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A decomposition of the home-market effect

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Abstract

Although the home-market effect has become one of the most important concepts in both trade theory and the new economic geography, it lacks a compelling graphical representation. The purpose of this note is to offer such a representation. We will decompose the home-market effect into two steps: a short-run response to population shift, creating entry-stimulating excess profits (in the short run) for firms of the country that experiences a population gain, and a further round of entries into the monopolistic sector of the expanding country induced by exits in the foreign industry.

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1 Introduction

The monopolistic competition model, characterized by increasing returns and differentiated products, is a major workhorse of the "New Trade Theory." Originally conceived by Joan Robinson and Edward Chamberlain in the 1930's, it became highly useful after the mathematical formulation by Dixit and Stiglitz (1977). In their seminal contributions, Krugman (1980) and Helpman and Krugman (1985, ch. 10.4) demonstrate that under monopolistic competition, country size determines the net trade flows in differentiated products when trade is subject to trade costs. The key idea is what is called the home-market effect: if two countries differ only in size, in the presence of trade costs, the larger country will end up with a more-than-proportional share of the production of differentiated products.[1]

The home-market effect has become one of the most important concepts in both trade theory and the new economic geography.[2] Still, it lacks a compelling graphical representation. The purpose of this note is to offer such a representation. We will decompose the home-market effect into two steps: a short-run response to population shift, creating entry-stimulating excess profits (in the short run) for firms of the country that experiences a population gain, and a further round of entries into the monopolistically competitive sector of the expanding country induced by exits in the foreign country. We will emphasize that the second round of entries constitutes the main source of the home-market effect. Our experience indicates that this graphical approach helps the reader to gain, almost effortlessly, a clear

[1] In a review of the scientific contribution of Paul Krugman, Neary (2009, p. 233) argues that this was to prove perhaps the most innovative of his contributions.

[2] See, for example, Brakman, Garretsen, and van Marrewijk (2009, ch. 1), Combes, Mayer and Thisse (2008, ch. 4), and Feenstra (2004, ch. 5). Applications of economic geography to open-economy macroeconomics include Alesina and Barro (2002).

understanding of the home-market effect.

The next section presents the basic model. The nature of the trading equilibrium is considered in Section 3, followed by concluding remarks in Section 4.

2 The Model

Suppose that there are two countries: Home and Foreign. Home (resp. Foreign) is endowed with L (L^*) units of labor, which is the only primary factor of production. The countries have identical technologies.

Each country produces two consumption goods, Good X (differentiated products) and Good Y (homogeneous goods). Good Y is sold in a perfectly competitive market, while Good X is sold in a monopolistically competitive market. Good Y is produced under constant returns using only labor; units are chosen such that one unit of labor produces one unit of output. Wage rates are normalized to unity. International trade of Good X incurs "iceberg" transport costs, meaning that for every τ units of Good X shipped from abroad, only one unit arrives. This raises the price to consumers of an imported variety from p^* to τp^*, where p^* is the mill price and $\tau > 1$ is the transport cost factor.

In each country, agents have the following utility function:

$$u = X^{\mu} Y^{1-\mu},\ 0 < \mu < 1, \tag{1}$$

where Y is the consumption of Good Y and X is an aggregator of the consumption of the differentiated products,

$$X = \left[\sum_{i=1}^{n} c_i^{\rho} + \sum_{i=1}^{n^*} (c_i^*)^{\rho} \right]^{1/\rho}, \quad 0 < \rho < 1. \tag{2}$$

Consumption of each variety is given by c_i and $\sigma \equiv 1/(1-\rho) > 1$ is the elasticity of substitution between every pair of Good X varieties.

The price index for Good X (which is dual to the aggregator X) is represented by

$$P_X = \left[\sum_{i=1}^{n} p_i^{\rho/(\rho-1)} + \sum_{i=1}^{n^*} (\tau p_i^*)^{\rho/(\rho-1)}\right]^{(\rho-1)/\rho} \tag{3}$$

Home consumers' demand for a Home product is

$$c = p^{-\sigma}(P_X)^{\sigma-1}\mu L. \tag{4}$$

Similarly, the *derived* demand (i.e. including units lost by iceberg transport costs) for a Foreign product from Home consumers is

$$\tilde{c} = \tau(\tau p^*)^{-\sigma}(P_X)^{\sigma-1}\mu L. \tag{5}$$

The production of a differentiated product involves a constant marginal cost β and α units of labor as a fixed cost. With the total number of products available to consumers being very large, each producer sets its price by applying a constant markup factor on marginal cost

$$p = p^* = \frac{\sigma\beta}{\sigma - 1}. \tag{6}$$

Free entry ensures that profit is zero in the long-run, hence the long-run equilibrium output of each variety, x, is a constant, independent of the level of trade costs:

$$x = \frac{\alpha}{\beta}(\sigma - 1). \tag{7}$$

Before moving to the trade equilibrium, it is important to note the entry-exit process. If in the short-run, the demand for a differentiated product exceeds the long-run equilibrium output x, there are positive profits, which creates an incentive for new firms to enter the industry. Conversely, if the short-run demand is smaller than x, some firms will exit. This entry-exit process plays an important role in determining the degree of the home-market effect.

3 Trade Equilibrium

Turning to the trade equilibrium with positive trade costs, the product market equilibrium requires that supply equal demand for each Home product:

$$x = c + \tilde{c}^* \equiv C \tag{8}$$

By substituting (4) for c, the Foreign counterpart of (5) for $\tilde{c}^*$, into equation (8) and denoting $\phi \equiv \tau^{1-\sigma} < 1$ we obtain the following aggregate demand for a Home product (C) and its Foreign counterpart (C^*):

$$C = \frac{\mu}{p}\left(\frac{L}{n+\phi n^*} + \frac{L^*}{n+(n^*/\phi)}\right), \tag{9}$$

$$C^* = \frac{\mu}{p}\left(\frac{L}{(n/\phi)+n^*} + \frac{L^*}{\phi n+n^*}\right). \tag{10}$$

Figure 1 depicts the relationship between the number of varieties in *each* country, n and n^*, and the level of demand for each variety, C and C^*. Aggregate demands are depicted as the curve CC in panel (a) (i.e., the space n, C), and curve C^*C^* in panel (b) (i.e. the space n^*, C^*), respectively. The long-run equilibrium output level x is represented as the intersection of the horizontal line ZZ with the vertical axis. The initial equilibria are depicted by points E and E^*. Along the curve CC (resp. C^*C^*), we treat n^* (resp. n) as an exogenous variable.

$$\frac{\partial C}{\partial n} = -\frac{\mu}{p}\left[\frac{L}{(n+\phi n^*)^2} + \frac{\phi^2 L^*}{(\phi n+n^*)^2}\right] < 0, \tag{11}$$

$$\frac{\partial C}{\partial n^*} = -\frac{\mu\phi}{p}\left[\frac{L}{(n+\phi n^*)^2} + \frac{L^*}{(\phi n+n^*)^2}\right] < 0. \tag{12}$$

Equation (11) implies that the curve CC is decreasing in n, while (12) indicates that the curve CC is shifted downward when there is an increase in n^*.

Now suppose that an exogenous labor movement from Foreign to Home occurs: in Home, the labor force becomes $L+\Delta L$, while in Foreign, the labor force becomes $L^* - \Delta L$. We can decompose the movement toward the new equilibrium into two steps.

Step 1: Firstly, suppose that in the short run, the number of varieties in each country is fixed: The increase in L, combined with the decrease in L^*, shifts the curve CC is upward (dotted $C'C'$) because $\phi n^* < n^*/\phi$, while the curve C^*C^* is shifted downward (dotted $C^{*\prime}C^{*\prime}$). The new short-run equilibrium is obtained as point E' (resp $E^{*\prime}$). Thus each Home (resp. Foreign) firm experiences an increase (resp. decrease) in demand relative to its long-run output level x. Since the price stays put at $\beta\sigma/(\sigma-1)$ while average fixed cost falls in Home, profit rises for each home firm. Similarly, profit falls for each foreign firm. These changes trigger the entry of new firms in Home, while exits begin to occur in Foreign, which are shown as arrows in each panel. (If exits did not occur in Foreign, the new equilibrium number of Home firm would be indicated by the intersection of the dotted $C'C'$ curve and the line ZZ.) It is important to note that this curve shifting does *not* exhibit the home-market effect: since the initial shift of CC is proportional to the increase in L, it only increases n proportionally.

Step 2: The above entry-exit process gives rise to a second round of curve shifting, and thus a second round of entries and exits. $C'C'$ is shifted further up by a reduction in n^* (to $C''C''$), while $C^{*\prime}C^{*\prime}$ is shifted further down by an increase in n (to $C^{*\prime\prime}C^{*\prime\prime}$). Thus the new long-run equilibrium is obtained as the point E'' (for Home) and $E^{*\prime\prime}$(for Foreign). It is important to note that the second round constitutes the main source of the "home-market effect." Expenditure shifting between countries triggers an entry-exit process in each country, which reinforces the first entry-exit process.

Proposition 1 (Krugman): *If two countries differ only in terms of size, the larger country will end up with a more-than-proportional share of world output of differentiated products.*

Finally, we can point to the "home-market magnification." Freer trade magnifies the degree of relocation that comes from a given shift of population.[3] In other words, industry becomes more footloose, not less footloose, as trade gets freer.

4 Concluding Remarks

We have decomposed the home market effect into two steps: a short-run response to population shift, creating entry-stimulating excess profits (in the short run) for firms of the country that experiences a population gain, and a further round of entries into the monopolistic sector of the expanding country induced by exits in the foreign industry. Our diagrammatic representation illustrates the process in an intuitive way.[4] A similar diagrammatic approach can be used to show how freer trade magnifies the home-market effect.

[3] This is because freeing up trade makes the impact of n^* on C makes bigger. Thus, the same change in L would result in a higher degree of relocation [Baldwin et al. (2003)]. In the case of free trade (i.e., $\phi = 1$), however, this home-market magnification vanishes. We would like to thank an anonymous referee for pointing this out.

[4] Davis (1998) has shown that the home market effect can be reversed if there is a transport costs for the homogeneous good that is larger than for the differentiated goods. Since our diagrammatic representation concentrates on the case of no transportation costs for the homogeneous goods (i.e., factor price equalization between countries), it is difficult to show Davis' case by using this approach.

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Figure 1