The Impact of Trade and Investment Liberalization on Rural Manufacturing

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Abstract

Rural areas in the United States, like in other OECD countries, rely heavily on manufacturing as a source of income. Taking stock of previous studies on the impact of trade and FDI liberalization on manufacturing industries, this study presents a model with heterogeneous firms in the context of a country consisting of an urban and a rural regions. We examine how a manufacturing industry responds differently in the urban and the rural regions when the domestic economy becomes open to trade and investment with a foreign partner.

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1 A Simple Model of Firm Location and International Trade

Any manufacturing firm originating from a country face a choice among an array of possible geographical locations where it can perform its activities. From a naive perspective applying to the context of OECD economies in particular, firms may locate all their activities in predominantly urban regions, or they may opt for a predominantly rural area. If firm can separate geographically some of their activities from the others, they may choose to conduct some non-production activities like administrative, clerical and R&D tasks in a city, while carrying out production activities in a rural region. In the context of an open economy, firms may also decide to relocate some of their activities to a foreign location. The manner in which a firm dispatches its activities across locations, that is, the geographical organization of the firm, is the outcome of a decision aiming at maximizing its profits, by hypothesis, given the technology the firm implements, the prices of factor inputs it can employ in different locations, the costs of delivering its output to markets it must incur, and possibly subject other factors. In what follows, we examine the behavior of firms in partial equilibrium in such a context. The analysis focuses on a single manufacturing industry, the objective being to determine how exogenous parameters generate cross-industry variation in the pattern of firms' geographical organization. The structure of the model developed henceforth draws on the framework proposed by [2]. One can refer to [1] for embedding the single-industry model of [2] in a general equilibrium model

with many industries.

1.1 Physical description of the economy

1.1.1 Countries' and regions' characteristics

Countries and regions The model supposes a world made of two countries, a "developed" or "advanced" country, and a "developing" or "emerging" country. The former is referred to as the home country, and the latter as the foreign country. The spatial distribution of factor endowments, economic activity, and consumption demand is uneven in the home country. An important aspect of the spatial heterogeneity is the urban versus rural disparity. Thus, the home country can be split into two homogeneous regions, an urban region and a rural region.[1] Unlike the home country, the foreign country is assumed to be spatially homogeneous, and thus can be treated a point in space. To summarize, the world is made up of three tiers, or locations: the urban region of the developed country, denoted by u, the rural region of the developed country, denoted by r, and the developing country, denoted by $*$.[2]

[1] Such a partition of the home country may be too simplistic. A more general treatment of the urban-rural aspect of spatial heterogeneity might consist in defining a range of discrete degrees of urbanization, or an urban-rural continuum along a segment.

[2] Henceforth, the term "regional" will be used to characterize phenomena linking the two domestic regions as opposed to those linking the home and foreign countries. To refer to the latter, we will use the term "international".

Factors of production The model supposes two primary factors of production, skilled labor and unskilled labor. Each location is endowed with some quantities of both types of labor input. Quantities of skilled and unskilled labor will be denoted by S and L, respectively.The nominal returns (i.e., the nominal wage rates) to skilled and unskilled labor used in productive activities in location m are denoted by v^m, and w^m, respectively. The two domestic regions and the foreign country exhibit different wage rates. The following assumptions are made regarding wages:

$$v^u = 1 > v^r > v^* \tag{1}$$

$$w^u > w^r > w^* \tag{2}$$

The urban wage of skilled labor is normalized to one. Most importantly, the ranking of the magnitude of relative skilled-labor wages may be different from that of nominal wages.

1.1.2 Technology

The urban region hosts a continuum of firms who know how to produce varieties of a differentiated good i. These firms have a mass normalized to one. Each of these firms produces a single variety of the good. To produce differentiated goods, firms must provide headquarters services, and they must use both types of labor according to a constant returns to scale technology. Headquarters must be located in the urban region, and thus the supply of headquarters services uses labor resources from the urban region. The production of the good may be geographically separated from a firm's headquar-

ters, and a firm may perform productive activities in one or several locations simultaneously. Once production took place, the output may be shipped to different locations from the one where it was produced. Output of variety j is obtained according to the following production function:

$$y_i(j) = \theta(j) g_i \left[S_i(j), L_i(j) \right] \tag{3}$$

where $\theta(j)$ is a multiplicative parameter representing the firm-specific level of productivity. g is an increasing and concave function, and homogeneous of degree one in all inputs.

Let c be the unit-cost function dual to g. Then, the unit-variable-cost function for the firm producing variety j is

$$\frac{c_i\left(v, w\right)}{\theta(j)}$$

where v and w are the wage rates prevailing at the location where production takes place. Since c_i is increasing in input prices, the low-wage foreign country has lower per-unit variable costs in the production of good i.

1.1.3 Fixed costs and transport costs

If a firm makes a direct investment to produce its product in the rural region, then it incurs a fixed cost of f_i units of skilled labor from the urban region. This fixed cost may be seen as the cost of setting up a domestic branch plant, and coordinating productive activities between the headquarters and the plant. In general, this fixed cost is the cost to invest in both tangible and non-tangible assets. Tangible assets may be buildings and equipment;

non-material resources may be based on workforce training and setting up procurement and distribution networks.

Using a structural model of bilateral FDI, [3] estimates the fixed costs of multinational production and find that a doubling of the distance between two countries entails a 56 percent rise in the fixed costs of FDI. Thus, it is reasonable to assume that the fixed costs of investment in the rural region are lower than the fixed costs of FDI in the foreign country. Thus, if a firm chooses instead to produce the good in the foreign country, it incurs a fixed cost of $\kappa_i f_i$ units of skilled labor from the urban region, where $\kappa_i > 1$, and κ_i may depend on the characteristics of the foreign country (i.e., distance to the headquarters).

The costs of transporting output take the form of iceberg transportation costs. A firm must ship $(1 + \tau_i)$ units of the good to deliver one unit in a different region within the home country, τ_i being greater than zero. International shipping requires to send $(1 + \lambda_i \tau_i)$ units of output to deliver one unit to the destination, where $\lambda_i > 1$, and λ_i may depend on the characteristics of the foreign country as well. Thus, interregional shipping is less costly than international shipping.

1.1.4 Demand

Consumers have Dixit-Stiglitz, constant-elasticity-of-substitution preferences for differentiated products. Consequently, the firm producing variety j of

good i faces the following demand function in location m:

$$x_i^m(j) = \rho^{-\rho/(1-\rho)} Y_i^m p_i^m(j)^{-1/(1-\rho)} \tag{4}$$

where $x_i^m(j)$ is the quantity demanded in location m; ρ is a parameter such that $\rho = (\sigma - 1)/\sigma$, where σ is the elasticity of substitution between varieties. It is assumed that $\sigma > 1$ or, equivalently, that $0 < \rho < 1$. When the number of varieties is large enough (which is guaranteed if one makes the assumption of a continuum of varieties), the elasticity of substitution and the elasticity of demand are equal. Y_i^m is a measure of the level of market m's demand for the good produced by industry i; $p_i^m(j)$ is the price charged for variety j of good i in location m.

The level of demand for good i is assumed to be higher in the urban region than in either the rural region or the foreign country.

$$Y_i^u > Y_i^r \quad \text{and} \quad Y_i^u > Y_i^*$$

or, equivalently, μ_i^m being defined as the share of location m's market demand in world demand for good i

$$\mu_i^u > \mu_i^r \quad \text{and} \quad \mu_i^u > \mu_i^* \tag{5}$$

The foreign country is fully described by its wage rate, the cost of international shipping for a given ratio of product value to weight, and its demand level. Each of these parameters may take different values, holding constant the values of the others, and thus several situations are possible. Table 1 presents a typology of foreign trading partners with respect to the wage rate

	High transport cost	Low transport cost
High wage	Japan	Canada
Low wage	China	Mexico

Table 1: Typology of foreign countries

and transport cost, from the pespective of the U.S. The countries retained to illustrate the four types of U.S. trading partners may not have an identical level of expenditure allocated to a good i originating from the U.S.; for instance, Japan and China probably have different demand levels for good i. But it is reasonable to assume that, at least for some traded goods originating from the U.S., all these countries have signicant and comparable demand levels, and thus, that they fit well into the typology showed above for a given level of demand. In this study, I consider a trading partner to the U.S. akin to China: the foreign wage rate is significantly lower than in the U.S., the cost of transportation to and from the U.S. is substantially greater than shipping costs within the U.S., and the foreign market is relatively large (as it is certainly the case for the China and the surrounding Asian countries).

1.1.5 Timing of decisions

To enter the industry and produce any variety, an entrepreneur, or a firm, must first incur a fixed cost of f_e units of skilled labor from the domestic country. This fixed cost may be interpreted as an R&D cost to create a variety, learn a production process, and set up the basic administrative

structure allowing the firm to function. It induces firm-level economies of scale The determination of the firm-specific productivity parameter follows the Hopenhayn-Melitz approach to heterogeneous firms. Upon entry into the industry, each firm randomly draws a productivity level θ from a cumulative distribution $G(\theta)$ with support $\left[0, \overline{\theta}\right]$. After learning θ the entrepreneur decides whether and how to produce the good (i.e., the choice of an integration strategy which consists in choosing where to produce the good), or to exit the market if its productivity is too low. In equilibrium, firms with different productivity levels may make different choices about their integration strategy. Therefore, the model allows for the co-existence of multiple integration strategies in the same industry. Once a firm has determined its optimal integration strategy, it produces the good, ship it if necessary, and deliver it to the market. We do not assume any fixed cost of exporting between regions, or between countries. Thus, there is no sorting between firms serving a domestic regional market only and firms trading between regions or countries. The Hopenhayn-Melitz approach focuses exclusively on steady-state equilibria and ignores discounting of future profits but keeps present values finite by assuming that firms face a constant probability of exit according to a Poisson process with a hazard rate of δ. Unlike that approach, this model is static.

The firms in an industry are subject to identical fixed costs of entry, identical fixed costs of opening regional or foreign affiliate plants, and identical costs of shipping output. They also face symmetric demand for their output. These are key parameters describing an industry. However, firms differ in their

productivity level within an industry.

1.2 Determinants of optimal integration strategies

The problem of the firm regarding its geographical organization is to determine the configuration of production locations that will minimize the cost of serving the markets in which it wants to sell its goods. To determine the conditions under which firms will choose one or another of many possible integration strategies, let us first summarize the fixed and unit-variable costs of production for those various possible integration strategies. To simplify the analysis of firms' choice of integration strategy, the fixed cost of entry is set to zero. Also, we will assume that the demand level in the rural region is zero. While some workers live in that region, they can go to the urban region at no cost to purchase consumption goods. Thus, firms deliver their output only to the urban and foreign markets. For clarity, we drop the subscript for good i in what follows. Strategies are summarized in table 2. The fixed costs reported in the third column are the additional fixed costs incurred by the firm when it operates regional and (or) foreign branch plants. Note that since the rural region does not have a market demand, the integration strategy with plants in u, r and $*$ can be precluded a priori. Furthermore, it may be possible to eliminate some of the strategies from the set of all the integration strategies reported above if they are to be unambiguously less profitable than the others at some levels of transport costs. We will consider different situations regarding the costs of regional and international shipping.

Headquarters	Production	Fixed cost	Unit-variable cost(s)
u	u	0	$c\left(v^u, w^u\right)/\theta(j)$
u	r	f	$c\left(v^r, w^r\right)/\theta(j)$
u	$*$	κf	$c\left(v^*, w^*\right)/\theta(j)$
u	u, r	f	$c\left(v^u, w^u\right)/\theta(j), c\left(v^r, w^r\right)/\theta(j)$
u	$u, *$	κf	$c\left(v^r, w^r\right)/\theta(j), c\left(v^*, w^*\right)/\theta(j)$
u	$r, *$	$(\kappa+1) f$	$c\left(v^r, w^r\right)/\theta(j), c\left(v^*, w^*\right)/\theta(j)$

Table 2: Integration strategies and their costs

Small values of τ First, assume that τ is small enough so that

$$1+\tau<\frac{c\left(v^u, w^u\right)}{c\left(v^r, w^r\right)}$$

Then, three situations may arise depending on how large λ is:

1. λ may be small enough so that

$$1+\lambda\tau<\frac{c\left(v^u, w^u\right)}{c\left(v^*, w^*\right)} \quad \text{and} \quad \frac{1+\lambda\tau}{1+\tau}<\frac{c\left(v^r, w^r\right)}{c\left(v^*, w^*\right)}$$

   In this case, the per-unit variable costs of serving the domestic urban market and the foreign market are minimized by carrying out production in the foreign country. Under these circumstances, a firm will necessarily choose one of the integration strategies featuring production in a single location. Low-productivity firms will locate production in the urban region and export output to the foreign market; firms with intermediate productivity level may locate production facilities in

the rural region, which then becomes an export-platform for the urban and foreign markets; high-productivity firms will conduct production activities in the foreign country, and import output into the urban region. The case of low transport costs is very similar to the situation where there are no transport costs at all. The decision of a firm about the location of its production is essentially the same in both situations, except that in the former it must take into account the relative sizes of the urban and foreign markets.

2. λ may be at some intermediate level such that

$$1 + \lambda\tau < \frac{c\left(v^u, w^u\right)}{c\left(v^*, w^*\right)} \quad \text{and} \quad \frac{c\left(v^r, w^r\right)}{c\left(v^*, w^*\right)} < \frac{1 + \lambda\tau}{1 + \tau}$$

   Both the per-unit variable costs of producing in the rural region and the foreign country, inclusive of transport costs, are lower than the marginal cost of producing in the urban region. However, the rural region has a cost advantage over the foreign country because the extra transport cost required to import foreign output outweighs the cost advantage of the foreign country in production. The cost advantage of the rural region would tend to favor location of production in that place; however, it may be counterbalanced by the advantage conferred by proximity to the foreign market, which tend to favor the location of production in the foreign country.

3. Lastly, λ may be large enough so that

$$\frac{c\left(v^u, w^u\right)}{c\left(v^*, w^*\right)} < 1 + \lambda\tau$$

Again, the rural region has a cost advantage to deliver output to the urban market relative to the urban region and the foreign country (note that the latter condition, with the condition that τ is relatively small, implies that $c(v^r, w^r)/c(v^*, w^*) < (1 + \lambda\tau)/(1 + \tau)$). This cost advantage may induce firms that are sufficiently productive to locate their production activities in the rural region instead of the urban region. Yet, the per-unit variable cost of serving the foreign market is lowest when producing abroad. If the foreign market is large enough, firms with sufficiently high productivity levels will be willing to incur the cost of making a FDI to supply the foreign market at low cost. In this case, if the fixed cost of producing in the rural area is relatively high, it may possible that a firm decides to conduct production activities abroad only, if the savings on that fixed cost offset the extra transport cost of international shipping to the urban region.

Large values of $\boldsymbol{\tau}$ Second, consider values of τ large enough so that

$$\frac{c\left(v^u, w^u\right)}{c\left(v^r, w^r\right)} < 1 + \tau$$

Two relevant situations arise depending on the size of λ.

1. The case where λ is relatively small:

$$1 + \lambda\tau < \frac{c\left(v^u, w^u\right)}{c\left(v^*, w^*\right)}$$

The latter condition plus the fact that τ is relatively small implies that $(1 + \lambda\tau)/(1 + \tau) < c(v^r, w^r)/c(v^*, w^*)$.

2. For sufficiently high levels of λ,

$$\frac{c\left(v^u, w^u\right)}{c\left(v^*, w^*\right)} < 1 + \lambda\tau$$

In both situations, it is no longer the case that the rural region has any cost advantage in delivering the good to the urban market, neither with respect to the urban region, nor the foreign country. Since there is no market in the rural area, production will not take place there under any circumstances. When λ is relatively small, a firm may now choose to locate production facilities either in the urban region if it has low productivity, or in the foreign country if it has high productivity. When λ is sufficiently large, a low-productivity firm will produce at home and export to the foreign market, while a high-productivity firm will engage in FDI to serve the foreign market.

The next step consists in comparing the operating profits that a firm with productivity $\theta(j)$ can achieve within a subset of alternative strategies, based on some assumptions about the size of transport costs, and given prevailing wage differentials across locations and fixed costs. In order to do so, we first need a general expression for the operating profits of the firm. In each market m, $m \in (u, *)$, every firm j faces a demand function for variety j as given by (4), and takes the demand level Y^m as given. Therefore, every firm maximizes profits by imposing a mark-up of price over marginal cost identical in all markets, and such that the price in location m is given by

$$p^m(j) = \frac{1}{\rho}\frac{c^m}{\theta(j)} \tag{6}$$

where $c^m/\theta(j)$ denotes the per-unit variable cost of producing the good *and* delivering it to location m's market. Note that this function is different than $c/\theta(j)$, the unit-cost function dual to $\theta(j)g$, since the former includes the cost due to transportation of the good from where it is produced to the market. Since the value taken by $c^m/\theta(j)$ is likely to vary across markets, so too will prices differ across locations.

The operating profits of a firm producing variety j are expressed as

$$\Pi(j) = \pi^u(j) + \pi^*(j) - F \tag{7}$$

where

$$\pi^u(j) = \left(p^u(j) - \frac{c^u}{\theta(j)}\right) x^u(j) \tag{8}$$

and

$$\pi^*(j) = \left(p^*(j) - \frac{c^*}{\theta(j)}\right) x^*(j) \tag{9}$$

where F is the fixed cost associated with the strategy chosen by the firm. The per-unit variable costs $c^m/\theta(j)$ also depends on the type of integration strategy. By substituting the demand function (4) and the mark-up pricing rule (6) for both the urban and foreign markets into (7), one obtains the maximal value of operating profits for a given integration strategy:

$$\Pi(j) = (1-\rho)\, Y\Theta \left(\frac{\mu^u}{C^u} + \frac{1-\mu^u}{C^*}\right) - F \tag{10}$$

where $\Theta \equiv \theta^{\rho/(1-\rho)}$ is a transformed measure of the firm's productivity, $C^m \equiv (c^m)^{\rho/(1-\rho)}$ is a transformed measure of the per-unit variable cost of supplying market m, and $Y \equiv Y^u + Y^*$ is a measure of world demand.

At this point, it will be convenient to specify a functional form for the production function g. Assume that it takes the form of a Cobb-Douglas technology:

$$g\left[S(j), L(j)\right] = \left[\frac{S(j)}{\alpha}\right]^{\alpha} \left[\frac{L(j)}{1-\alpha}\right]^{1-\alpha} \tag{11}$$

where α is a sector-specific technological parameter such that $0 < \alpha < 1$. Higher values of α correspond to production technologies that make more intensive use of skilled labor. Then, the unit-cost function dual to g is given by

$$c\left(v, w\right) = \alpha^{1-\alpha}(1-\alpha)^{\alpha} v^{\alpha} w^{1-\alpha} \tag{12}$$

The following analysis treats the case in which τ is sufficiently low so that, given cost conditions in the three tiers of the world, it is possible for either the rural region or the foreign country to have a cost advantage, depending on the value of λ. We will consider the situation in which λ is also relatively small. In such a situation, firms will choose to produce in a single location. Thus, consider the operating profits that a firm with productivity $\theta(j)$ can achieve by concentrating productive activities in one of the three tiers of the world. First, in the urban region

$$\Pi^{u} = (1-\rho)\, Y\Theta \frac{\mu^{u} + (1-\mu^{u})/T_{\lambda}}{A\left((v^{u})^{\alpha}(w^{u})^{1-\alpha}\right)^{\rho/(1-\rho)}} \tag{13}$$

Second, in the rural region

$$\Pi^{r} = (1-\rho)\, Y\Theta \frac{\mu^{u}/T + (1-\mu^{u})/T_{\lambda}}{A\left((v^{r})^{\alpha}(w^{r})^{1-\alpha}\right)^{\rho/(1-\rho)}} - f \tag{14}$$

Third, in the foreign country

$$\Pi^* = (1-\rho)\, Y\Theta \frac{\mu^u/T_\lambda + 1 - \mu^u}{A\left((v^*)^\alpha (w^*)^{1-\alpha}\right)^{\rho/(1-\rho)}} - \kappa f \tag{15}$$

where $A \equiv [\alpha^{1-\alpha}(1-\alpha)^\alpha]^{\rho/(1-\rho)}$; $T \equiv (1+\tau)^{\rho/(1-\rho)}$, and $T_\lambda \equiv (1+\lambda\tau)^{\rho/(1-\rho)}$.

Figure 1 depicts the operating profits for the integration strategies that involve production in a single location. The figure illustrates the ambiguity about the possibility that some firms with some intermediate levels of productivity will locate their production operations in the rural region. The solid line labeled by Π^r depicts a case where such firms will exist. The broken line $\Pi^{r'}$ illustrates another case, where such firms do not operate. In the second case, there is no production in the rural region because the extra fixed cost of conducting production abroad is smaller relative to the fixed cost of producing in the rural region, and because the per-unit variable cost of production in the rural region is too high relative to that of foreign production. In that case, low-productivity firms (that is, firms with productivity less than $\Theta(u,*)$) produce in the urban region, while high-productivity firms (with a productivity higher than $\Theta(u,*)$) produce abroad. For rural production to take place, it must be the case that the profit line Π^r intersects the profit line Π^u before it intersects the profit line Π^*. That is, the productivity level $\Theta(u,r)$ must be smaller than the productivity level $\Theta(r,*)$. So, first, let us derive the expressions for $\Theta(u,r)$ and $\Theta(r,*)$ as functions of the other parameters of the model. $\Theta(u,r)$ is defined by

$$\Pi^u\left(\Theta(u,r)\right) = \Pi^r\left(\Theta(u,r)\right) \tag{16}$$

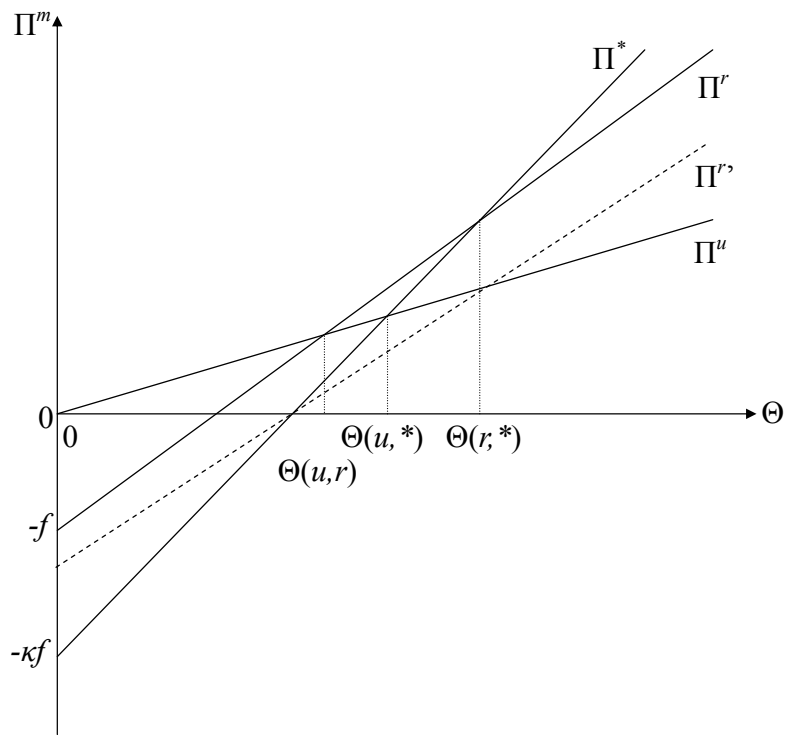

Figure 1: Profitability for different locations of production

Solving for $\Theta(u,r)$ yields

(17)

$$\Theta(u,r) = f\left[\frac{(1-\rho)\,Y}{A}\left(\frac{\mu^u/T + (1-\mu^u)\,/T_\lambda}{\left((v^r)^\alpha\,(w^r)^{1-\alpha}\right)^{\rho/(1-\rho)}} - \frac{\mu^u + (1-\mu^u)\,/T_\lambda}{\left((v^u)^\alpha\,(w^u)^{1-\alpha}\right)^{\rho/(1-\rho)}}\right)\right]^{-1}$$

Similarly, $\Theta(r,*)$ is defined by

$$\Pi^r\left(\Theta(r,*)\right) = \Pi^*\left(\Theta(r,*)\right) \tag{18}$$

Solving for $\Theta(r,*)$ yields

(19)

$$\Theta(r,*) = f\,(\kappa-1)\left[\frac{(1-\rho)\,Y}{A}\left(\frac{\mu^u/T_\lambda + 1 - \mu^u}{\left((v^*)^\alpha\,(w^*)^{1-\alpha}\right)^{\rho/(1-\rho)}} - \frac{\mu^u/T + (1-\mu^u)\,/T_\lambda}{\left((v^r)^\alpha\,(w^r)^{1-\alpha}\right)^{\rho/(1-\rho)}}\right)\right]^{-1}$$

Then, the condition $\Theta(u,r) < \Theta(r,*)$ is satisfied if the following one holds:

$$\begin{aligned}\kappa > \kappa_{min} \equiv & \left(\frac{\mu^u/T_\lambda + 1 - \mu^u}{\left((v^*)^\alpha\,(w^*)^{1-\alpha}\right)^{\rho/(1-\rho)}} - \frac{\mu^u/T + (1-\mu^u)\,/T_\lambda}{\left((v^r)^\alpha\,(w^r)^{1-\alpha}\right)^{\rho/(1-\rho)}}\right) \\ & \cdot\left(\frac{\mu^u/T + (1-\mu^u)\,/T_\lambda}{\left((v^r)^\alpha\,(w^r)^{1-\alpha}\right)^{\rho/(1-\rho)}} - \frac{\mu^u + (1-\mu^u)\,/T_\lambda}{\left((v^u)^\alpha\,(w^u)^{1-\alpha}\right)^{\rho/(1-\rho)}}\right)^{-1} + 1\end{aligned} \tag{20}$$

Thus, κ must be sufficiently large in order for some firms to locate their production facility in the rural region. The expression for the lower bound κ_{min} shows how changes in market shares and wages affect the prevalence of rural manufacturing. The minimal extra cost of FDI that allows for the presence of rural production increases with rural wages, decreases with foreign wages and urban wages, and it increases with the foreign country's market share. Moreover, a reduction in the extra cost of international shipping, λ, *ceteris paribus* increases the lower bound of the FDI's minimum extra cost

allowing for the presence of rural manufacturing. The relative intensity of production in skilled labor is also a determinant of κ_{min} if relative wages are not equalized across locations. Hence, if the relative unskilled-labor wage is lower in the foreign country than in the urban and rural regions, a more unskilled-labor intensive production process will be have a relatively higher κ_{min}, and it will be more likely to be offshored and leave the rural region.

The optimal integration strategies can be depicted as in figure 2 in as function of the parameter κ and the firm-level productivity parameter Θ, for a given fixed cost of direct investment f, relatively low transport costs, and a given share of the foreign country's demand. The boundary between production in the urban region and foreign production is obtained from the equality $\Pi^u = \Pi^*$, which entails

(21)

$$\Theta(u,*) = \kappa f \left[\frac{(1-\rho)\,Y}{A} \left(\frac{\mu^u/T_\lambda + 1 - \mu^u}{\left((v^*)^\alpha (w^*)^{1-\alpha}\right)^{\rho/(1-\rho)}} - \frac{\mu^u + (1-\mu^u)/T_\lambda}{\left((v^u)^\alpha (w^u)^{1-\alpha}\right)^{\rho/(1-\rho)}} \right) \right]^{-1}$$

Recall that the situation depicted in figure 2 applies for low interregional and international shipping costs. For relatively high relative FDI costs and relatively low productivity levels, firms' production operations are located in the urban region despite the higher per-unit variable costs there. At low levels of relative FDI costs, firms produce abroad. For some sufficiently high levels of relative FDI costs and at some intermediate productivity levels, firms may locate production facilities in the rural area. Importantly, when κ is sufficiently low, a rise in productivity induces firms to relocate directly from the urban region to the foreign country. This observation may be reinterpreted in terms

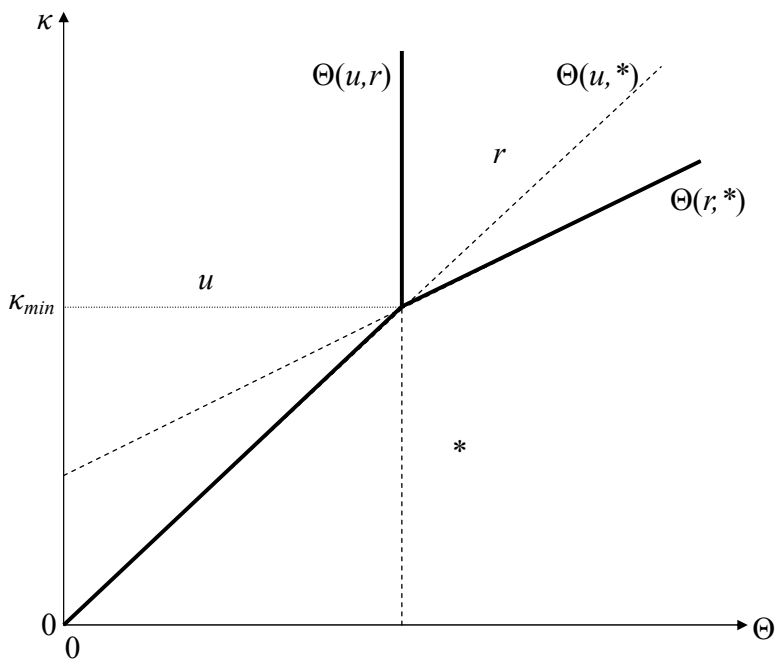

Figure 2: Integration strategies for different productivities and relative fixed costs of FDI

of the product cycle theory. According to the concept of domestic product cycle, entrepreneurs develop new techniques and products in urban centers, and as the production techniques become mature, more standardized, easier to transfer away from the headquarters of the firm, and presumably more productive (Θ increases), production operations are relocated to low-wage regions, usually less densely populated and thus predominantly rural places. Such a concept has been used to explain the early history of industrial development in America, from the late nineteenth century to the late twentieth century. The concept of international product cycle, formalized by [4], suggests that production processes eventually relocate to foreign countries in order to take advantage of lower labor costs than those at home. The late twentieth century has witnessed a rapid growth of offshoring of productive activities to low-wage countries, and, simultaneously, the relative decline of domestic manufacturing, even in rural areas of the U.S. characterized by low-wages. Figure 2 illustrates well how a decline in the cost of FDIs relative to domestic direct investment, that could be brought about by improvements in ICTs for instance, can short-circuit the domestic product cycle and favor the international product cycle, and thus reduce manufacturing activity in rural areas. Furthermore, the rise of consumption demand in developing countries is another factor that can explain the decline of rural manufacturing because of the importance of proximity to markets. Indeed, many empirical studies of multinational firms show that a primary motivation of firms to expand internationally is to get closer to foreign consumers. Of course, there is another side of the story according to which foreign multinational

firms may find it advantageous to locate in rural areas of developed countries to be close to urban centers, where consumption occurs, while still enjoying relatively low labor costs. Thus, while the domestic product cycle may not function well anymore for rural areas, another source of rural manufacturing activities is the inflow of firms from other developed countries seeking a production location closer to large markets. An example is given by Asian auto-manufacturers in North-America, all of which have located their facilities in either rural or small city locations. These firms are in rural areas primarily to improve their market access, and not only because they seek lower labor and land costs. In many cases, another aspect of the importance of proximity to market is the practice of "just-in-time" delivery systems has tended to tighten the links between the suppliers of intermediate inputs and the firm or plant performing the assembly stage.

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