariff barriers), information costs, contract enforcement costs, costs associated with the use of different currencies, legal and regulatory costs, and local distribution costs (wholesale and retail)." They further proceed to report that an approximate estimate of the tax equivalent of representative trade costs for "industrialized countries" amounts to 170%; transport costs, local retail and wholesale distribution costs, and border-related barriers account for roughly 21%, 55%, and 44% of this estimate, respectively ($2.7 = 1.21 \times 1.55 \times 1.44$).

There is a sharp distinction between transport costs and tariffs. The transport costs are considered to be exogenous and to disappear, whereas tariffs are determined endogenously by national tariff policies and are redistributed to consumers in importing countries. While the transport costs are major concern, the tariffs are neglected in new economic geography. We therefore explicitly

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consider that trade costs consist of the transport costs and the tariffs.[1] We extend Krugman's (1980) model of firm migration, wherein each country engages in tariff competition in order to attain a high national welfare level. In particular, it differs from Krugman (1980) in that the tariffs are strategically determined, whereas the transport costs are exogenously given.

The specific structure of the model yields some interesting results. On the one hand, we show that when the transport cost is large enough, each country imposes a positive tariff. Such a tariff is shown to harm each other because it distorts market efficiency. Therefore, if both countries can reach mutually binding agreement of free trade, then it is a Pareto improvement for both countries. On the other hand, when the transport cost is small enough, we show that one of the two countries does not impose a tariff and firms migrate from a zero-tariff country to a positive-tariff country, leading to a core-periphery structure. In sum, we can say that *de facto "free trade" agreements are likely to be concluded between neighbor countries like EU, whereas they are unlikely between distant countries like Japan*.

The organization of the paper is as follows. In the next section, we present the model and characterize equilibria with agglomeration and non-agglomeration of firms for the given tariffs. In Section 3, we analyze the tariff competition in the case of both a large and small transport costs. In order to substantiate the analytical results, we perform numerical simulations, using the values of Anderson and van Wincoop (2004) in Section 4. Section 5 concludes.

2. The model

The global economy comprises two countries, indexed by r and s, and involves two sectors, called the manufacturing sector ($\mathbb{M}$-sector) and the agricultural sector ($\mathbb{A}$-sector). Each country is endowed with an identical number of homogenous workers (= consumers) by mass $L_r = L_s = L/2$. Each worker supplies one unit of labor inelastically and is perfectly mobile between sectors but spatially immobile between countries.

Individual preferences are identical and described by the following utility function:

$$U = \left[\int_0^n q(i)^{\frac{\sigma-1}{\sigma}} di\right]^{\frac{\mu\sigma}{\sigma-1}} q_{\mathrm{A}}^{\alpha} \tag{1}$$

where $q(i)$ represents the consumption of a differentiated manufacturing good ($\mathbb{M}$-good) of variety $i \in [0, n]$, n is the mass of varieties, q_{A} is the consumption of the homogenous agricultural good ($\mathbb{A}$-good), $\sigma > 1$ measures both the elasticity of demand of any variety and the elasticity of substitution between any pair of varieties, μ is the expenditure share of $\mathbb{M}$-goods, and α is the expenditure share of $\mathbb{A}$-good, where $0 < \mu < 1$, $0 < \alpha < 1$ and $\mu + \alpha = 1$. Each individual maximizes her utility subject to the income constraint:

$$\int_0^n p(i)\, q(i) di + q_A = y \tag{2}$$

where $p(i)$ is the price of the $\mathbb{M}$-good i, y is the income of an individual, and the price of the $\mathbb{A}$-good is chosen as a numéraire.

Ex-post symmetry between varieties imposes that $q_{rs}(i) = q_{rs}$ for all variety i produced in country r and sold in country s. Thus, the first-order condition to maximize the individual utility yields the demand of each variety in country s for a good produced in country r as

$$q_{rs} = \frac{p_{rs}^{-\sigma}}{P_s^{1-\sigma}} \mu y_s \tag{3}$$

where p_{rs} is the price of any variety produced in country r and sold in country s, y_s is the individual income in country s,

$$P_s = \left(n_r p_{rs}^{1-\sigma} + n_s p_{ss}^{1-\sigma}\right)^{\frac{1}{1-\sigma}} \tag{4}$$

is the price index of $\mathbb{M}$-goods in country s, and n_r is the mass of firms in country r. Product differentiation ensures a one-to-one relation between firms and varieties. Thus, the number of firms and varieties in country r is given by n_r.

On the production side, firms in the $\mathbb{A}$-sector produce a homogenous good using labor under perfect competition and constant returns to scale. Without loss of generality, units are chosen such that one unit of output requires one unit of labor. Assuming costless transportation of the $\mathbb{A}$-good, the equilibrium wage of workers is equalized between the countries as $w_r = w_s = 1$.[2]

While both the firms in the $\mathbb{A}$-sector and all the workers are immobile, the firms in the $\mathbb{M}$-sector are mobile between countries. The production technology for any variety of $\mathbb{M}$-goods needs the same marginal and fixed labor requirements, labeled c and F respectively, under increasing returns to scale in a monopolistically competitive market. We assume "iceberg" transport costs both between the countries and within each country: a firm in country r has to produce $t_{\mathrm{d}} t q_{rs}$ units to satisfy the final demand q_{rs} in country $s (\neq r)$, and $t_{\mathrm{d}} q_{rr}$ units to satisfy the final demand q_{rr} in country r, where $t_{\mathrm{d}} (\geq 1)$ is the local retail and wholesale distribution costs (i.e. domestic transport costs) which are identical between countries, and $t (\geq 1)$ denotes the international transport cost. We also assume that country s imposes the *ad valorem* tariff τ_s on one unit of $\mathbb{M}$-good imported from country r, while no tariff is imposed on $\mathbb{A}$-good. The transport costs "melt" during the process of trade, whereas the tariffs do not and are redistributed equally

[1] Frankel et al. (1995) also treat them explicitly in order to analyze the number of blocs. However, their tariffs are exogenously given, while ours are endogenous, which significantly complicates the entire analysis.

[2] We assume $\mu < 1/2$ such that factor price equalization holds for any tariff. See Appendix A in Behrens et al. (2004) for more details.