Preferential trading areas: investment and welfare effects when countries differ in their size

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30 June 2008

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May 12, 2009

Abstract

This paper examines the investment and welfare effects of a preferential trading area (PTA) on member and non-member countries when countries differ in their relative size. I numerically solve a three-country and two-good model to characterize equilibria pertaining to investment diverting and creating effects of a preferential trade area. I conclude that welfare benefits of a preferential trade area are non-negative for the member countries, and could go either way for the non-member countries depending on their relative size. There exist equilibria which, given the parameter values and the relative size, result in welfare improvement in non-member countries.

[*]I would like to thank Priya Ranjan, Amihai Glazer and Kurt Van Dender for their help with this research. All errors are mine.

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1 Introduction

The post-world war II period has seen a remarkable growth in the formation of preferential trade areas (PTAs), a discriminatory reduction in tariffs by a country in favor of a subset of countries, among nations around the world. The European Union (EU), the North American Free Trade Agreement (NAFTA) and the Association of South East Asian Nations (ASEAN) Free Trade Area (AFTA) are a few notable examples. Viner (1950) argues that a preferential trade area may have a positive effect in which more trade is created in both member and non-member countries. It could also have a negative trade diverting effect when trade increases in the member countries and decreases in the non-member countries.[1] But there is less attention paid to the investment effects of a preferential trade area, which assumes greater importance due to an increased growth of investment flows in the world economy. Between 1973-1997, the annual rate of growth of global foreign investment is 9.5 percent almost twice as large as that of global exports, which grew by only 4.8 percent. The discrepancy in the growth rates is even more pronounced in recent years. Between 1991-1999, the foreign investment flows have grown by 26 percent per year compared with the growth of the exports of goods and non-factor services by about 5.5 percent per year.[2]

This paper develops a theoretical framework to analyze the investment and welfare effects of a preferential trade area on member countries and non-member counties when countries differ in their size.[3] The multinational firms are the main medium through which investment flows across countries. As in case of the trade effects, the formation of a preferential trade area may have both investment creating and diverting effects. It may divert investment by making the integrated region an attractive location for production

[1] Panagariya (2000) provides an excellent survey of the literature on the welfare effects of trade diverting and trade creating free trade agreements.

[2] The developed countries still account for a greater majority of these global investment flows. The share of developed countries in total inflows rose from 62% in 1993 to 74% in 1999 and in total outflows rose from 85% in 1993 to 91% in 1999. But for developing countries, ratio of inward foreign direct investment stock to GDP has been rising steadily. This ratio increased from 5.4 in 1980 to 10.5 in 1990, and further to 20 in 1998. See Kleinert (2001) for more detailed statistics.

[3] I use member countries or the integrated region interchangeably to label countries which form a preferential trade area. Similarly, I use non-member countries or non-integrated region interchangeably to label countries that are not part of the preferential trade area.

due to its larger market, and hence, shift investment by multinational firms away from non-members to members. However, a preferential trade area allows multinational firms to operate only one plant in the integrated region compared to the pre-PTA case when they had a separate plant in each country, which creates new investment by freeing up resources and allowing new firms to enter the market.[4] This could create investment in both member and non-member countries.

The development of the new trade theory mainly due to Krugman (1979), which accounts for increasing returns to scale, imperfect competition and product differentiation, has opened up new frontiers for the study of multinational enterprises, and hence, the investment effects of preferential trade areas. More recently, the theory of multinational enterprises has evolved significantly. Brainard (1993) and Markusen (1995) discuss that a multinational enterprise must have ownership, location and internalization advantages to offset the higher costs of foreign production such as communications and transport costs, higher costs of stationing personnel abroad, and barriers due to language, customs and being outside the local business and government networks.[5]

One line of research on multinational enterprises focuses on the choice between licensing and investing across borders. Ethier (1986) incorporates the internalization decision into a general equilibrium trade model based on specific factor endowments with a differentiated manufacturing sector. The internalization decision of the firm is a response to imperfections in contracting under uncertainty. Horstmann and Markusen (1987) focus on the internalization decision in a partial equilibrium framework, where production in the destination market may be chosen over licensing in order to maintain a reputation for

[4] After the formation of a preferential trade area, there are no trade barriers between the member countries. It pays the multinational firms to own one plant and supply (or export in more technical sense) their output from one location in the integrated region. So, the integrated region is treated as one "economic" country ignoring any politico-nationalistic issues which may come with it.

[5] These advantages are discussed as follows. First, a multinational firm should have an ownership advantage in some unique asset such as network capital, proprietary process technology or product designs or an established reputational capital that gives the firm market power and is associated with increasing returns across the firm, and the motivation for expansion is to maximize the returns to this asset. Second, there is an internalization advantage, such that the firm is unable to realize the full value of the asset through the market, due to transaction costs or other market failures. This determines the choice of direct investment over licensing. Third, there is an advantage to locating production near consumers or factors across borders, which makes international expansion more profitable than exporting.

quality. Ethier and Markusen (1996) similarly focus on the internalization decision in a partial equilibrium setting. The decision between exporting and overseas production via licensing or investment depends in part on a trade-off between variable transportation costs and a fixed cost of foreign production.

Another line of literature focuses on the choice between exporting and investing across borders, which hinges on the locational advantages (Krugman (1983), Helpman (1984), Markusen (1984), and Helpman and Krugman (1985)). These models explain vertical expansion across borders in terms of factor proportions differences, and conclude that when factor endowments are similar, there is no incentive for multinational investment. So, the cross-border investment flows necessarily arise because of factor price differentials. Though these models explain the vertical multinational investment activity, they do not account for the horizontal multinational activity, which is the predominant type of foreign investment present between countries of similar sizes.

Markusen and Venables (1998, 2000) show how the technology and division of world endowment between countries may determine the mix of national and multinational firms that operate in the equilibrium. They also demonstrate how the presence of trade costs changes the pattern of trade and creates incentives for factor mobility which may lead to agglomeration of activity in a single country and to multinationality of firms. They conclude that multinationals are more likely to exist, the more similar are countries in both relative and absolute endowments. Markusen and Mascus (2001) find empirical support for these conclusions.

A few applications of these models examine the investment effects of a preferential trade area. Baldwin et al (1999) provide evidence that the EU's single market program (EU92) significantly shifted foreign investment flows away from the European Free Trade Association (EFTA) nations to the EU member nations. Motta and Norman (1993, 1996) discuss the effects of market integration and growth on locational choices of multinational firms and welfare of the member countries. They use a game theoretic framework and provide conclusions which are similar to this paper. However, they do not allow for

entry of new firms, and the welfare comparisons in their paper exclude the non-member countries and profits of multinational firms. Their paper does take into account the cost differences between the member countries to look at the differing effects of preferential liberalization within the integrated region.

Ekholm et. al (2007) consider a model concentrating on export-platform foreign direct investment in which an affiliate's output is largely sold in a third country rather than in the host or the parent market in response to a preferential trade area between the third country and the host. This paper considers horizontal foreign direct investment in which affiliates sell their output only in the host market. Ranjan (2006), keeping in line with the locational advantage theory, studies the investment and welfare effects of a preferential trade area and concludes that if the investment creating effects are strong enough they could provide welfare gains for both member and non-member countries. However, he assumes that all countries are identical in size giving rise to a symmetric number of firms. However, I allow for a difference in the country sizes.

The results of this paper can be summarized here as follows. Depending on the relative size of the integrated region with respect to the non-integrated region, a preferential trading arrangement may result in investment diversion or investment creation. For a majority of cases in my analysis based on numerical simulations, the formation of a preferential trade area has an investment diverting effect. Investment diversion, however, may not always result in an unfavorable effect on the welfare of the non-integrated region. Also, investment creation is not a sufficient condition for welfare improvement of the non-integrated region as there is no change in its welfare in some cases despite investment creation.

The remainder of the paper is organized as follows. Section 2 formulates the basic model, and identifies various equilibria in the pre-PTA and post-PTA regimes. Section 3 discusses the investment and welfare effects in the two regimes. Section 4 concludes the paper, and provides the implications and future extensions of this research.

2 The Model

I consider a world with three countries having endowments of labor, L_i ($i = 1, 2$ *and* 3). Countries 1 and 2 are potential members of a preferential trade area and the third country represents the rest of world. Each country in the model has either a numeraire good sector or a differentiated good sector or both. There are two types of firms in the differentiated goods sector - the national and the multinational firms. The important distinction between the two assumed for the purposes of this paper is their location decisions. A national firm has a single plant in the home country and export the differentiated goods to the foreign markets. A multinational firm owns a plant in each country and sells the differentiated goods only in the host country, the so-called horizontal multinational firms (as opposed to vertical multinational firms, which export their output from a host location). The exports of differentiated goods are subject to a trade barrier in the importing countries. So, the decision to be a national firm or multinational firm depends on the costs of owning an additional plant in a foreign market relative to trade barriers faced by exports from home.

The utility function for country i is:

$$U_i = Q_i^{\theta}.Y_i^{1-\theta} \tag{1}$$

where Y is the numeraire good and Q is an index of differentiated goods consumed. This index is given by $(\sum q_i^{\pi})^{1/\pi}$ where $\pi = \frac{\sigma-1}{\sigma}$ and σ is the elasticity of substitution between two varieties of differentiated good which is greater than one. The demand for a differentiated good is:

$$q_i = \frac{p_i^{-\sigma}}{\sum_j p_j^{1-\sigma}} E_i \tag{2}$$

where E_i is the total expenditure on the differentiated goods in country i. Following Dixit and Stiglitz (1977), for a large number of varieties, the elasticity of demand for each variety can be approximated by σ.

On the production side, the numeraire good sector uses only labor as an input, whereas

the differentiated good sector uses both labor and capital. Each unit of numeraire good requires 1 unit of labor, thus fixing the wage rate and the price of the numeraire good to be one in each country. Each firm producing the differentiated good incurs two types of fixed costs, the corporate or firm level fixed costs (F_1) and the plant level fixed costs (F_2), and a constant marginal cost (c), which is assumed to be identical across countries. The differentiated goods sector exhibits increasing returns to scale at the corporate level and scale economies at the plant level. The exports of differentiated goods involve an iceberg transportation cost ($1-\tau$) due to trade barriers imposed by each country against imports. As a result, the marginal cost (MC) equals c for the goods produced at home and c/τ for the exported goods. The price per unit of a differentiated good is a markup over its marginal cost:

$$p = \frac{\sigma}{\sigma - 1} MC \tag{3}$$

Given the above pricing rule, the operating profit from a variety produced in country i and sold in country j ($O\Pi_{ij}$) is:

$$O\Pi_{ij} = (p_{ij} - MC)q_{ij} = \frac{p_{ij}q_{ij}}{\sigma} \tag{4}$$

where p_{ij} and q_{ij} are the price and quantity of a variety produced in country i and sold in country j. Free entry and exit of firms of each type in the differentiated goods sector yields zero profits in the equilibrium.

2.1 The Pre-PTA Equilibria

Let n_i be the number of national firms in country i, and m be the number of multinational firms. Since multinational firms operate a plant in each country, m is the same across countries. Given the Cobb-Douglas utility function in (1) and the wage rate of 1, the expenditure in country j (E_j) equals θL_j. Using the CES price indices in the differentiated good sector, the quantity of a variety produced in country i and sold in country j (q_{ij}), the quantity of a variety produced in country i and sold in country i (q_{ii}) and the total revenue

for a country i firm from its sales in country j ($p_{ij}q_{ij}$) are:

$$q_{ij} = \frac{p_{ij}^{-\sigma}}{n_i p_{ij}^{1-\sigma} + (n_j + m)p_{jj}^{1-\sigma} + n_k p_{kj}^{1-\sigma}} \theta L_j \tag{5}$$

$$q_{ii} = \frac{p_{ii}^{-\sigma}}{(n_i + m)p_{ii}^{1-\sigma} + n_j p_{ji}^{1-\sigma} + n_k p_{ki}^{1-\sigma}} \theta L_i \tag{6}$$

$$p_{ij}q_{ij} = \frac{p_{ij}^{1-\sigma}}{n_i p_{ij}^{1-\sigma} + (n_j + m)p_{jj}^{1-\sigma} + n_k p_{kj}^{1-\sigma}} \theta L_j \tag{7}$$

$$i \neq j \neq k$$

Using transportation cost inclusive export prices $p_{ij} = p_{ik} = p_{ii}/\tau = \frac{\sigma}{\sigma-1}\frac{c}{\tau}$, we can rewrite the total revenue and the operating profit of a national firm in country i from sales in country j as:

$$p_{ij}q_{ij} = \frac{\tau^{\sigma-1}}{n_i \tau^{\sigma-1} + (n_j + m) + n_k \tau^{\sigma-1}} \theta L_j \tag{8}$$

$$O\Pi_{ij} = \left(\frac{\tau^{\sigma-1}}{n_i \tau^{\sigma-1} + (n_j + m) + n_k \tau^{\sigma-1}} \right) \frac{\theta L_j}{\sigma} \tag{9}$$

The total operating profits of a national firm in country i ($O\Pi_i$) from its sales in all three markets and the total operating profits of a multinational firm ($O\Pi_m$) from its sales in the host nation are:

$$\begin{aligned} O\Pi_i &= O\Pi_{ii} + O\Pi_{ij} + O\Pi_{ik} \\ &= \left(\frac{L_i}{(n_i + m) + (n_j + n_k)\tau^{\sigma-1}} + \frac{L_j \tau^{\sigma-1}}{(n_j + m) + (n_i + n_k)\tau^{\sigma-1}} + \frac{L_k \tau^{\sigma-1}}{(n_k + m) + (n_i + n_j)\tau^{\sigma-1}} \right) \frac{\theta}{\sigma} \end{aligned} \tag{10}$$

$$O\Pi_m = \left(\frac{L_i}{(n_i + m) + (n_j + n_k)\tau^{\sigma-1}} + \frac{L_j}{(n_j + m) + (n_i + n_k)\tau^{\sigma-1}} + \frac{L_k}{(n_k + m) + (n_i + n_j)\tau^{\sigma-1}} \right) \frac{\theta}{\sigma} \tag{11}$$

$$i, j, k = 1, 2, 3 \text{ and } i \neq j \neq k$$

The zero profit condition for the equilibrium implies that operating profits be less than equal to total fixed costs:

$$O\Pi_i \leq (F_1 + F_2) \qquad n_i \geq 0, \qquad i = 1, 2, 3 \tag{12}$$

$$O\Pi_m \leq (F_1 + 3F_2) \qquad m \geq 0 \tag{13}$$

Table 1: The Pre-PTA Equilibrium

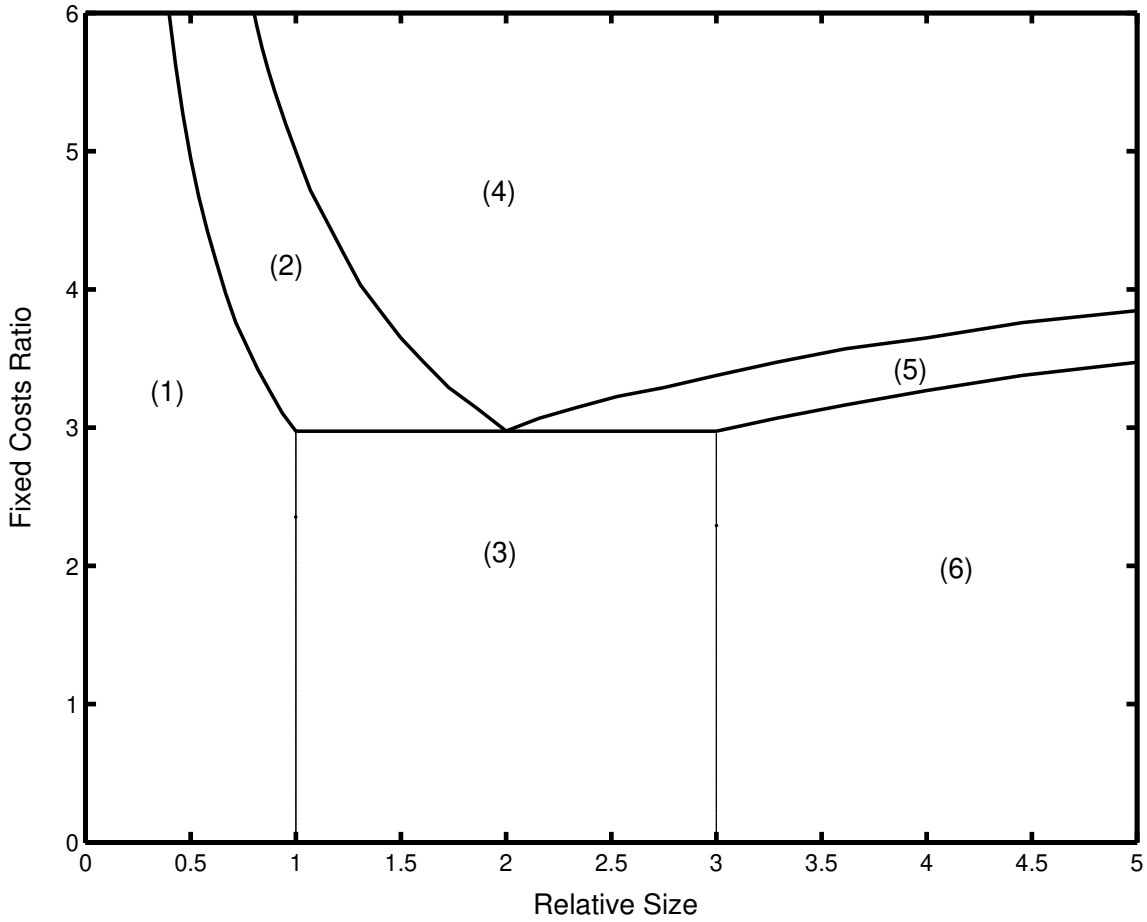
Equilibrium Type	Parametric Range
$n_1 > 0, n_2 > 0, n_3 = 0, m = 0$	$\frac{F_1}{F_2} < \min\left(\frac{L_I\tau^{\sigma-1} - L_3(1-2\tau^{\sigma-1})}{L_3(1-\tau^{\sigma-1})}, \frac{L_I\tau^{\sigma-1}(1+3\tau^{\sigma-1}) - L_3(1-3\tau^{\sigma-1})(1+\tau^{\sigma-1})}{L_I(1-\tau^{\sigma-1})\tau^{\sigma-1} + L_3(1-\tau^{2(\sigma-1)})}\right)$, $\frac{L_I}{L_3} > \frac{1+\tau^{\sigma-1}}{1-\tau^{\sigma-1}}$
$n_1 > 0, n_2 > 0, n_3 > 0, m = 0$	$\frac{F_1}{F_2} < \frac{3\tau^{\sigma-1}}{1-\tau^{\sigma-1}}$, $2\tau^{\sigma-1} < \frac{L_I}{L_3} < \frac{1+\tau^{\sigma-1}}{\tau^{\sigma-1}}$
$n_1 > 0, n_2 > 0, n_3 > 0, m > 0$	$\frac{F_1}{F_2} = \frac{3\tau^{\sigma-1}}{1-\tau^{\sigma-1}}$, $2\tau^{\sigma-1} < \frac{L_I}{L_3} < \frac{1+\tau^{\sigma-1}}{\tau^{\sigma-1}}$
$n_1 = 0, n_2 = 0, n_3 > 0, m = 0$	$\frac{F_1}{F_2} < \frac{2L_3\tau^{\sigma-1} - L_I(1-3\tau^{\sigma-1})}{L_I(1-\tau^{\sigma-1})}, 2\tau^{\sigma-1} > \frac{L_I}{L_3}$
$n_1 = 0, n_2 = 0, n_3 > 0, m > 0$	$\max\left(\frac{3\tau^{\sigma-1}}{1-\tau^{\sigma-1}}, \frac{2L_3\tau^{\sigma-1} - L_I(1-3\tau^{\sigma-1})}{L_I(1-\tau^{\sigma-1})}\right) < \frac{F_1}{F_2} < \frac{2L_3 - L_I(1-3\tau^{\sigma-1})}{L_I(1-\tau^{\sigma-1})}$
$n_1 > 0, n_2 > 0, n_3 = 0, m > 0$	$\max\left(\frac{3\tau^{\sigma-1}}{1-\tau^{\sigma-1}}, \frac{L_I\tau^{\sigma-1}(1+3\tau^{\sigma-1}) - L_3(1-3\tau^{\sigma-1})(1+\tau^{\sigma-1})}{L_I(1-\tau^{\sigma-1})\tau^{\sigma-1} + L_3(1-\tau^{2(\sigma-1)})}\right) < \frac{F_1}{F_2} < \frac{L_I(1+3\tau^{\sigma-1}) - 2L_3(1-3\tau^{\sigma-1})}{(L_I+2L_3)(1-\tau^{\sigma-1})}$
$n_1 = 0, n_2 = 0, n_3 = 0, m > 0$	$\max\left(\frac{L_I(1+3\tau^{\sigma-1}) - 2L_3(1-3\tau^{\sigma-1})}{(L_I+2L_3)(1-\tau^{\sigma-1})}, \frac{2L_3\tau^{\sigma-1} - L_I(1-3\tau^{\sigma-1})}{L_I(1-\tau^{\sigma-1})}\right) < \frac{F_1}{F_2}$

I solve the system of equations in (12) and (13) to compute the parametric conditions for the pre-PTA equilibria, which are summarized in Table 1. The equilibria with only national firms are exporting, only multinational firms are multinational, and both kinds of firms are mixed. The exporting equilibria are more likely to exist, the lower are the transportation costs (higher is τ), the lower is the firm level fixed cost (F_1) to the plant level fixed cost (F_2), and the higher is the elasticity of demand (σ) of a variety.

Figure 1 plots the pre-PTA equilibria in $(\frac{L_I}{L_3}, \frac{F_1}{F_2})$ space where L_I is the size of the integrated region and equals $(L_1 + L_2)$ and thus, $\frac{L_I}{L_3}$ is the relative size of the integrated region with

respect to country 3.[6] As can be seen, the relative size is an important determinant of the pre-PTA equilibrium that is obtained. Given τ, there are no national firms in the

Figure 1: The Pre-PTA Equilibrium



Notes: The figure is plotted for the following values of the parameters: $\theta = 0.8$, $\sigma = 5$, $\tau = 0.84$, $F_1 = 0.05$, $L_1 + L_2 + L_3 = 3$. The relative size is the ratio of the size of the (potentially) integrated region (L_I) with respect to the size of country 3 (L_3). The fixed costs ratio is the ratio of the firm level fixed cost (F_1) with respect to the plant level fixed cost (F_2). The numbered regions represent the possible equilibria in the pre-PTA case. $n_1 = 0, n_2 = 0, n_3 > 0, m = 0$ is represented by region (1), $n_1 = 0, n_2 = 0, n_3 > 0, m > 0$ by region (2), $n_1 > 0, n_2 > 0, n_3 > 0, m = 0$ by region (3), $n_1 = 0, n_2 = 0, n_3 = 0, m > 0$ by region (4), $n_1 > 0, n_2 > 0, n_3 = 0, m > 0$ by region (5), and $n_1 > 0, n_2 > 0, n_3 = 0, m = 0$ by region (6). Also, the horizontal line above region (3) is the mixed equilibrium $n_1 > 0, n_2 > 0, n_3 > 0, m > 0$.

integrated region and it depends on the imports of differentiated goods from country 3

[6]Countries 1 and 2 are the potential members of the preferential trade area as we see in the next section. The comparisons thus involve countries 1 and 2 as the (potentially) integrated region and country 3 (as the rest of the world (ROW)) even in the pre-PTA regime. Appendix A derives the conditions for the Pre-PTA equilibria listed in Table 1.

(region (1) in Figure 1: $n_1 = 0, n_2 = 0, n_3 > 0, m = 0$) if the integrated region is small relative to country 3. Similarly, country 3 has no national firms (region (6) in Figure 1: $n_1 > 0, n_2 > 0, n_3 = 0, m = 0$) if the integrated region is larger relative to country 3. For intermediate values of relative size we have only national firms in all countries or a mix of national and multinational firms. This implies that when one region is relatively larger than the other indicating a skewed distribution of world income, the pattern of trade is inter-industry. The richer countries export the differentiated goods and the poorer countries export the numeraire or the homogenous goods. Also, the pre-PTA equilibrium has production by multinational firms when countries are more similar in size or if relative dissimilarity in sizes is compensated by lowering of F_2, the plant level fixed cost, relative to F_1, the firm level fixed cost. Thus, an equitable distribution of world income supports the existence of an intra-industry pattern of trade in which countries export various varieties of differentiated goods to each other or the existence of multinational firms. It is not surprising to find that multinational firms are more likely to exist when both the regions are similar in size. The smaller size of one region may not make it viable to for the multinational firm to incur fixed costs of owning an additional plant in that country, and make exports from the national firms in the larger country a more viable option.[7]

2.2 The Post-PTA Equilibria

In this section, we study the equilibria that exist when a group of countries preferentially liberalize their trade with each other. More specifically, we allow countries 1 and 2 to form a preferential trade area by eliminating all trade barriers on their goods. However, the trade barriers are kept at the initial level on goods coming from country 3. Let n_I and n_3 be the number of national firms in the integrated region and country 3 (or the non-integrated region), and m be the number of multinationals in the post-PTA regime. As in the pre-PTA case, the quantity of a variety produced in country i and sold in country j (q_{ij}), and the

[7]The horizontal line on top of region (3) is characterized by a multiplicity of equilibria both pure mixed ($n_1 > 0, n_2 > 0, n_3 > 0, m > 0$) and pure Exporting ($n_1 > 0, n_2 > 0, n_3 > 0, m = 0$) with the latter existing for a high majority of values of the relative size.

quantity of a variety produced in country i and sold in country i (q_{ii}), respectively, are:

$$q_{ij} = \frac{p_{ij}^{-\sigma}}{n_i p_{ij}^{1-\sigma} + (n_j + m) p_{jj}^{1-\sigma}} \theta L_j \tag{14}$$

$$q_{ii} = \frac{p_{ii}^{-\sigma}}{(n_i + m) p_{ii}^{1-\sigma} + n_j p_{ji}^{1-\sigma}} \theta L_i \tag{15}$$

$$i, j = I, 3 \quad i \neq j$$

Following from the pre-PTA case, the total operating profits of a national firm in region i and a multinational firm in the post-PTA regime, respectively, are:

$$O\Pi_i = \left(\frac{L_i}{(n_i + m) + (n_j)\tau^{\sigma-1}} + \frac{L_j \tau^{\sigma-1}}{(n_j + m) + (n_i)\tau^{\sigma-1}} \right) \frac{\theta}{\sigma} \tag{16}$$

$$O\Pi_m = \left(\frac{L_i}{(n_i + m) + (n_j)\tau^{\sigma-1}} + \frac{L_j}{(n_j + m) + (n_i)\tau^{\sigma-1}} \right) \frac{\theta}{\sigma} \tag{17}$$

After the formation of the preferential trade area, a multinational firm needs to maintain only one plant in the integrated region incurring a fixed cost of only $(F_1 + 2F_2)$. The post-PTA

Table 2: The Post-PTA Equilibrium

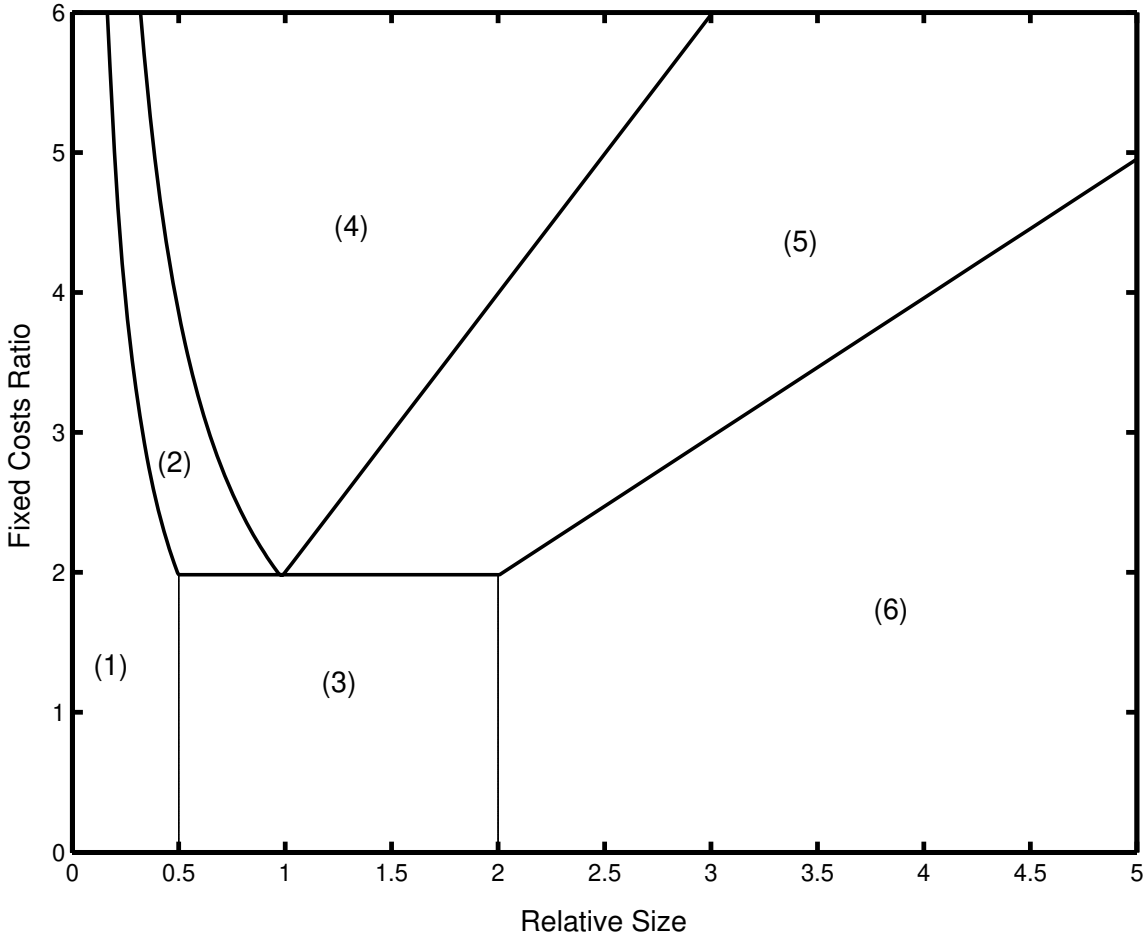
Equilibrium Type	Parametric Range
$n_I > 0, n_3 = 0, m = 0$	$\frac{F_1}{F_2} < \min\left(\frac{L_I \tau^{\sigma-1} - L_3(1-2\tau^{\sigma-1})}{L_3(1-\tau^{\sigma-1})}, \frac{2\tau^{\sigma-1}}{1-\tau^{\sigma-1}} \right), \frac{L_I}{L_3} > \frac{1}{\tau^{\sigma-1}}$
$n_I > 0, n_3 > 0, m = 0$	$\frac{F_1}{F_2} < \frac{2\tau^{\sigma-1}}{1-\tau^{\sigma-1}}, \ \tau^{\sigma-1} < \frac{L_I}{L_3} < \frac{1}{\tau^{\sigma-1}}$
$n_I > 0, n_3 > 0, m > 0$	$\frac{F_1}{F_2} = \frac{2\tau^{\sigma-1}}{1-\tau^{\sigma-1}}, \ \tau^{\sigma-1} < \frac{L_I}{L_3} < \frac{1}{\tau^{\sigma-1}}$
$n_I = 0, n_3 > 0, m = 0$	$\frac{F_1}{F_2} < \frac{L_3 \tau^{\sigma-1} - L_I(1-2\tau^{\sigma-1})}{L_I(1-\tau^{\sigma-1})}, \tau^{\sigma-1} > \frac{L_I}{L_3}$
$n_I = 0, n_3 > 0, m > 0$	$\max\left(\frac{2\tau^{\sigma-1}}{1-\tau^{\sigma-1}}, \frac{L_3 \tau^{\sigma-1} - L_I(1-2\tau^{\sigma-1})}{L_I(1-\tau^{\sigma-1})} \right) < \frac{F_1}{F_2} < \frac{L_3 - L_I(1-2\tau^{\sigma-1})}{L_I(1-\tau^{\sigma-1})}$
$n_I > 0, n_3 = 0, m > 0$	$\max\left(\frac{2\tau^{\sigma-1}}{1-\tau^{\sigma-1}}, \frac{L_I \tau^{\sigma-1} - L_3(1-2\tau^{\sigma-1})}{L_3(1-\tau^{\sigma-1})} \right) < \frac{F_1}{F_2} < \frac{L_I - L_3(1-2\tau^{\sigma-1})}{L_3(1-\tau^{\sigma-1})}$
$n_I = 0, n_3 = 0, m > 0$	$\max\left(\frac{L_3 - L_I(1-2\tau^{\sigma-1})}{L_I(1-\tau^{\sigma-1})}, \frac{L_I - L_3(1-2\tau^{\sigma-1})}{L_3(1-\tau^{\sigma-1})} \right) < \frac{F_1}{F_2}$

equilibrium can be characterized by the following zero profit conditions:

$$O\Pi_i \leq (F_1 + F_2) \qquad n_i \geq 0 \qquad i = I, 3 \tag{18}$$

$$O\Pi_m \leq (F_1 + 2F_2) \qquad m \geq 0 \tag{19}$$

Figure 2: The Post-PTA Equilibrium



Notes: The figure is plotted for the following values of the parameters: $\theta = 0.8$, $\sigma = 5$, $\tau = 0.84$, $F_1 = 0.05$, $L_I + L_3 = 3$. The relative size is the ratio of the size of the integrated region (L_I) with respect to the size of country 3 (L_3). The fixed costs ratio is the ratio of the firm level fixed cost (F_1) with respect to the plant level fixed cost (F_2). The numbered regions represent the possible equilibria in the post-PTA case. $n_I = 0, n_3 > 0, m = 0$ is represented by region (1); $n_I = 0, n_3 > 0, m > 0$ by region (2); $n_I > 0, n_3 > 0, m = 0$ by region (3); $n_I = 0, n_3 = 0, m > 0$ by region (4); $n_I > 0, n_3 = 0, m > 0$ by region (5); and $n_I > 0, n_3 = 0, m = 0$ by region (6). Also, the horizontal line above (3) is the mixed equilibrium $n_I > 0, n_3 > 0, m > 0$.

Table 2 details the parametric conditions for the post-PTA equilibria.[8] Figure 2 plots the post-PTA equilibria $(\frac{L_I}{L_3}, \frac{F_1}{F_2})$ space.[9] The effect of the preferential trade area is to increase the range of relative size and fixed costs ratio in which there are national firms in the integrated region, and decrease the area in which there are national firms in country 3. Thus, a typical effect of the preferential trade area is to divert the investment away from non-members to members. For example, region (6) in Figure (2) which represents the post-PTA equilibrium in which there are national firms in the integrated region is much larger than region (6) in Figure 1 in the pre-PTA equilibrium. Regions (1) and (2) which have national firms in the non-integrated region shrink in size. A larger market in the integrated region due to the preferential trade area makes it more attractive for both the

Table 3: Summery of the Pre-PTA and the Post-PTA Equilibria

Pre-PTA Equilibrium	Post-PTA Equilibrium
$n_1 > 0, n_2 > 0, n_3 = 0, m = 0$	$n_I > 0, n_3 = 0, m = 0$
$n_1 > 0, n_2 > 0, n_3 > 0, m = 0$	$n_I > 0, n_3 = 0, m = 0; n_I > 0, n_3 > 0, m = 0;$ $n_I > 0, n_3 = 0, m > 0;$ $n_I = 0, n_3 = 0, m > 0; n_I > 0, n_3 > 0, m > 0$
$n_1 > 0, n_2 > 0, n_3 > 0, m > 0$	$n_I > 0, n_3 = 0, m > 0; n_I = 0, n_3 = 0, m > 0,$
$n_1 = 0, n_2 = 0, n_3 > 0, m = 0$	$n_I = 0, n_3 > 0, m = 0; n_I = 0, n_3 > 0, m > 0;$ $n_I > 0, n_3 > 0, m = 0;$ $n_I > 0, n_3 > 0, m > 0; n_I = 0, n_3 = 0, m > 0$
$n_1 = 0, n_2 = 0, n_3 > 0, m > 0$	$n_I > 0, n_3 = 0, m > 0; n_I = 0, n_3 = 0, m > 0$
$n_1 > 0, n_2 > 0, n_3 = 0, m > 0$	$n_I > 0, n_3 = 0, m > 0; n_I > 0, n_3 = 0, m = 0$
$n_1 = 0, n_2 = 0, n_3 = 0, m > 0$	$n_I > 0, n_3 = 0, m > 0; n_I > 0, n_3 = 0, m = 0;$ $n_I = 0, n_3 = 0, m > 0$

national and multinational firms to set up their plants there. We shall see below that the non-integrated region has to be extremely large in size relative to the integrated region to be unaffected by the preferential trade area. Table 3 summarizes the pairs of equilibria that may exist before and after the preferential trade area. Depending on the values of $\frac{F_1}{F_2}$ and $\frac{L_I}{L_3}$, each pre-PTA equilibrium is associated with a unique post-PTA equilibrium. We turn

[8] Appendix B derives the conditions for the post-PTA equilibria listed in Table 2.

[9] The horizontal line on top of region (3) in Figure 2 is characterized by a multiplicity of equilibria with the pure exporting equilibria existing for the most of relative size values.

now to a comparison of the pre-PTA and post-PTA equilibria to examine the investment and welfare effects of a preferential trade area.

3 Investment Creation and Diversion, and Welfare

Consider the utility function in (1):

$$U_i = Q_i^{\theta} Y_i^{1-\theta} \tag{20}$$

where Q_i equals $\left(\sum q_i^{\pi}\right)^{\frac{1}{\pi}}$. Given the Cobb-Douglas utility function, the demand for the numeraire good is $(1-\theta)L_i$. Using equations (4) and (5), the demand for the numeraire good and $p_{ij} = p_{ik} = p_{ii}/\tau = \frac{\sigma}{\sigma-1}\frac{c}{\tau}$, the utility functions of a representative individual in country i in the pre-PTA case and the post-PTA case are:[10]

$$U_i^{Pre} = C \times \left(n_i + m + n_j\tau^{\sigma-1} + n_k\tau^{\sigma-1}\right)^{\frac{\theta}{\sigma-1}} \tag{21}$$

$$n_i, n_j, n_k, m \geq 0 \qquad i, j, k = 1, 2, 3 \qquad i \neq j \neq k$$

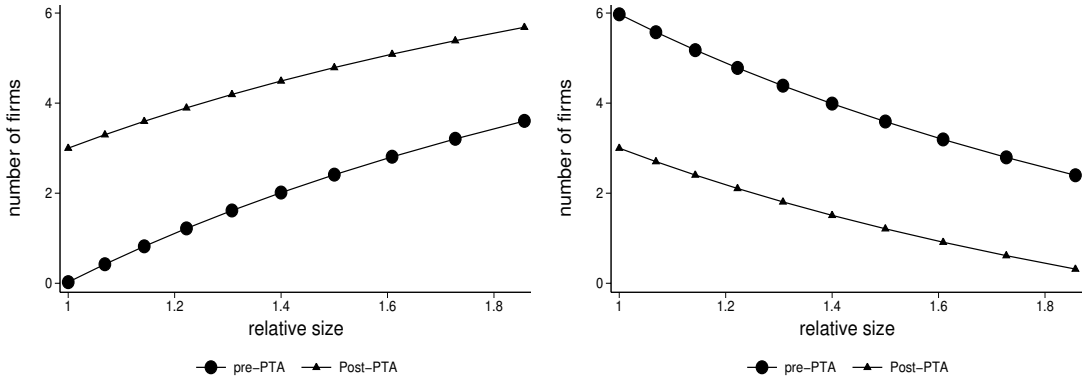
$$U_i^{Post} = C \times \left(n_i + m + n_k\tau^{\sigma-1}\right)^{\frac{\theta}{\sigma-1}} \tag{22}$$

$$n_i, n_k, m \geq 0 \qquad i, k = I, 3 \qquad i \neq k$$

where $C = \theta^{\theta}(1-\theta)^{1-\theta}\left(\frac{\sigma-1}{\sigma c}\right)^{\theta}$. Let N_I^{Pre} and N_3^{Pre} be the total number of firms in the integrated region and country 3 in the pre-PTA case, respectively. Let N_I^{Post} and N_3^{Post} be the total number of firms in the integrated region and country 3 in the post-PTA case. The preferential trade area is investment creating if $\frac{N_I^{Pre}}{N_I^{Post}} < 1$ and $\frac{N_3^{Pre}}{N_3^{Post}} < 1$. This means that the total number of firms in the pre-PTA case is less than the total number in the post-PTA case in both the integrated region and country 3. The preferential trade area is investment diverting if $\frac{N_I^{Pre}}{N_I^{Post}} < 1$ and $\frac{N_3^{Pre}}{N_3^{Post}} > 1$ implying that it results in more investment in the

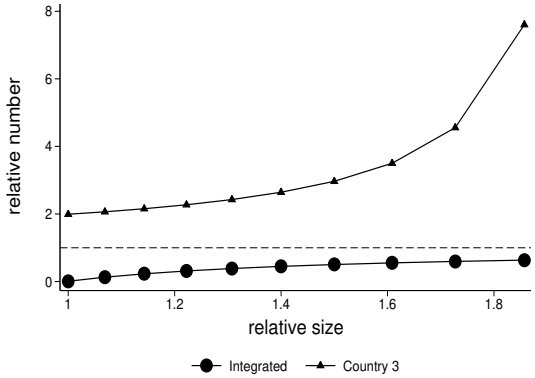
[10] Appendix C derives the expressions for the utility of a representative individual in the pre-PTA and the post-PTA regimes. I also discuss in detail the investment and welfare effects, and compare each pre-PTA equilibrium with the corresponding post-PTA equilibrium.

Figure 3: The Investment and Welfare Effects

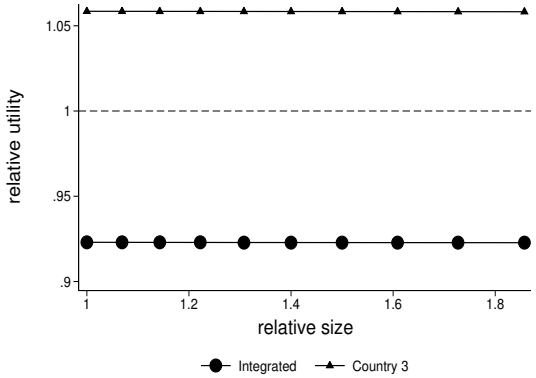


(a) Number of firms in the integrated region

(b) Number of firms in the non-integrated region



(c) Relative number of firms



(d) Relative utility

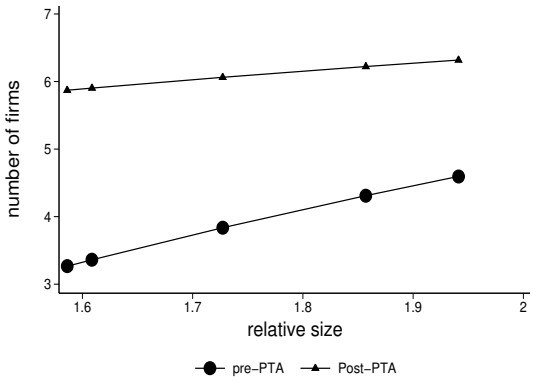
Notes: The pre-PTA equilibrium is pure exporting ($n_1 > 0, n_2 > 0, n_3 > 0, m = 0$) and the post-PTA equilibrium is mixed ($n_I > 0, n_3 > 0, m = 0$). The relative size is the ratio of the size of the integrated region to the side of country 3. The relative number is the ratio of number of firms in the pre-PTA case to number of firms in the post-PTA case. The relative utility is the utility in the pre-PTA case relative to the post-PTA case. The figure is plotted for the following values of the parameters: $\theta = 0.8$, $\sigma = 5$, $\tau = 0.84$, $F_1 = 0.05$, $L_I + L_3 = 3$.

integrated region at the expense of country 3. To figure out the welfare change, we look at the utility in the pre-PTA regime relative to the post-PTA regime for region i $\left(\frac{U_i^{Pre}}{U_i^{Post}}\right)$. If $\frac{U_i^{Pre}}{U_i^{Post}} < 1$, the welfare improves. There are two sources of the welfare effect of the preferential trade area, the effect of total number of varieties of differentiated goods available worldwide and the effect of number of varieties of differentiated goods produced at home. As can be seen from the utility functions above, the varieties produced at home add more to the

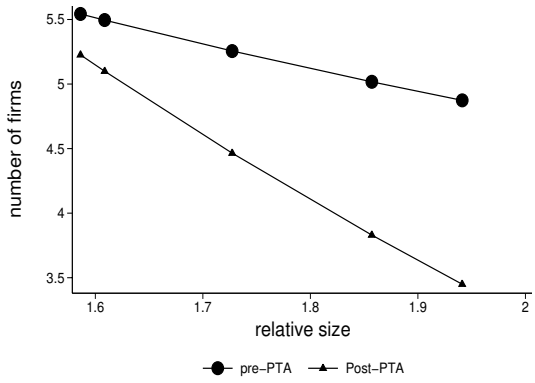
utility than the varieties produced abroad because the latter cost more due to the trade barriers.

Figure 3 plots the total number of firms in the integrated and non-integrated region in both regimes, the number of firms in the pre-PTA case relative to the post-PTA case, and the utility in the pre-PTA case relative to the post-PTA case in both regions when both the pre-PTA ($n_1 > 0, n_2 > 0, n_3 > 0, m = 0$) and the post-PTA ($n_I > 0, n_3 > 0, m = 0$) equilibria

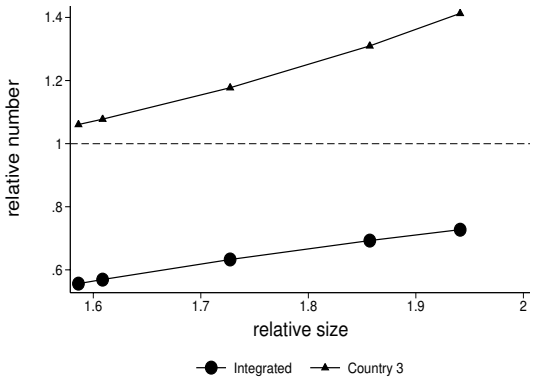
Figure 4: The Investment and Welfare Effects (Cont'd)



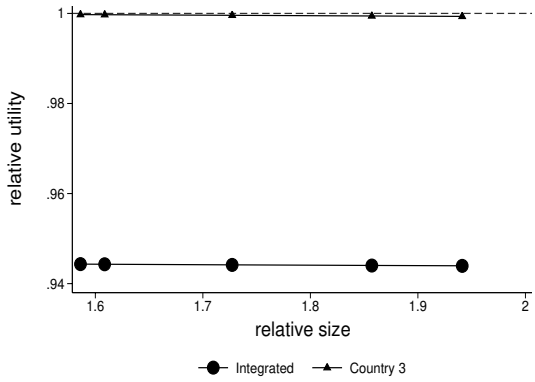
(a) Number of firms in the integrated region (Cont'd)



(b) Number of firms in the non-integrated region



(c) Relative number of firms



(d) Relative utility

Notes: The pre-PTA equilibrium is pure exporting ($n_1 = 0, n_2 = 0, n_3 > 0, m > 0$) and the post-PTA equilibrium is mixed ($n_I > 0, n_3 = 0, m > 0$). The relative size is the ratio of the size of the integrated region to the side of country 3. The relative number is ratio of number of firms in the pre-PTA case to number of firms in the post-PTA case. The relative utility is the utility in the pre-PTA case relative to the post-PTA case. The figure is plotted for the following values of the parameters: $\theta = 0.8$, $\sigma = 5$, $\tau = 0.84$, $F_1 = 0.05$, $L_I + L_3 = 3$.

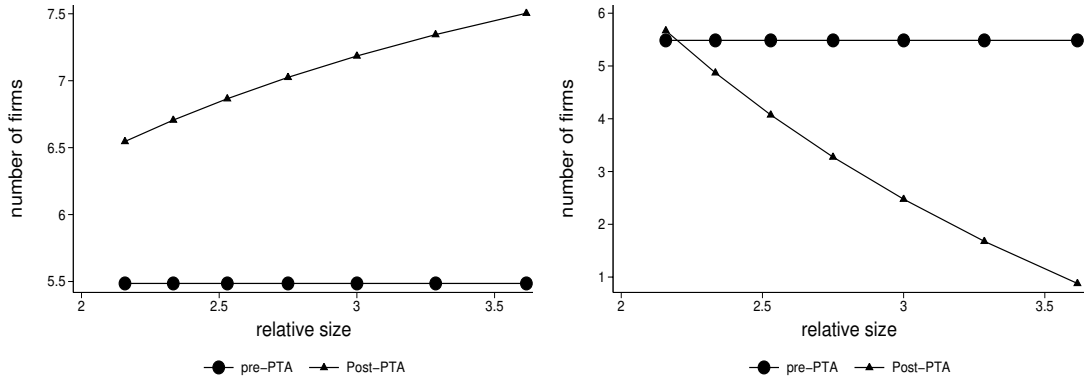
are pure exporting. Both regions export and import differentiated goods implying presence of intra-industry trade. From Figures 1 and 2 we know that this case arises for intermediate values of the relative size and when the plant level fixed cost is high compared to the firm level fixed cost making multinational activity less viable. As can be seen from panel (a), the total number of firms in the integrated region is higher in the post-PTA case than in the pre-PTA case. Also, the number of firms in the integrated region increase with its relative size. The opposite is true for the non-integrated region in panel (b). So, the preferential trade area diverts investment to the integrated region from the non-integrated region in this case. This is also evident in panel (c) where I plot the relative number of firms in the integrated and the non-integrated region. The relative number of firms curve lies below one for the integrated region indicating more investment after the preferential trade area, and lies below one for the non-integrated region. In panel (d) of the figure, the welfare of the integrated region improves and that of country 3 worsens due to the preferential trade area. The integrated region gains because it produces a greater number of varieties of the differentiated goods. The non-integrated region has a corresponding decline in welfare due to a loss in the domestic production.[11]

Figure 4 depicts the investment and welfare comparisons when the pre-PTA equilibrium is $n_1 = 0, n_2 = 0, n_3 > 0, m > 0$ and the post-PTA equilibrium is $n_I > 0, n_3 = 0, m > 0$. The integrated region has only multinational firms in the pre-PTA equilibrium, whereas country 3 has both national and multinational firms. However, after the preferential trade area, the non-integrated region has only multinational firms, whereas the integrated region has both national and multinational firms. So the preferential trade area allows investment in the integrated region by national firms which were absent before the preferential trade area. As can be seen from panels (a), (b), and (c), the preferential trade area causes an investment diversion in this case also. The total number of firms in the integrated region in the post-PTA case is higher than the pre-PTA case. However, the total number of firms after the preferential trade area declines in the non-integrated region. The national firms which were

[11]The simulation exercises show that the total number of firms worldwide remain the same in this case. So the only effect on welfare is due to a change in the number of varieties produced at home.

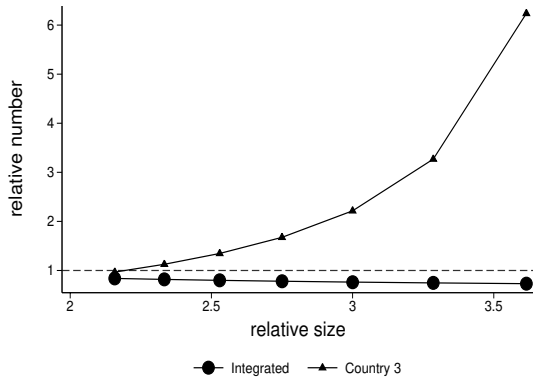
exporting to the integrated region before the preferential trade area now find it more viable to locate in the integrated region and serve the world market. In panel (d), the welfare effect is positive for the integrated region as the number of varieties worldwide increases and the integrated region produces a greater number of varieties after the preferential trade area. However, the welfare of country 3 remains unchanged as the decline in domestic production is equally compensated by greater number of varieties available worldwide. So an investment diversion may not always cause welfare decline in country 3.

Figure 5: The Investment and Welfare Effects (Cont'd)

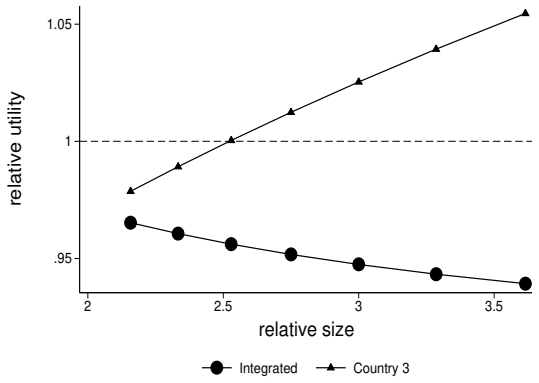


(a) Number of firms in the integrated region

(b) Number of firms in the non-integrated region



(c) Relative number of firms



(d) Relative utility

Notes: The pre-PTA equilibrium is pure exporting ($n_1 = 0, n_2 = 0, n_3 = 0, m > 0$) and the post-PTA equilibrium is mixed ($n_I > 0, n_3 = 0, m > 0$). The relative size is the ratio of the size of the integrated region to the side of country 3. The relative number is the ratio of number of firms in the pre-PTA case to number of firms in the post-PTA case. The relative utility is the utility in the pre-PTA case relative to the post-PTA case. The figure is plotted for the following values of the parameters: $\theta = 0.8$, $\sigma = 5$, $\tau = 0.84$, $F_1 = 0.05$, $L_I + L_3 = 3$.

Finally, Figure 5 plots the investment and welfare effects when the pre-PTA equilibrium is $n_1 = 0, n_2 = 0, n_3 = 0, m > 0$ and the post-PTA equilibrium is $n_I > 0, n_3 = 0, m > 0$. This case also results in an investment diversion. The welfare effect on the integrated region is unambiguously positive. However, despite investment diversion, the welfare effect on the non-integrated region depends on its relative size. At lower values of the relative size, the welfare effect in the non-integrated region is positive. It is only when the integrated region is much larger than the non-integrated region does the welfare effect become negative for latter. The non-integrated region experiences a welfare improvement when the effect due to number of varieties available more than offsets the effect due to diversion of investment. But eventually the effect due to decline in domestic production dominates the effect due to number of varieties available decreasing the welfare in the integrated region. So from Figures 4 and 5, we see that investment diversion is not a sufficient condition for a welfare decline in the non-integrated region.

Table 4: The Investment and Welfare Effects

Equilibrium		Investment	Welfare effects	
Pre-PTA	Post-PTA	effects	Integrated	Country 3
$n_1 > 0, n_2 > 0, n_3 = 0, m = 0$	$n_I > 0, n_3 = 0, m = 0$	none	+	unchanged
$n_1 > 0, n_2 > 0, n_3 > 0, m = 0$	$n_I = 0, n_3 = 0, m > 0$	diversion/creation	+	-
	$n_I > 0, n_3 = 0, m = 0$	diversion	+	-
	$n_I > 0, n_3 = 0, m > 0$	creation	+	unchanged
	$n_I > 0, n_3 > 0, m = 0$	diversion	+	-
	$n_I > 0, n_3 > 0, m > 0$	diversion	+	-
$n_1 = 0, n_2 = 0, n_3 > 0, m = 0$	$n_I = 0, n_3 = 0, m > 0$	diversion	+	-
	$n_I = 0, n_3 > 0, m = 0$	none	unchanged	unchanged
	$n_I = 0, n_3 > 0, m > 0$	diversion	+	-
	$n_I > 0, n_3 > 0, m = 0$	diversion	+	-
	$n_I > 0, n_3 > 0, m > 0$	diversion	+	-
$n_1 > 0, n_2 > 0, n_3 > 0, m > 0$	$n_I = 0, n_3 = 0, m > 0$	diversion/creation	+	-
	$n_I > 0, n_3 = 0, m > 0$	creation	+	unchanged
$n_1 = 0, n_2 = 0, n_3 > 0, m > 0$	$n_I = 0, n_3 = 0, m > 0$	diversion	+	-/+
	$n_I > 0, n_3 = 0, m > 0$	diversion	+	unchanged
$n_1 > 0, n_2 > 0, n_3 = 0, m > 0$	$n_I > 0, n_3 = 0, m = 0$	diversion	+	-
	$n_I > 0, n_3 = 0, m > 0$	diversion	+	unchanged
$n_1 = 0, n_2 = 0, n_3 = 0, m > 0$	$n_I = 0, n_3 = 0, m > 0$	creation	+	+
	$n_I > 0, n_3 = 0, m = 0$	diversion	+	-
	$n_I > 0, n_3 = 0, m > 0$	diversion	+	+/-

Table 4 summarizes the investment and welfare effects for all possible pre-PTA and

the post-PTA equilibria. The preferential trade area has positive investment and welfare effects on the integrated region, and hurts the non-integrated region a majority of cases. However, there are a few cases in which the preferential trade area creates investment in both regions and does not result in decline in the non-integrated region's welfare. In few cases, the preferential trade area results in a welfare gain in both the integrated and non-integrated region. This is the case when both the Pre-PTA ($n_1 = 0, n_2 = 0, n_3 = 0, m > 0$) and post-PTA ($n_I = 0, n_3 = 0, m > 0$) equilibria have only multinational firms. This is identical to the multinational equilibrium in Ranjan (2003). In this case, the preferential trade area results in investment creation because the multinational firms have to own only one plant in the integrated region freeing up resources for the creation of more investment and causing welfare gains in both regions. However, we encounter a case in which there are only multinational firms in the pre-PTA case ($n_1 = 0, n_2 = 0, n_3 = 0, m > 0$) and a mixed equilibrium in the post-PTA case with national firms in the integrated region. The preferential trade area causes investment diversion in this case. But the welfare effect on country 3 is positive initially when it is relatively similar to the integrated region in size before it becomes negative at higher levels of the relative size.

4 Conclusion

The focus of this paper is on the investment and welfare effects on the member and the non-member countries as a result of a preferential trade area. Using numerical simulations, I identify the possible equilibria that might arise in the pre-PTA and the post-PTA regimes. The exporting equilibria exist if transportation costs are lower (τ is higher), the ratio of the firm level fixed cost (F_1) to the plant level fixed cost (F_2) is lower, the elasticity of demand (σ) of a variety is higher and the distribution of world income is more skewed. The opposite should hold for the multinational equilibria. The number of national firms in a region in any equilibrium increases with the relative size of that region. Thus, the relative size also determines the pattern of trade. The larger the relative size of a region, the higher will

be the number of national firms in that region, the closer will be the pattern of trade to inter-industry kind. Similarly, the closer the regions are in terms of their size, the closer the pattern of trade will be to intra-industry kind.

The effect of a preferential trade area is to allow the integrated region to have the size advantage to attract more national firms. The simulations exercises suggest that, in most cases, the preferential trade area results in investment diversion as the integrated region headquarters a greater number of national firms at the expense of country 3. There are also cases in which the preferential trade area does not lead to investment diversion. In some cases, it creates investment in both regions. Investment creation is a sufficient condition for the preferential trade area to cause a welfare improvement in the integrated region but not in country 3 as there are other effects working at the same time. Similarly, the investment diversion is a sufficient condition for welfare improvement in the integrated region but not for country 3. The integrated region experiences a welfare improvement in cases involving both investment creation and diversion because both effects, number of varieties available worldwide and number of varieties produced at home, work in its favor. The welfare of country 3 depends on the relative strength of the two factors. The stronger is the first factor relative to the second, the greater is welfare of country 3 in the post-PTA case relative to the pre-PTA case.

In the future, this paper can improve upon the present results in at least two ways. First, we can consider a more general framework by allowing for two factors of production in the basic model. This will enable us to study the factor mobility issues under the preferential trade area. Secondly, the present paper ignores the tariff generating trade barriers. The loss of tariff revenue might be expected to offset some of the gains from a preferential trade area. Thirdly, we can empirically examine the investment and welfare effects of a preferential trade area on member and non-member countries.

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