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The Impact of Foreign Market Expansion on the Domestic Labor Market in a Footloose Capital Model

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Abstract

This paper analyzes how an expansion of foreign market size affects firms' location decision and employment of the home country in a two-country footloose capital model. Under monopolistic competiton, standard "home market effect" in manufacturing sector induces capital to flow toward the country which has larger factor endowment. As we assume wage rigidity in the domestic labor market, labor demand shrinks and unemployment increases when foreign market becomes larger. We also verify that welfare of the home country declines unambiguously due to the outflow of capital.

JEL classification: F16; F62; R12
Keywords: footloose capital; home market effect; unemployment

1 Introduction

There is growing public concern about some detrimental aspects of international capital movements. As more and more firms close domestic plants and make their foreign affiliates, workers in the home country are conscious of their employment instability. In the context of developed countries, their population growth has slowed down while foreign market, especially giant emerging economies, has increasingly become important business opportunity. What is the impact of growing foreign economy on the locational decision of firms and the outcomes of domestic labor market?

To give an answer from the perspective of economic theory, we present a two-country footloose capital model in which foreign market size can be altered as a shift parameter. To capture the fear for the so-called hollowization phenomenon, capital endowments of each country are assumed to move freely to the location where their owners gain the highest profit. In line with the tradition of new economic geography models, Martin and Rogers (1995) demonstrated

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how the "home market effect" results in the agglomeration of firms to the larger country more than proportionately. For example, if foreign country has twice as large population as the home country, then the foreign market end up with more than twice as many firms as the home. We add to their footloose capital model an element of labor market imperfection in order to investigate the issue of rising domestic unemployment.

More specifically, we adopt the framework presented by Pflüger (2004). In that paper, exogenous wage rigidity is introduces to study how changes in the domestic wage level affect the direction of international capital flow. Here we focus on another aspect of that footloose capital model, namely the implication of asymmetric country size on the capital movement and domestic labor market. Because of increasing returns to scale technology in manufacturing sector, firms have an incentive to locate in the larger market. With this kind of home market effect, foreign market expansion induces capital flow out of the home country and deteriorates the home labor market even though the wage level is held constant. The purpose of this paper is to verify above argument in a formal economic geography model.

There are some studies on the relationship between economic agglomeration and unemployment. Epifani and Gancia (2005) presented a search and matching model to show that the rate of unemployment is lower in the region where workers agglomerate. Francis (2009) obtained similar results in a setting with endogenous job destruction. They are based on the new economic geography model in which workers move freely between two regions, while few studies have investigated the issue of unemployment in a footloose capital model so far[1]. The present paper thus contributes to the literature by focusing on the effect of international capital flow on domestic labor market with explicit agglomeration forces.

The next section describes the structure of the model, and section 3 investigates the impact of foreign market expansion on the capital flow and domestic labor market. Section 4 closes this paper by discussing the limitation of the present analysis and some possible directions for future research.

[1]Many interesting properties of economic geography models with labor mobility are explored by Fujita and Thisse (2013, pp.291–306) in depth.

2 Model

2.1 Environment

We follow the setup of Pflüger (2004). The main difference between that model and the present analysis is that here we introduce another shift parameter which governs the size of foreign country. There are two countries (home and foreign) and three factors, low-skilled labor L, high-skilled labor H, and capital K, all of which are given exogenously. Its foreign counterparts are L^*, H^*, and K^*, respectively[2].

Two types of goods, homogeneous traditional good A and differentiated manufactured good X, are produced in both countries and consumed by each agent. Traditional goods are traded freely across countires, while trading manufactured varieties incurs the iceberg transportation costs. As for the trade pattern, we confine ourselves to the case of imperfect specialization. Both types of labor are not mobile internationally, while capital can be used anywhere in this economy with no impediments between the two countries. As in the standard footloose capital model of Martin and Rogers (1995), capital income earned by domestic owners are repatriated to the home country wherever their capital is used, and vice versa for the foreign capital owners.

Each agent supplys one unit of their production factors inelastically. For example, a low-skilled worker is endowed with one unit of L and does not have any other factors. Their income is thus w_L for low-skilled workers, w_H for high-skilled workers, and R for capital owners, respectively. Low-skilled labor market is perfect while its high-skilled counterpart is assumed to be under some exogenous wage floor which is higher than the (potential) market-clearing wage. We thus focus on the unemployment of high-skilled workers only in this model[3]. Unemployed high-skilled workers receive benefit b which is supported by balanced government budget system. For simplicity, every employed workers pay an equal amount of tax t whose level is endogenously determined in equilibrium[4].

In this static framework, we do not consider any intertemporal decision making of agents

[2] All foreign variables are denoted with asterisks throughout this paper.

[3] The issue of low-skilled unemployment is of course important, although we do not include them in this paper for analytical tractability. Méjean and Patureau (2010) analyze the effect of minimum wage binding only for low-skilled workers in a new economic geography model. However, they abstract from capital flow and high-skilled labor market is assumed to be perfect instead.

[4] We assume that capital owners are not imposed of any tax for a technical reason. If capital owners pay tax, then capital would flow internationally to equalize after-tax return, in which case the possibility of tax competition arises. The issue of strategic tax setting by governments is out of the scope of the present paper.

such as saving and investment in physical and human capital. The main result regarding foreign market expansion is hence dealed with comparative statics.

2.2 Consumption

Agents derive utility from consumption of two types of goods, traditional good C_A and differentiated manufactured good C_X out of their respective income;

$$U = \alpha \ln C_X + C_A,\ \alpha > 0, \tag{1}$$

where C_X is composed of manufactured varieties produced by domestic firms x_i and by foreign firms x_j,

$$C_X = \left(\int_0^N x_i^{\frac{\sigma-1}{\sigma}} di + \int_0^{N^*} x_j^{\frac{\sigma-1}{\sigma}} dj \right)^{\frac{\sigma}{\sigma-1}},\ \sigma > 1. \tag{2}$$

There are N varieties of home manufactured goods and N^* varieties of foreign-made manufactured goods. Note that N and N^* are the key endogenous variables of this model. The budget constraint of an agent with income Y is

$$PC_X + C_A = Y,$$

where the traditional good A is chosen as the numéraire and P is the price index of manufactured goods defined as follows by using prices of each home variety p_i and foreign variety p_j in a standard manner;

$$P \equiv \left[\int_0^N p_i^{-(\sigma-1)} di + \int_0^{N^*} \left(\tau p_j\right)^{-(\sigma-1)} dj \right]^{-\frac{1}{\sigma-1}},\ \tau > 1. \tag{3}$$

Home consumers can import foreign manufactured varieties j, but in order to consume one unit of x_j they have to buy τ units of goods inclusive of the iceberg costs. The price of foreign goods for the home consumers is therefore p_j, the mill price, multiplied by τ. Solving the utility maximization problem, we obtain the following individual demand functions;

$$C_A = Y - \alpha, \tag{4}$$

$$C_X = \frac{\alpha}{P}, \tag{5}$$

$$x_i = \alpha p_i^{-\sigma} P^{\sigma-1}, \tag{6}$$

$$x_j = \alpha \left(\tau p_j\right)^{-\sigma} P^{\sigma-1}. \tag{7}$$

2.3 Production

Traditional good A is produced solely by the low-skilled worker L. We assume a fixed coefficient technology $X_A = L_A$ and perfect competition for this sector to set the wage of low-skilled workers $w_L = 1$.

Production of manufactured varieties i requires all the three factors in this model. We denote l_i and h_i for the employment level of low-skilled and high-skilled workers of each firm i respectively. First, before setting up a plant firms have to incur one unit of capital K as fixed cost whose price is R. Next, firms use l_i and h_i as variable inputs to produce

$$X_i = l_i^{\beta} h_i^{1-\beta}$$

units of manufactured good i. We use the upper case letter X_i to distinguish the firm's supply of manufacturing good from its demand x_i which is represented by the lower case letter. Solving the cost minimization problem, we obtain the following conditional factor demand functions;

$$l_i = \left(\frac{\beta}{1-\beta} w_H\right)^{1-\beta} X_i,$$
$$h_i = \left(\frac{1-\beta}{\beta} \frac{1}{w_H}\right)^{\beta} X_i,$$

where w_H is the wage of a high-skilled worker. By using these optimal choices of variable factor inputs, cost function (net of the fixed capital cost R) for the production of X_i can be derived as follows;

$$C = X_i w_H^{1-\beta} \beta^{-\beta} (1-\beta)^{-(1-\beta)}. \tag{8}$$

We assume w_H are set exogenously for some institutional reason[5]. By this assumption, we can define $c \equiv w_H^{1-\beta} \beta^{-\beta} (1-\beta)^{-(1-\beta)}$ as the (constant) marginal cost of manufacturing production.

A typical firm i sells x_i unit of its manufactured variety to each household in the home country from equation (6), and x_i^* unit to each foreign household[6]. The total number of home households is $L + H + K$, while its foreign counterpart is $L^* + H^* + K^*$. Profit of a home manufacturing firm π_i is then represented as

$$\pi_i = (p_i - c)(L + H + K) x_i + (p_i^* - c)(L^* + H^* + K^*) \tau x_i^* - R. \tag{9}$$

[5]Instead, if the labor market of high-skilled workers is perfect, w_H is determined endogenously to equate labor demand and supply. In such a setting, Takahashi, Takatsuka and Zeng (2013) investigated the relationship between the home and foreign wage in a model without homogeneous good sector.

[6]The demand for home-made goods by foreign households x_i^* can be derived by a similar manner as (6), $x_i^* = \alpha (\tau p_i)^{-\sigma} (P^*)^{\sigma - 1}$, where P^* is the price index for foreign consumers defined accordingly.

Note that home firms set p_i^* in the foreign market and produce physically τx_i^* unit of goods to deliver x_i^* units to the foreign consumers. Under monopolistic competition, firms choose prices p_i and p_i^* to maximize their profit (9). With price elasticity of demand being σ, their optimal pricing is;

$$p_i = p_i^* = \frac{\sigma c}{\sigma - 1}. \tag{10}$$

2.4 Equilibrium

In monopolistically competitive manufacturing sector, profit of each firm (9) is driven down to zero. Inserting the pricing rule (10) and using the market clearing condition for the home-made variety i, which is

$$X_i = (L + H + K)x_i + (L^* + H^* + K^*)\,\tau x_i^*,$$

the zero-profit condition can be transformed to the following relationship between firm's supply X_i and capital rent R,

$$X_i = \frac{R(\sigma - 1)}{c}. \tag{11}$$

Now we are ready to derive the equilibrium conditions of this model. Set the right-hand side of the firm's profit (9) zero again, but insert the demand function (6) and its foreign counterpart x_i^* this time. Also insert the price index (3) and assume that all manufacturing firms are identical symmetric. Define the augumented measures of trade freeness ϕ and ϕ^* as follows[7];

$$\phi \equiv \left[\tau \left(\frac{w_H}{w_H^*}\right)^{1-\beta}\right]^{-(\sigma-1)}, \; \phi^* \equiv \left[\tau \left(\frac{w_H^*}{w_H}\right)^{1-\beta}\right]^{-(\sigma-1)}.$$

Then the zero-profit condition for home firms is

$$R = \frac{\alpha}{\sigma}\left[\frac{L + H + K}{N + \phi^* N^*} + \frac{\phi\,(L^* + H^* + K^*)}{\phi N + N^*}\right]. \tag{12}$$

Similarly, by setting the profit of foreign manufacturing firm j

$$\pi_j^* = \left(p_j^* - c^*\right)(L^* + H^* + K^*)\,x_j^* + (p_j - c^*)(L + H + K)\tau x_j - R^*$$

equal to zero, we obtain the following relationship among the foreign capital rent R^* and the number of home and foreign manufacturing firms;

$$R^* = \frac{\alpha}{\sigma}\left[\frac{L^* + H^* + K^*}{N^* + \phi N} + \frac{\phi^*(L + H + K)}{\phi^* N^* + N}\right]. \tag{13}$$

[7]Note that if the wage of high-skilled workers is the same in home and foreign countries, then ϕ and ϕ^* end up simply the standard measure of trade freeness $\tau^{-(\sigma-1)}$. As the iceberg cost τ becomes smaller, trade freeness ϕ goes up and approaches to 1.

Recall that footloose capital K and K^* flow to the country where their return is higher. This type of arbitrage results in the equalization of capital rent internationally,

$$R = R^*. \tag{14}$$

Finally, the market clearing condition for capital is

$$K + K^* = N + N^*. \tag{15}$$

By combining these equations (12) through (15), we can solve for the number of home and foreign firms, N and N^*. Capital rent R is then calculated by (12), and the scale of each firm X_i followsfrom (11). Finally, Nl_i and Nh_i workers are employed in the manufacturing sector, while the rest of low-skilled workers produce traditional goods and $H - Nh_i$ high-skilled workers are unemployed in equilibrium.

3 Foreign Market Expansion

3.1 Scale parameter

For the rest of this paper, we consider a special case of Pflüger (2004) by assuming that foreign factor endowments are proportionally larger than the home country[8]. Specifically, we set $L^* = sL$, $H^* = sH$, and $K^* = sK$, with some constant scale parameter $s > 1$. Under these assumptions, the equilibrium conditions (12) through (15) lead to the explicit solutions for the key endogenous variables;

$$N = \frac{K\left[1 - \phi^* - s\phi^*(1-\phi)\right]}{(1-\phi)\left(1-\phi^*\right)}, \tag{16}$$

$$N^* = \frac{K\left[s(1-\phi) - \phi(1-\phi^*)\right]}{(1-\phi)\left(1-\phi^*\right)}, \tag{17}$$

$$R = R^* = \frac{\alpha(L+H+K)}{\sigma K}. \tag{18}$$

As long as wages of high-skilled worker w_H and w_H^* are set exogenously, this model has unique equilibrium. Instead, if there is some kind of wage adjustment in the labor market of high-skilled workers, additional conditions on wages, together with above equations, would determine the value of w_H and w_H^* implicitly[9].

[8] Pflüger (2004) did not consider the case of asymmetric country size but investigated the case of different wage setting rules between countries, $w_H \neq w_H^*$. The present analysis thus complements the original paper.

[9] For example, Zierahn (2013) introduced the efficiency wage, while Francis (2009) and vom Berge (2013) investigated the search and matching frictions in economic geography models without capital mobility.

3.2 Comparative statics

To make the argument clearer, we further assume that home and foreign country set the wage of high-skilled workers at the same level, $w_H = w_H^*$ from now on[10]. Under this assumption, $\phi = \phi^* = \tau^{-(\sigma-1)}$ holds and the equilibrium numbers of home and foreign firms (16) and (17) are simplified as follows;

$$N = \frac{K\left(1 - s\tau^{-(\sigma-1)}\right)}{1 - \tau^{-(\sigma-1)}}, \tag{19}$$

$$N^* = \frac{K\left(s - \tau^{-(\sigma-1)}\right)}{1 - \tau^{-(\sigma-1)}}. \tag{20}$$

Note that the return of capital R is not affected by this additional assumption. From equation (19), it is apparent that the number of home firms N is smaller than its capital endowment K as long as the foreign country has larger endowments of production factors, $s > 1$. In other words, $N < K$ means capital flows from the home to the foreign country. Underlying this result is the famous home market effect of economic geography models. Because of decreasing average costs in the manufacturing industry, firms locate more than proportionately in the larger country[11]. Furthermore, it is clear from (19) that as the parameter s becomes larger, more and more firms run out of the home country.

What is the impact of this capital outflow on the labor market? In this model, supply of high-skilled workers is inelastic and denoted with H. Demand for home high-skilled workers is

$$Nh_i = \frac{1 - s\tau^{-(\sigma-1)}}{1 - \tau^{-(\sigma-1)}} \frac{1-\beta}{w_H} \frac{\sigma - 1}{\sigma} \alpha(L + H + K), \tag{21}$$

which is a decreasing function of s and w_H. If the high-skilled labor market is perfect, then w_H would adjust to equate the right-hand side of (21) to the level of labor supply H. In figure 1, we denote this market-clearing wage by w_H^F. However, in this model the wage w_H is exogenously fixed to $\bar{w}_H$ which is above w_H^F. The discrepancy between the labor demand at $\bar{w}_H$ and H means unemployment.

When the foreign country becomes larger, s goes up and the number of home manufacturing firms N decreases accordingly. From (21), demand for home high-skilled workers also

[10] The analysis below thus intends to capture the capital flow between countries with similar labor standards, i.e. the case of north-north trade for example.

[11] Similar result is obtained in a model with perfect labor market by Baldwin et al. (2003, pp.84–86).

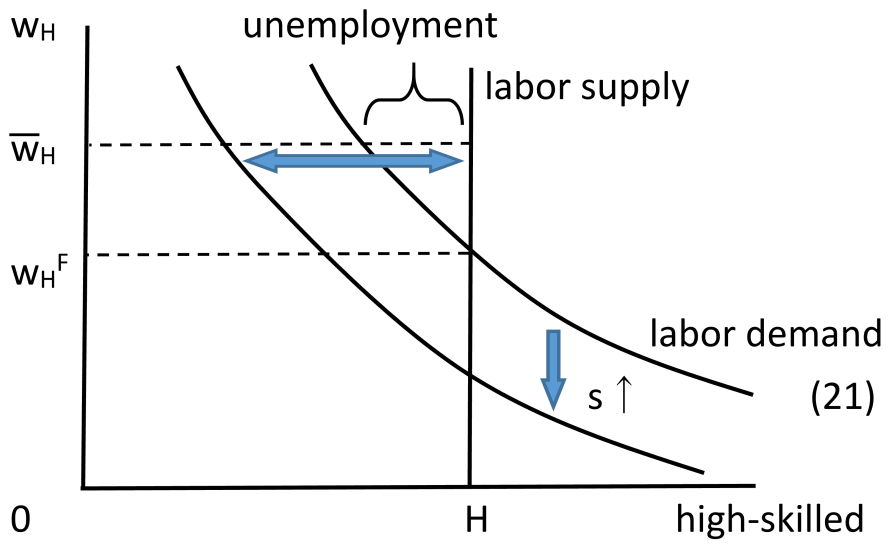

Figure 1: Labor market of high-skilled workers.

declines, raising the number of unemployed persons (see figure 1). We can summarize the result so far in the following proposition.

Proposition 1. *As the foreign market expands (s increases), capital flows from the home to the foreign country (N declines and N^* goes up). At the same time, unemployment of high-skilled workers in the home country increases monotonically.*

3.3 Welfare comparison

To complete the analysis, we compare the welfare of agents in the home country before and after the foreign market expansion. First, we derive the indirect utility function V for the home consumers with income Y by inserting the demand functions (4) and (5) to the utility function (1),

$$V = Y - \alpha \ln P + \alpha(\ln \alpha - 1). \tag{22}$$

Next, recall that government runs unemployment benefit system by levying tax t to every employed workers and paying benefit b to the high-skilled workers who are unemployed. Disposable income of low-skilled workers is hence $1 - t$, while its high-skilled counterpart is

$w_H - t$. The government budget constraint is;

$$(H - Nh_i)b = (L + Nh_i)t. \tag{23}$$

We assume that benefit b is fixed at some constant value[12]. Then the tax t has to be adjusted to meet the constraint (23). Specifically, when the foreign market expands, the number of home firms N declines and thus government has to raise the tax level

$$t = \frac{H - Nh_i}{L + Nh_i} b.$$

The last element which affects the indirect utility (22) is the price index P. Under the assumption of equal wage $w_H = w_H^*$, we can readily show that equilibrium price index of the home country is

$$P = \frac{\sigma c}{\sigma - 1} \left[K \left(1 + \tau^{-(\sigma-1)} \right) \right]^{-\frac{1}{\sigma-1}}. \tag{24}$$

Note that the price index P is independent of foreign market size s. With P held constant, we can therefore compare the welfare of any home agents (22) only by changes in their disposable income Y.

Proposition 2. *As the foreign market expands (s increases), welfare of employed high-skilled and low-skilled workers in the home country declines because the price index P does not change while their tax payment t rises. Welfare of capital owners and unemployed high-skilled workers does not change because their disposable income is held constant.*

4 Discussion

In this paper, we present a two-country footloose capital model to investigate the impact of foreign market expansion on domestic labor market. Based on the framework of Pflüger (2004), we restrict our attention to the unemployment of high-skilled workers. As the foreign factor endowments become larger, capital flows from relatively small home market to the growing foreign market due to the home market effect. The number of home manufacturing firms declines, which in turn undermines demand for domestic high-skilled labor. Due

[12] As we have rigid high-skilled wage w_H in this model, it is natural to fix the level of benefit payment b to maintain constant replacement ratio.

to the wage rigidity, unemployment of high-skilled worker in the home country increases accordingly. To support the unemployment benefit system, tax levied to the employed workers must go up, making their welfare lower than before.

The present analysis leaves a lot to be studied further. Although we have made some theoretical rationalization of the fear for foreign market expansion, the underlying mechanism is rather oversimplified. We have not specified why the wage of high-skilled workers is not adjusted to maintain their employment at all. As Méjean and Patureau (2010) pointed out, rigid wage higher than potential equilibrium has two opposing forces. On the one hand, it means high cost for manufacturing firms in the home country and results in capital outflow. On the other hand, high wage means large consumption demand in the home country which attracts the firms' location. This second possibility or any other side effects are completely omitted in this paper.

The next step is, therefore, to analyze how the wage for high-skilled workers is determined endogenously. One way to do this is to introduce search and matching frictions in the model. Another way is to alter the production structure with maintaining the assumption of perfect labor markets. Such modifications should clarify the robustness of the results we have shown in this paper.

References

[1] Baldwin, Richard, Rikard Forslid, Philippe Martin, Gianmarco Ottaviano, and Frederic Robert-Nicoud (2003), *Economic Geography and Public Policy*, Princeton University Press.

[2] Epifani, Paolo and Gino A. Gancia (2005). "Trade, Migration and Regional Unemployment", *Regional Science and Urban Economics* **35**, 625–644.

[3] Francis, John (2009). "Agglomeration, Job Flows and Unemployment", *Annals of Regional Science* **43**, 181–198.

[4] Fujita, Masahisa and Jaques-François Thisse (2013). *Economics of Agglomeration* 2nd edition, Cambridge University Press.

[5] Martin, Philippe and Carol Ann Rogers (1995). "Industrial Location and Public Infrastructure", *Journal of International Economics* **39**, 335–351.

[6] Méjean, Isabelle and Lise Patureau (2010). "Firms' Location Decisions and Minimum Wages", *Regional Science and Urban Economics* **40**, 45–59.

[7] Pflüger, Michael (2004). "Economic Integration, Wage Policies, and Social Policies", *Oxford Economic Papers* **56**, 135–150.

[8] Takahashi, Toshiaki, Hajime Takatsuka, and Dao-Zhi Zeng (2013). "Spatial Inequality, Globalization, and Footloose Capital", *Economic Theory* **53**, 213–238.

[9] vom Berge, Philipp (2013). "Search Unemployment and New Economic Geography", *Annals of Regional Science* **50**, 731–751.

[10] Zierahn, Ulrich Theodor (2013). "Agglomeration, Congestion, and Regional Unemployment Disparities", *Annals of Regional Science* **51**, 435–457.