Delocation, home wages and welfare

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Abstract

I present a general equilibrium model of delocation where firms move from the North to the South to benefit from low wages. As suggested by the large empirical litterature, welfare in the North increases when the host country is not technologically too lagged. Moreover, I show that vertical technology transfer to the South plays a major role in enhancing welfare of workers-consumers in the North and in the South. This analysis helps explaining the differences in empirical findings on production delocation.

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1 Introduction

Differences in wages across the Globe, disminishing trade costs and development of communication technologies give the opportunity to entrepreneurs to relocate their activities towards low wages regions. One phenomenon is called delocation, that is, doing abroad what was so far done at home but at a cheaper price. That is, there is a change in the location of the production plant which moves from the high wage North to the low wage South. Part of the production which has moved to the low wages South is hence exported to satisfy northern demand while part of the production which has stayed in the North is still exported to satisfy southern demand. The remaining production is sold in its country of production. According to this definition, we distinguish delocation from Foreign Direct Investment (FDI) and offshoring. Delocation implies that a firm is closed at home to be re-opened abroad, ruling out any pure investment as it can be the case when engaging in FDI. Delocation is also different from offshoring since outsourcing abroad (or offshoring) can be an initial decision, that is, the outsourced production has always been located abroad and has not moved from home to abroad as it is the case when firms delocate. Delocation also implies re-importing part of the production which is not necessarily so when offshoring activities or when engaging in FDI. As a result FDI or offshoring do not systematically imply delocation.

Delocation has been a matter of concern of rich countries for many years and the phenomenon is increasing with more and more firms delocating towards low wages countries (Ebenstein, Harrison, McMillan, and Phillips, 2011). Salient examples mentioned by mainstream media include among others Salomon delocating its production of boots from France to Romania; Molex, the car equipment producer, delocating from France to Slovakia or finally General motors, delocating part of its production from the US to China, Korea and Mexico. Empirical studies of the economic impact of delocation show mixed results. The effects on home wages are, depending on the cases, positive (Desai, Foley, and Hines, 2009; Borga, 2005), negative (Brainard and Riker, 2001; Hanson, Mataloni, and Slaugher, 2003; Hijzen, Gorg, and Hine, 2005)) and sometimes neutral (Falk and Koebel, 2002; Riker and Brainard, 1997).

The purpose of this paper is to provide a new theoretical framework to analyze the wages and welfare effects of delocation. When firms move for cost saving incentives, workers hired in these firms increase labor supply for other jobs in the home country but these workers also have the possibility to consume the low priced goods now produced abroad through delocation. This paper hence models in details how these workers-consumers are affected by delocation. (i) It fully analyzes the various general equilibrium effects of pure delocation on workers-consumers when firms are moving to benefit from low wages; (ii) It uses the technology level of the host country to explain how

differences across destination of delocation and how differences in the short (direct effects: No technology transfer to the host economy) to long run (indirect effects: technology transfer) affect home welfare of the worker-consumer. The analytical framework presented gives an additional rationale so as to explain the mixed results obtained by empirical investigations so far[1] and describes clear mechanisms of delocation on wages and welfare in the North.

I develop a model where firms from the North produce a final good with the resources from the South and the South cannot produce the final good without technology from the North. You can think of any product or service using labor from low wage regions and technology initially not available in those regions such as cars, hi-fi, chemicals and refined products. You can also think of production that needs raw materials present in some location and technology present in other locations. Among others, mobile phones need coltan and technology to be produced, and these two input are not available in the same Region; medication such as malaria fighters need quinine and technology not available in the same country.

I use a standard general equilibrium model of North-South trade to asses the welfare effects of firms relocation where firms move from the North to the South to benefit from low wages. In a Dixit-Stiglitz model of trade with a two stage level of production, I show that when firms relocate from the North to the South, northern labor demand decreases, which yields lower wages in the North. Since the prices of the goods produced by relocated firms are lower, northern consumers consume relatively more of these goods. Moreover, the host technology level affects positively the production capacity and wages in the South which in turn impacts positively demand for final goods and hence wages and prices in the North. Because in this kind of model, wages react more than prices to a variation in the host technology, moving to a lower technology region will result in a drop in northern wages and in a relatively lower drop in northern and southern prices. Hence, welfare of a worker-consumer in the North increases if the region of destination of the delocation is not relatively technologically too lagged. On the other hand, since delocated firms pay higher wages than locals and that southern consumers have access to cheaper goods, the welfare in the South increases.

I then allow for exogenous vertical technology transfer (VTT) [2] to analyze welfare effects in both the North and the South when relocated firms boost technology of their local suppliers because they are situated closer to them. In presence of VTT, southern wages increase, which leads to less incentives to delocate and to a higher southern demand for final goods. These effects boost labor demand in the North and northern wages increase. The evolu-

[1] This new rationale is complementary to other explanations of the effects of delocation on wages such as the period under study, the type of delocation, the exposure to offshoring.

[2] We don't study IPR effects or innovation/imitation incentives. For endogenous technology transfer and IPR questions see Jakobsson and Segerstrom (2013).

tion of prices is ambiguous since wages and technology increase. However, the wage effect dominates and welfare of the worker-consumer increases with technology transfer.

Related litterature

First, we enlarge North-South general equilibrium models of trade to study welfare effects of delocation while existing models (e.g Segerstrom and Dinopoulos, 2007; Gustafsson and Segerstrom, 2011) focus on the effects of trade openess or IP protection on welfare. Second, we contribute to the litterature studying the relationship between Foreign Direct Investment, VTT (i.e. vertical technology transfer) under exclusivity and welfare (Lin and Saggi, 2007). In Lin and Saggi (2007), the model is a partial equilibrium one. Using a general equilibrium framework and relaxing the hypothesis of exclusivity, we contrast the previous findings by shedding light on the potential gains from the North resulting from having access to cheaper goods. Morever, technology transfer is welfare-enhancing for both regions since an increase in the technology of the South affects the capacity of production of the North because the production chain may be multi-regions. Third, we contrast the findings of the outsourcing litterature on welfare (see Keuschnigg and Ribi, 2007). We add technology transfer to upstream suppliers and we characterize the results conditioned by the technology level of the destination of delocated firms. We show that without technology transfer, welfare decreases only when the destination is technologically too lagged, and we also show that VTT is welfare increasing in both regions. In this line, it is also close to the litterature in trade-in-tasks ((Grossman and Rossi-Hansberg, 2006, 2008; Baldwin and Robert-Nicoud, 2010). While they also analyze the effects of relocation on wages, they find ambiguous effects in general.[3] By focusing implicitly on low skilled workers-consumers and hence dropping the traditional distinction between low and high skilled workers and by introducing the technological gap between home and host economies, we are able to clearly predict wages and welfare effects of delocation.

The model is reduced to its highest simplicity to study the price and wages effects on consumers-workers. It does not account for the chosen type of production process (see Antras and Chor (2012); Schwarz and Suedekum (2011)) and omits the traditional discussion on transportation costs (see e.g Eicher and Kang (2005)). Transition from one occupation to another is automatic in a full-employment context and is reflected in the increase in labor supply in alternative jobs. However, the model's results provide a potential explanation regarding the mixed evidence obtained by empirical studies about the effects of delocation. As other authors, Feenstra (2010) suggests that the offshoring destination plays a significant role in the home effects of offshoring. Strauss-Kahn (2003) shows that there is a negative effect

[3]Except for a special positive case in Grossman and Rossi-Hansberg (2006).

on the northern labor market only with relocation towards very low wages regions and Harrison and McMillan (2009) show that affiliate employment in low-income countries substitutes for domestic employment and find that lower host wages are associated to lower labor demand in the home country. Moreover, Ebenstein, Harrison, McMillan, and Phillips (2011) shows that offshoring put downward pressure on wages through reallocation of workers. Rama (2003) finds negative short run effects and positive long run effects of relocation on northern wages. Hence, these studies suggests that the technology level of the destination and the time horizon of the study (Short/long run are of major importance when we analyze the effects of production relocation. This paper formalizes theoretically these ideas. Finally, as pointed out by Ebenstein, Harrison, McMillan, and Phillips (2011), the limit of the empirical studies is that they are not able to characterize the counterfactual of how wages would have evolved in absence of offshoring. The model overcomes this limit.

The rest of the paper is organized as follows: In Section 2, the basis of the general model are presented. I analyze the effects when there is no delocation in Section 3 and do the same when allowing for delocation in Section 4. I then compare both situations in Section 5 before concluding.

2 The Model

We assume there are 2 regions, North and South, respectively denoted N and S. Labor is perfectly mobile within each region but immobile across regions. Its measure in each region is L_r with $r = N, S$. We consider that there is full employment in both regions. The whole economy is made of two sectors. A competitive intermediate good sector and a final good sector where firms in the South compete monopolistically with firms from the North . The intermediate good is taken as the numeraire. It is only produced in the South which is the low technology region. There are N differenciated final goods and each variety needs labor and intermediate goods to be produced. Hence the North can be seen as a high technology region asembling a final good from an intermediate that is produced only in the South.

We consider two types of firms in the final good sector. The northern firm (Type n) that buys the intermediate from the South and asembles it in the North and the delocated firm (Type d) that buys and asembles in the South. Hence, the northern firm uses labor and technology from the North while the delocated firm (infra DLF) uses labor from the South and technology from the North.

2.1 Demand

We consider that all individuals have the same utility function across regions and the utility function is featured by Dixit-Stiglitz preferences

$$U = (\sum_{j=1}^{N} c_j^{\frac{\sigma-1}{\sigma}})^{\frac{\sigma}{\sigma-1}} \qquad j = 1, ..., N \tag{1}$$

Where c_j is the consumption of a variety j and N is the worlwide number of available differenciated varieties. Among these N varieties N_N varieties are produced in the North and N_D varieties are produced in the South by DLFs. The elasticity of substitution between two varieties is measured by σ. Wages in the North are ω_N and in the South wages in the intermediate good sector ($s = I$) are $\omega_{S,I}$ [4] while the DLF ($s = D$) pays wages $\omega_{S,D}$. Hence, individual demand for a final good variety j in Region r and sector s is the solution of:

$$Max_{c_j} U(c_1, ..., c_N) \tag{2}$$

$$s.t. \sum_{j=1}^{N} p_j c_{j,r,s} \leq \omega_{r,s} \tag{3}$$

Where p_j is the price of variety j and $\omega_{r,s}$ is the wage in country r and sector s.[5] Optimal demand for variety j, by a consumer in Region r and sector s is given by:

$$c_{j,r,s} = (\frac{p_j}{P_M})^{-\sigma} \frac{\omega_{r,s}}{P_M} \tag{4}$$

Where P_M is the price index

$$P_M = (\sum_{j=1}^{N} p_j^{1-\sigma})^{\frac{1}{1-\sigma}} \tag{5}$$

and the indirect utility of a consumer in Region r and sector s is given by

$$V_{r,s} = \frac{\omega_{r,s}}{P_M} \tag{6}$$

2.2 Production

2.2.1 Final good production

Each symmetric variety j of the final good is produced with a Cobb-Douglas production function. Each firm uses technology of its type, labor from its

[4] To simplify the notation we use ω_S in place of $\omega_{S,I}$.

[5] Note that in Region N, there is only one sector. Hence we omit the subindex s. Note also that we allow the DLF to pay higher wages than its suppliers ($\omega_{S,d} > \omega_{S,f}$).

Region $L_{r,j}$ and an intermediate good X_j. Hence, a Northern firm ($j = n$) has the following production function

$$y_n = A_N L_{N,n}^{\alpha} X_n^{1-\alpha} \tag{7}$$

while the production function of the delocated firm ($j = d$) is given by

$$y_d = A_D L_{S,d}^{\alpha} X_d^{1-\alpha} \tag{8}$$

Where α is the labor share and A_D the total factor productivity of the DLF. We assume that the productivity of DLFs is lower than the productivity of Northern firms (i.e. $A_D < A_N$) as suggested by the large literature on technology transfer from home to host country (e.g. Acemoglu and Zilbotti (1999)).

2.2.2 Intermediate good production

The production of each intermediate good requires L units of labor for each unit of the intermediate. Hence the production function is given by

$$X(L_S) = A_S L_{S,I} \tag{9}$$

Where A_S is total factor productivity in Region S (with $A_S < A_D$) and $L_{S,I}$ is the total amount of labor hired in the intermediate good sector.

3 No Delocation

We begin by analyzing the case in which there is no delocation, that is when the production of the final good comes only from the North. Then, we study the case in which we allow for delocation and finally, we compare both situations.

3.1 Final good production

We consider N producers of the final good in the North. Each minimizing its costs to maximize profit

$$min_{L_{N,j},X_j} \;\; \omega_N L_{N,j} + X_j \;\; s.t. \;\; y_j = A_N L_{N,j}^{\alpha} X_j^{1-\alpha} \quad j = 1, ..., N \tag{10}$$

Which gives conditional input demand for each firm j

$$L_{N,j} = \frac{1}{A_N}(\frac{1-\alpha}{\alpha})^{\alpha-1}\omega_N^{\alpha-1} y_j \tag{11}$$

$$X_j = \frac{1}{A_N}(\frac{1-\alpha}{\alpha})^{\alpha}\omega_N^{\alpha} y_j \tag{12}$$

Since each firm produces a symmetric variety subject to homothetic cost function, the price of each variety, p_j, is

$$p_j = \frac{\sigma}{\sigma - 1} a_j \tag{13}$$

where unit cost $a_j = \frac{1}{A_N}(1-\alpha)^{\alpha-1}\alpha^{-\alpha}\omega_N^{\alpha}$. From zero profit condition in the final good sector

$$\pi_j = (p_j - a_j)y_j - H\omega_N = 0 \tag{14}$$

Where fixed cost is the same across firms and has the form of H workers hired at wage ω_N, we derive the quantity of output for each variety

$$y_j = \frac{H\omega_N}{a_j}(\sigma - 1) \tag{15}$$

which is a traditional ratio of fixed on marginal costs.
Equilibrium in the final good market ($c_j = y_j$) gives the equilibrium number of firms in the North

$$N = \frac{E}{\sigma H \omega_N} \tag{16}$$

which depends positively on world income E and negatively on the fixed cost. Hence, a higher fixed cost lowers the number of firms and increases production by firm.

3.2 Intermediate good production

Each firm in the South produces the intermediate good and faces perfect competition. Demand for intermediate comes from final good producers in the North. Combining (12) and (15) gives the firm intermediate demand

$$\sum_j X_j = X^* = NH\omega_N(1-\alpha)(\sigma - 1) \tag{17}$$

Its profit is thus given by

$$\pi_S = X - \omega_S L_{S,I} \tag{18}$$

and free entry induces competitive wages

$$\omega_S = A_S \tag{19}$$

which is also GDP per capita in the South. Note that the wage bill or total GDP is given by $X = \omega_S L_{S,I} = NH\omega_N(1-\alpha)(\sigma - 1)$.

3.3 Equilibrium

Since the level of prices (P_M) is already computed, we look a (i) the number of firms or varieties in the final good sector and at (ii) wages in both Region. (i) Note that combining (11), (15) and the fixed labor cost requirement yields the labor input per firm

$$L_{N,j} = H(\alpha(\sigma - 1) + 1) \tag{20}$$

combining this with full employment condition $L_N = \sum_{j=1}^{N}(L_{N,j} + H)$ yields the number of firms in the North

$$N = \frac{L_N}{H(\alpha(\sigma - 1) + 1)} \tag{21}$$

Which is the population in the North divided by the number of workers per firm. It depends negatively on (i) the labor share, (ii) the fixed costs and (iii) the elasticity of substitution. Since the love for variety is inversely reflected in the elasticity of substitution, the number of firms depends positively on the love for variety.
(ii) Wages in the South are competitive

$$\omega_{S,I} = A_S \tag{22}$$

while in the North, combining (17) and (21) gives wages in the North

$$\omega_N = A_S \frac{L_{S,I}}{L_N} \frac{(\alpha(\sigma - 1) + 1)}{(1 - \alpha)(\sigma - 1)} \tag{23}$$

Wages in the North are expressed in terms of the intermediate good, the numeraire, and can hence be easily transformed into relative wage.[6] However, given our considerations and for the sake of clarity in the following sections we keep this exposition method. We see that wages in the North (i) depend positively on the level of production in the South. A higher level of production in the South means more demand for the final good, higher labor demand in the North and higher wages in the North, (ii) are increasing in the final good love for variety. A higher love for variety increases the number of firms. At given output by firm, there are more spendings in fixed labor cost and labor demand increases, (iii) is increasing in the labor share of the final good production function since a higher labor share increases labor demand and (iv) does not depend on northern technology since the higher labor demand coming from a higher output production is perfectly offset by the lower labor demand per unit of output coming from a higher technology. Note that the wage bill or GDP in the North is $E_N = A_S L_{S,I} \frac{(\alpha(\sigma-1)+1)}{(1-\alpha)(\sigma-1)}$, and in the

[6] In these settings, any change in population size, labor share, elasticity of substitution is capitalized into wages in the North.

South $E_S = A_S L_{S,I}$. Hence, whatever the level of σ, when $\alpha \geq 0.5$, that is when the labor share is not too low, the northern region has a higher GDP than the southern region. Moreover, wages in the North are higher than wages in the South for $\frac{L_S}{L_N} > \frac{(1-\alpha)(\sigma-1)}{\alpha(\sigma-1)+1}$, that is the northern population is not too large with respect to the southern population, what we assume from now on. Since the production of the final good requires the intermediate good produced in the South, labor demand in the North depends on labor supply in the South. Labor demand in the North is hence higher when there are more intermediate goods to be transformed into final goods. That is, when L_S is sufficiently high.

4 Delocation

The equilibrium wages in each region just derived supra implies that northern firms have an incentive to move their production plant from the North to the South to benefit from lower wages. On the other hand, DLFs are less productive than northern firms ($A_D < A_N$) which lowers the incentive to delocate. However, since the choice of one single firm affects the overall incentives to delocate, only a part of the firms delocates at equilibrium.
In this model, since each firm was already selling in both regions, there is no market penetration incentive for firms.[7] We can thus study the effect of firms moving only for lower wages advantage.

4.1 Final good production

We now have two types of firms in the final good sector. The delocated firm (type d) and the northern firm (type n). DLF minimizes costs to maximize profit

$$min_{L_d,X_d} \;\; \omega_D L_d + X_d \;\; s.t. \;\; y_d = A_D L_d^{\alpha} X_d^{1-\alpha} \tag{24}$$

Which gives conditional input demand

$$L_d = \frac{1}{A_D}(\frac{1-\alpha}{\alpha})^{\alpha-1}\omega_D^{\alpha-1} y_d \tag{25}$$

[7] We set no transportation cost. We hence avoid any market size effect. Adding transportation costs would mean, on the one hand, that a northern firm would pay transportation costs when importing the intermediate to the North and also when exporting the final good to te South. On the other hand, a delocated firm would face transportation costs only when exporting the final good to northern consumers. Indeed, since this firm is now located in the South, it does not import anymore the intermediate good produced in the South. As a result, adding transportation costs could limit (resp. favour) the incentives to delocate if the cost of exporting the final good to all northern consumers is higher (resp. lower) than the imports and exports costs for intermediate goods and southern consumers. The results of the model would only change in terms of magnitude with higher or lower delocation depending on the structure of transportation costs but the highlighted mechanisms would stay the same.

$$X_d = \frac{1}{A_D}(\frac{1-\alpha}{\alpha})^{\alpha}\omega_D^{\alpha}y_d \tag{26}$$

Since we consider firms' price setting under Dixit-Stiglitz preferences in the case of monopolistic competition, optimal price is a constant mark up over marginal costs and does not depend on other firms decisions. Hence, price, profit and optimal quantities of the DLF are given by:

$$p_d = \frac{\sigma}{\sigma - 1}a_d \tag{27}$$

$$\pi_d = (p_d - a_d)y_d - M\omega_D \tag{28}$$

$$y_d = \frac{M\omega_D}{a_d}(\sigma - 1) \tag{29}$$

Where a_d is the marginal cost equal to $\frac{1}{A_D}(1-\alpha)^{\alpha-1}\alpha^{-\alpha}\omega_D^{\alpha}$. M is the fixed cost faced by the DLF wich is hiring M workers from the South. We allow fixed costs in the South and in the North to be different since it can take more time to settle a business in one region or another, or infrastructure costs may also differ etc.
Price and quantities of each northern firm take the same general expression as in the previous section (resp. (13) and (15)) but wages in the North may have changed. We denote the total number of firms or varieties by N. Where there are N_N northern firms and N_D delocated firms and $N = N_N + N_D$.
Equilibrium in the final good market requires $c_d = y_d$, from (29) and world demand derived from (4) we find the link between the number of northern and DLF firms

$$N_D = \frac{E}{\sigma M\omega_D} - N_N[\frac{A_N}{A_D}(\frac{\omega_D}{\omega_N})^{\alpha}]^{\sigma-1} \tag{30}$$

This suggests that the equilibrium number of DLFs depends (i) positively on World GDP, (ii) negatively on the fixed cost and the wage level of the DLF, (iii) negatively on the number of northern firms and (iv) negatively on the cost advantage of the northern firm on the DLF respresented by the term between brakets.

4.2 Intermediate good production

Demand of intermediate comes from DLFs and northern firms. Each DLF demand is given by

$$X_d = M\omega_D(1-\alpha)(\sigma - 1) \tag{31}$$

and each northern firm demand is

$$X_n = H\omega_N(1-\alpha)(\sigma - 1) \tag{32}$$

Which makes total demand ($X = N_N X_i + N_D X_d$)

$$X = (H\omega_N N_N + M\omega_D N_D)(1-\alpha)(\sigma - 1) \tag{33}$$

and free entry induces competitive wages $\omega_S = A_S$.

4.3 Labor market

In the South, there is full employment but the market is dual. Workers in the intermediate good sector are paid the competitive wage while the DLF fixes efficiency wages à la Shapiro and Stiglitz (1985). That is, they attract workers and avoid shirking. This is in line with the literature in which Multinationals pay higher wages than locals.[8] Hence, the DLF fixes its wages on the wages in the intermediate sector. Under these settings, Shapiro and Stiglitz (1985) showed that the firm pays a constant premium over the competitive wages. We denote it c and we have $\omega_D = \omega_{S,I} + c$. We hence have an excess labor supply for the DLFs and applicants who are not hired work in the intermediate good sector at the competitve wage. We denote by $L_{S,D}$ the total number of workers employed by DLFs and by $L_{S,I}$ the total number of workers in the intermediate good sector. Full employment condition ensures $L_S = L_{S,I} + L_{S,D}$. Given this, after delocation, the wage bill in the South increases since there is full employment and the only possible movement of labor takes place from the intermediate good sector to the final good sector that pays higher wages.

In the North, since firms are moving from the North to the South, we expect relocation of firms to lower labor demand and wages in the North. Moreover, a lower intermediate production from the South (since some southern workers work now for the DLF) makes less intermediate available what lowers total output in the North. This lowers again labor demand and wages. Conversely, higher wages in the South should boost final good demand, what increases labor demand and wages in the North. Hence, these effects on wages in the North go the opposite way. This makes the net effect ambiguous.

4.4 Existence and uniqueness of the equilibrium

Variables of major importance here are (i) wages in the North ω_N which is also GDP per capita since there is full employment and free entry conditions greeding zero profit, (ii) the number of firms in the North N_N, to analyse whether firm delocation affects the mass and structure of the home country economy and (iii) the number of southern workers in DLFs $L_{S,D}$, which will give the number of workers in the South that benefit from higher wages paid by the DLFs.

Combining (11) and (15) gives the number of firms in the North: $N_N =$

[8] See for example Aitken, Harrison, and Lipsey (1997) and Brown, Deardorff, and Stern (2003)

$\frac{L_N}{(\alpha(\sigma-1)+1)H}$ which depends only on fixed parameters. Similarily the number of workers $L_{S,D}$ is proportional to the number of DLFs, $L_{S,D} = N_D(\alpha(\sigma - 1)+1)M$. Hence, we focus here on 2 equations that describe the relationship existing between wages in the North and the number of DLFs. Since all other variables are proportional to these variables, these equations describe the equilibrium.

Rewriting zero profit condition in the intermediate sector combining $L_{S,D} = N_D(\alpha(\sigma-1)+1)M$ with (33) and the full employment condition in the South yields what we now call the Intermediate sector equation

$$N_D = Max[\frac{\omega_{S,I}L_S - H\omega_N N_N(1-\alpha)(\sigma-1)}{M\omega_D(1-\alpha)(\sigma-1) + M\omega_{S,I}(\alpha(\sigma-1)+1)}; 0] \tag{34}$$

and rewriting the final good market equilibrium using $L_{S,D} = N_D(\alpha(\sigma - 1) + 1)M$ yields what we now call the final good market equation

$$N_D = Max[\frac{\omega_N L_N + \omega_{S,I}L_S - \sigma M\omega_D N_N[\frac{A_N}{A_D}(\frac{\omega_D}{\omega_N})^\alpha]^{\sigma-1}}{M\omega_D(1-\alpha)(\sigma-1) + M\omega_{S,I}(\alpha(\sigma-1)+1)}; 0] \tag{35}$$

Intermediate sector equation (34) is decreasing in the northern wage ω_N and its horizontal intercept is $\omega_N = A_S\frac{L_S}{L_N}\frac{\alpha(\sigma-1)+1}{(1-\alpha)(\sigma-1)} > 0$. Since final good market equation (35) is increasing in the northern wage ω_N, a sufficient condition that ensures the existence and uniqueness of the equilibrium with a positive number of DLF is for the Market equilibrium condition evaluated at $\omega_N = A_S\frac{L_S}{L_N}\frac{\alpha(\sigma-1)+1}{(1-\alpha)(\sigma-1)}$ to be positive. Market equilibrium is positive if

$$\omega_N L_N + \omega_{S,I}L_S \geq \sigma M\omega_D N_N[\frac{A_N}{A_D}(\frac{\omega_D}{\omega_N})^\alpha]^{\sigma-1} \tag{36}$$

which is the sufficient condition for the existence and uniqueness of the equilibrium.[9] When the world demand in the no delocation case, LHS of inequality (36), is larger, there is more room for final good firms. Moreover, firms coexist if the DLF has costs which are sufficiently low and if firms do not differ to much in terms of costs, RHS of inequality (36). In other words, we have coexistence of both types of firms when (i) world demand is sufficiently high, (ii) costs are sufficiently low and (iii) when costs differences between DLF and northern firms are not too high.

Hence solving (34) and (35) yields the equilibrium northern wages and the number of DLFs, respectively

$$\omega_N = (c + A_S)[\frac{M}{H}(\frac{A_N}{A_D})^{\sigma-1}]^{\frac{1}{\alpha(\sigma-1)+1}} \tag{37}$$

$$N_D = \frac{A_S L_S - (c + A_S)[\frac{M}{H}(\frac{A_N}{A_D})^{\sigma-1}]^{\frac{1}{\alpha(\sigma-1)+1}}\frac{(1-\alpha)(\sigma-1)}{\alpha(\sigma-1)+1}L_N}{M(A_S+c)(1-\alpha)(\sigma-1) + MA_S(\alpha(\sigma-1)+1)} \tag{38}$$

[9] Where ω_N, $\omega_{S,I}$ are described by equations (23)and (22), and $N_N = \frac{L_N}{(\alpha(\sigma-1)+1)H}$ and $\omega_D = A_S + c$.

5 Direct effects of Delocation

In this section I assess the effects of delocation on the North. Beginning with wages, I then move to purchasing power and welfare effects of delocation.

Proposition 1: When firms relocate from the North to the South, wages in the North unambiguously decrease.

Proof: See App A

Wages in the North unambiguously decrease when firms move to the South. In the intermediate sector equation (34), when a firm moves to the South, demand for intermediate goods from the North decreases, which yields to less output produced by the northern firms and a decrease in wages. Conversely, in the final good market equation (35), when firms move to the South they hire labor from the South and since they pay higher wages, South becomes richer and demand for final goods increases which tends to boost labor demand in the North. However, the former effect dominates the latter and wages in the North unambiguously decrease. When wages in the North are lower than their equilibrium value, the cost advantage of a DLF over a northern firm is low and DLFs have an incentive to relocate their plant in the North. This increases labor demand in the North and so do wages.

Proposition 2: For the sufficient conditions c and x[10] not too high and σ not too low, when firms relocate from the North to the South, welfare in the North (i) is increasing in the southern technology (ii) increases when the technology gap G is not too high, i.e when $G > \underline{G}$.

Proof: See App B

From proposition (1), wages in the North decrease when firms relocate to the South. In terms of prices, since (i) delocation decreases northern wages and (ii) wages in the South are lower than in the North, then the unit cost of producing the final good drops. Moreover, there are more varieties available. These effects go in the same way and the price index unambiguously decreases.
Since wages and prices in the North decrease, the effect of delocation on northern welfare of workers-consumers is not straightforward. Let denote R_u, the ratio of utilities in the North prior and post delocation

$$R_u = \frac{\frac{\omega_{N,D}}{\omega_N}}{\frac{P_{M,D}}{P_M}} \tag{39}$$

[10] x is the cost advantage of the northern firm $[\frac{M}{H}(\frac{A_N}{A_D})^{\sigma-1}]^{\frac{1}{\alpha(\sigma-1)+1}}$.

Where the subscript D describes the situation with delocation. This ratio can also be interpreted as the variation in purchasing power. It is increasing in southern technology A_S (See App B). Consider the level of southern technology $\underline{A_S}$ such that utility does not change after delocation, i.e. $R_u = 1$. This mean that even if wages unconditionnaly drop following delocation, utility or purchasing power increase if delocation occurs in a country where technology is not too lagged that is where $A_S > \underline{A_S}$. In other words, welfare in the North increases when the technology gap G between North and South is not too high, i.e. when $G < \underline{G}$[11]. In figure 1, purchasing power or welfare in the North is plotted as a function of the level of southern technology. Two effects are at work. On the one hand, the access to cheaper goods and a higher number of varieties under delocation increase utility and redirect expenses toward low prices goods produced in the South. On the other hand, delocation decreases northern wages. In other words, consumers are better off and workers are worse off. When firms delocate to very low wages regions, the latter effect dominates the former. That is, the decrease in prices and the additional number of varieties do not compensate the decrease in wages. Conversely when firms move to relatively higher wages regions the decrease in northern wages is more than compensated by the decrease in prices and the larger number of varieties. The intuition is the following. After a decrease in wages, prices drop but they drop less than wages. Hence, when a firm moves to a relatively lower wages region (i) wages in the North drop relatively more (ii) prices in the North and in the South drop less than the decrease in wages. These effects lower the purchasing power of workers-consumers in the North when firms relocate to relatively lower wages regions.[12]

This analysis supports the skeptical view that delocation reduces the wages in the North and hence hurts workers but it also shows that following delocation, consumers have access to more varieties and to low prices goods. This may increase welfare of workers-consumers in the North. Moreover, when firms delocate to lower wages regions, the welfare effect is relatively more detrimental to the home economy. This result is in line with lots of empirical studies (Strauss-Kahn (2003), Rama (2003), Feenstra (2010)).

We have analyzed the direct effects of delocation. Nevertheless, once delocation has occured, it may have various indirect effects on the host economy.

[11] where the technology gap $\underline{G}$ is given by $A_N - \underline{A_S}$ and $G = A_N - A_S$.

[12] Note that the love for variety is not determinant for the results. It plays a limited role since consumers already benefit from trade when there is no delocation possibility. These results hence do not depend on the CES form of the utility function. The gain in utility would be still valid but in a lower extend with a CES augmented or a quadratic utility function. With the former, if love for variety is null, utility gains come only from lower prices which would reduce the number of delocated firms at the equilibrium w.r.t the CES. With the latter, consumers would spread more equally their consumptions between varieties leading to less delocation. As a result, the same mechanisms would occur with these other preferences - but their magnitude would be lower - and we would still have utility gains stemming from consuming lower priced goods.

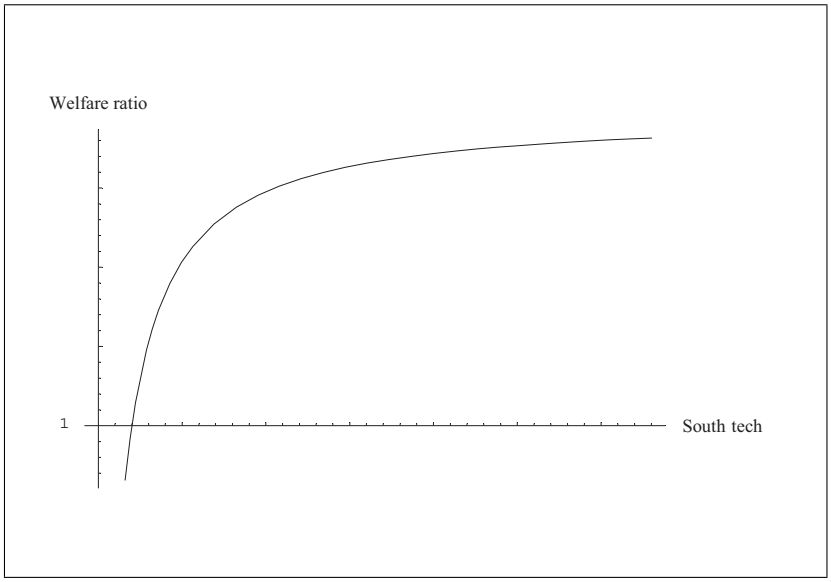


Figure 1: Welfare ratio and southern technology

Among others, there could be a technology transfer from the DLF to its local suppliers. We analyze this indirect effect in the next section.

6 Indirect effects of Delocation

As emphasized previously, the domestic effects of delocation are expected to be different depending on the destination of DLF. Moreover, indirect effects of delocation such as technology transfer to upstream suppliers may also affect the effects of delocation. In other words, when firms delocates, they affect their new environment and these changes lead to indirect effects. This section studies the effects of a technolgy transfer from the DLF to its local suppliers. We model it as an exogenous increase in the southern technology A_S (As in Lin and Saggi (2005)). That is, we study how markets, delocated firms, wages and welfare adjust when firms start transfering technology when they have already delocated.

Proposition 3: When delocated firms start transfering technology to the South, wages in the North unambiguously increase.

Proof: See App C

This effect is illustrated in figure 2. On the one hand, the effect of a better southern technology on the Intermediate sector equation (34) results

in a higher horizontal intercept. That is, when there is no delocation, there are more intermediate goods produced which increases labor demand and wages in the North. The effect on the vertical intercept is similar. For any value of the northern wage, there is room for more delocation since there are more intermediate goods produced. Finally, the slope is flatter since when a DLF leaves the South, the increase in intermediate goods demand is higher than prior to delocation because of the technology transfer. Hence, for given wages in the North, there is room for more delocation. This supposes that once the transfer has taken place, the technology stays, even if the DLF moves back to the North. On the other hand, the final good market equation (35) moves downwards and is flatter as A_S increases. That is, firms have less incentives to delocate since wages in the South are higher. Hence, the increase in the southern technology following a transfer has a positive impact on northern wages. Moreover, the number of DLFs increases since the effect of a higher capacity of production in the intermediate sector which yields to more place for delocation always dominates the effect of a lower incentive to delocate. The increase in the number of DLFs hence induces a higher overall number of workers for DLFs. So, under vertical technology transfer (VTT) the South is richer, demand for final good increases which in turn boosts labor demand and wages in the North and final good demand in the South. Hence, VTT leads to higher wages in both the North and the South and to more varieties.

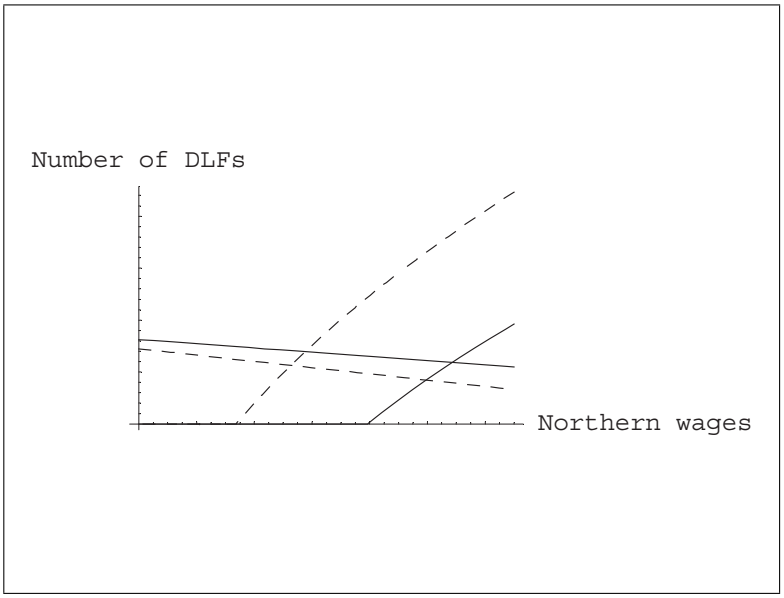
Hence, compared to the situation in which there is no delocation, when firms move from the North to the South and transfer technology to their suppliers, wages in the South are unambiguously higher and if the transfer is large enough wages in the North increase. We now move to welfare effects of the transfer.

Proposition 4: When delocated firms start transfering technology to the South, welfare in the North unambiguously increases.

Proof: See App E

In terms of prices, when DLFs start transfering their technologies to the South, from proposition (4) both wages in the North and in the South increase, this results in an increase in the price of the varieties sold in the two regions. At the same time, the number of varieties increases. Hence, the effect of the transfer on the price index is unsigned. Therefore, the effect of a technology transfer on welfare is not straightforward since wages increase and the sign of the variation in the price index is ambiguous. However, the positive wages effect always dominates and welfare in the North increases with the transfer as depicted in Figure 3.

Hence, from the previous propositions, we can describe the effects of delocation when it involves technology transfer. When firms move to the South,



- - - No Transfer — Transfer

Figure 2: Effect of a technology transfer

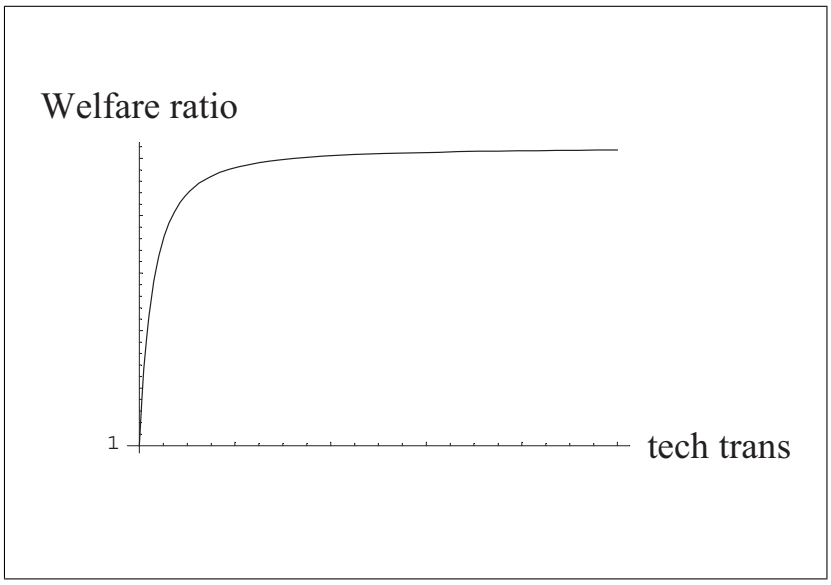


Figure 3: Welfare effect of a technology transfer

wages in the North and prices drop. When the DLF starts transfering its technology, it increases productivity and wages in the South. This induces a higher demand for final goods by southern consumers which leads to an increase in wages in the North while the price index is still dependent on the lower unit cost of production in the South. There are two effects at work (i) delocation decreases prices and northern wages and (ii) technology transfer increases southern productivity and southern demand for final goods. As a result, if northern wages increase only for a sufficient technology transfer, welfare in the North increases if the host country has a sufficient initial level of technology or if it acquires a higher technology through the transfer. Note also that the higher the transfer, the higher the relative welfare gain. Hence, moving to a lower wages region and transfering more technology will lead to a relatively higher increase in welfare in the North. Moreover, northern consumers consume more final good produced from the South relative to those produced in the North since their price is lower. This increases their consumption and they consume more varities which increases welfare. When the transfer is larger, the ratio of northern to southern prices decreases and consumers spread more equally their consumption over the goods. That is, they consume relatively more northern goods.
Hence, contrarily to the skeptical view on delocation, this analysis shows that delocation to low wages regions may increase wages and purchasing power and welfare in the North.

7 Conclusion

The model presented in this paper contrast the general skepticism on delocation of northern activities to the South. When there is no vertical technology transfer from the North to the South, northern wages unambiguously decrease. Indeed when firms move to the South, demand for northern goods shrinks because prices of southern goods are lower. This lowers wages in the North. Still, welfare in the North may increase when consumers redirect their expenses toward cheaper goods available from the South after delocation occured.
When transfer occurs, I have shown that northern wages, purchase power and welfare may increase. The mechanism is quite simple. A delocated firm transfers technology to its suppliers what increases wages in the southern economy and boosts southern demand for final goods, including northern ones. This increase in demand as a positive impact on northern wages. Moreover, since southern goods are still cheaper the purchase power increases. So does welfare. But with transfer, consumers spread more equally their consumption across northern and southern goods.
This enlarges the classical view that the level of technology and the absorp-

tion capacity of the host country affect the effect of delocation on the host but also on the home economy. This model presents an additional explanation of why empirical studies produce different results about the effect of delocation on home wages, that is, why delocation to lower wages region is relatively more detrimental for the home economy in terms of welfare and why long run effects may be different than short run effects.

A

The existence of the equilibrium with a positive number of DLFs requires $N_D \geq 0$. From (34) we have $N_D \geq 0$ when $\omega_N \leq A_S \frac{L_S}{L_N} \frac{\alpha(\sigma-1)}{(1-\alpha)(\sigma-1)}$ where the RHS term is equal to wages in the North when there is no delocation. We hence have lower wages after delocation. This ends the proof.□

B

First we show that under the conditions

$$c \leq A_S \frac{L_S - L_N}{L_N} \tag{40}$$

$$\sigma > \frac{(b(bc^2(\alpha-1) + c(a\alpha + 2b(\alpha-1)A_S + b(\alpha-1) + a\alpha)A_S^2)L_N + aA_S(bc(2-\alpha) + (a + b(2-\alpha) - a\alpha)A_S)L_S)}{(b(bc^2(\alpha-1) + c(a(\alpha-1) + 2b(\alpha-1)A_S + (a+b)(\alpha-1)A_S^2)L_N + aA_S(bc(1-\alpha) + (a + b - a\alpha - 1b\alpha)A_S)L_S))} \tag{41}$$

$$x < \frac{(aA_S(bc(2+\alpha(\sigma-1)-\sigma) + (a(1+\alpha(\sigma-1)-\sigma) + b(2+\alpha(\sigma-1)-\sigma))A_S)L_S)}{(b(bc^2(1+\alpha(\sigma-1)-\sigma) + c(a(\alpha(\sigma-1)-\sigma) + 2b(1-\sigma+\alpha(\sigma-1)))A_S + (a(\alpha(\sigma-1)-\sigma) + b(1+\alpha(\sigma-1)-\sigma))A_S^2)L_N)} \tag{42}$$

the ratio of utilities prior and post delocation $R_u = \frac{U_{N,D}}{U_N}$ is increasing in A_S where subscript D describes the situation with delocation. We have

$$\frac{U_{N,D}}{U_N} = \frac{\frac{\omega_{N,D}}{P_{M,D}}}{\frac{\omega_N}{P_M}} = \frac{\omega_{N,D}}{\omega_N}\left(\frac{N_N p_{j,d}}{N_N p_j^{1-\sigma} + N_D p_d^{1-\sigma}}\right)^{\frac{1}{1-\sigma}} \tag{43}$$

Note that $\frac{p_{j,d}}{p_j} = (\frac{\omega_N}{\omega_{N,D}})^{-\alpha}$ and $\frac{p_d}{p_j} = \frac{A_N}{A_D}(\frac{\omega_N}{\omega_{N,D}})^{\alpha}$.
Dividing (34) by (21), using (22) and (37) and rearranging yields

$$\frac{N_D}{N_N} = \frac{H}{L_N}\frac{A_S L_S(\alpha(\sigma-1)+1) - \omega_N L_N(1-\alpha)(\sigma-1)}{M\omega_D(1-\alpha)(\sigma-1) + M\omega_{S,I}(\alpha(\sigma-1)+1)} \tag{44}$$

Substituting (44),(37), (22) and $\omega_D = A_S + c$ in (43) gives

$$\begin{aligned} \frac{U_{N,D}}{U_N} &= \left(\frac{A_S \frac{L_{S,I}}{L_N}\frac{a}{b}}{(c+A_S)[\frac{M}{H}(\frac{A_N}{A_D})^{\sigma-1}]^{\frac{1}{a}}}\right)^{\alpha-1} \\ [1 &+ \frac{H}{L_N}\frac{A_S L_S a - (c+A_S)[\frac{M}{H}(\frac{A_N}{A_D})^{\sigma-1}]^{\frac{1}{a}} L_N b}{M(A_S+c)b + MA_S a}\left(\frac{A_N}{A_D}\left(\frac{M}{H}\left(\frac{A_N}{A_D}\right)^{\sigma-1}\right)^{\frac{1}{a}}\right)^{a-1}]^{\frac{1}{\sigma-1}} \end{aligned} \tag{45}$$

where $a = \alpha(\sigma-1)+1$ and $b = (1-\alpha)(\sigma-1)$.
Deriving (45) w.r.t A_S yields

$$\underbrace{\frac{1}{A_S(c+A_S)}}_{>0}\underbrace{[ac(\frac{aA_S L_S}{xb(A_S+C)L_N})^{\alpha-1}(1 - \frac{H(\frac{A_N}{A_D}x)^{\alpha-1}(bx(c+A_S)L_N - aA_S L_S)}{M(bc+(A+b)A_S)L_N})^{\frac{1}{\sigma-1}}}_{>0 \text{ from equation (38)}} \tag{46}$$

$$\underbrace{[\frac{\alpha-1}{a} - (\frac{(bHA_D(\frac{A_N}{A_D}x)^a A_S(c+A_S)(xL_N + L_S))}{((\sigma-1)(bc+(a+b)A_S)(-MA_N x(bc+(a+b)A_S)L_N + HA_D(\frac{A_N}{A_D}x)^a(bx(c+A_S)L_N - aA_S L_S)))})]]}_{\Omega}$$

where $x = [\frac{M}{H}(\frac{A_N}{A_D})^{\sigma-1}]^{\frac{1}{a}}$.
The term Ω determines the sign of the derivative.

It is strictly positive under the conditions (40),(41) and (42).

I now show that we can have $R_u = 1$. Since R_u is increasing in A_S, It is sufficient to show that $lim_{A_S \to 0} R_u = 0$.
We have $R_u = Max\,[\frac{U_D}{U}, 0]$. We have $lim_{A_S \to 0}\omega_{N,D} = cx$ and $lim_{A_S \to 0} P_{M,D} = -\frac{xL_N}{MA}\frac{\sigma}{\sigma-1}\frac{1}{A_D}(1-\alpha)^{\alpha-1}\alpha^{-\alpha c^{\alpha}}$. Applying Hospital rule for the limit of U, we get $lim_{A_S \to 0}\omega_N = \frac{aL_S}{bL_N}$ and $lim_{A_S \to 0} P_M = 0$. Hence, $lim_{A_S \to 0} R_u = lim_{A_S \to 0}\frac{\omega_{N,D}}{P_{M,D}}\frac{P_M}{\omega_N} = \frac{(+)(0)}{(+)(-)} = 0$. This ends the proof. $\square$

C

Rewriting (37) with transfer yields

$$\omega_N = (c + A_S + t)[\frac{M}{H}(\frac{A_N}{A_D})^{\sigma-1}]^{\frac{1}{\alpha(\sigma-1)+1}}$$

Which is increasing in the transfer t.

D

I show that N_D and L_D are increasing in the transfer.
Let t be the transfer such that the technology of the South is $A_S + t$ after a transfer t. Introducing the transfer in (38) yields

$$L_D = \frac{(\alpha(\sigma-1)+1)(A_S+t)L_S - (A_S+t+c)[\frac{M}{H}(\frac{A_N}{A_D})^{\sigma-1}]^{\frac{1}{\alpha(\sigma-1)+1}}(1-\alpha)(\sigma-1)L_N}{(A_S+t+c)(1-\alpha)(\sigma-1) + (A_S+t)(\alpha(\sigma-1)+1)}$$

let

$$\begin{aligned} a &= \alpha(\sigma-1)+1 \\ b &= (1-\alpha)(\sigma-1) \\ d &= L_N\frac{b}{a}[\frac{M}{H}(\frac{A_N}{A_D})^{\sigma-1}]^{\frac{1}{\alpha(\sigma-1)+1}} \end{aligned}$$

we have

$$\frac{(A_S+t)-d}{M(A_S+c+t)b + (A_S+t)aM}$$

Deriving w.r.t. the transfer t yields

$$\frac{(a+b)d + bcL_S}{M(at + b(c+t) + (a+b)A_S)^2}$$

Which is positive. Hence N_D is increasing in t. And since $L_D = N_D(\alpha(\sigma-1)+1)M$, we have that L_D is increasing in t.

E

I show that the welfare in the North ratio is increasing in the transfer t.
we have

$$\frac{U_{N,t}}{U_N} = \frac{\omega_{N,t}}{\omega_N}\frac{P_M}{P_{M,t}}$$

where subindex t describes the situation with transfer. Rearranging using equilibrium expressions of the variables yields

$$\frac{U_{N,t}}{U_N} = (\frac{\omega_{N,t}}{\omega_N})^{1-\alpha}(\frac{1+\frac{N_D}{N_N}(\frac{P_d}{P_j})^{1-\sigma}}{1+\frac{N_{D,t}}{N_{N,t}}(\frac{P_{d,t}}{P_{j,t}})^{1-\sigma}})^{\frac{1}{1-\sigma}}$$

Note that $1+\frac{N_D}{N_N}(\frac{P_d}{P_j})^{1-\sigma}$ and $N_{N,t}$ do not depend on t and that

$$\frac{P_{d,t}}{P_{j,t}} = \frac{A_N}{A_D}(\frac{1}{(\frac{M}{H}(\frac{A_N}{A_D})^{\sigma-1})^{\frac{1}{\alpha(1-\sigma)+1}}})^{\alpha}$$

is also independent on t.
let

$$x = 1+\frac{N_D}{N_N}(\frac{P_d}{P_j})^{1-\sigma}$$
$$y = (\frac{P_{d,t}}{P_{j,t}})^{1-\sigma}\frac{1}{N_{N,t}}$$

we have

$$\frac{U_{N,t}}{U_N} = (\frac{A_S+t+c}{A_S+c})^{1-\alpha}(\frac{x}{1+yN_{D,t}})^{\frac{1}{1-\sigma}}$$

let

$$f[t] = (\frac{A_S+t+c}{A_S+c})^{1-\alpha}$$
$$h[t] = 1+yN_{D,t}$$
$$g[t] = (\frac{x}{h[t]})^{\frac{1}{1-\sigma}}$$

we have

$$\frac{U_{N,t}}{U_N} = f[t]g[t] = f[t](\frac{x}{h[t]})^{\frac{1}{1-\sigma}}$$

With $f[t]>0$ and $g[t]>0$ it is sufficient to prove that $f'[t]>0$ and $g'[t]>0$ to have that $\frac{U_{N,t}}{U_N}$ is increasing in t. It is straightforward to show that $f'[t]>0$ and we proved in App D that $N_{D,t}$ is increasing in t. Hence, $h'[t]>0$ and $g'[t]>0$. This ends the proof. □

References

Acemoglu, D., and F. Zilbotti (1999): "Productivity Differences," NBER Working Papers 6879, National Bureau of Economic Research, Inc.

Aitken, B., A. Harrison, and R. E. Lipsey (1997): "Wages and Foreign Ownership: A Comparative Study of Mexico, Venezuela and the United States," (5102).

Antras, P., and D. Chor (2012): "Organizing the Global Value Chain," Working Papers 25-2012, Singapore Management University, School of Economics.

Baldwin, R., and F. Robert-Nicoud (2010): "Trade-in-goods and trade-in-tasks: An Integrating Framework," NBER Working Papers 15882, National Bureau of Economic Research, Inc.

Borga, M. (2005): "Trends in Employment at U.S. Multinationals Companies: Evidence from Firm-Level Data," in *Trade forum*.

Brainard, L., and D. Riker (2001): "In: Greenway, D., Nelson, D.R., Globalization and Labour markets: Are U.S Multinationals exporting U.S. jobs?, Vol2.," .

Brown, D. K., A. V. Deardorff, and R. M. Stern (2003): "The Effects of Multinational Production on Wages and Working Conditions in Developing Countries," NBER Working Papers 9669, National Bureau of Economic Research, Inc.

Desai, M. A., C. F. Foley, and J. R. Hines (2009): "Domestic Effects of the Foreign Activities of US Multinationals," *American Economic Journal: Economic Policy*, 1(1), 181–203.

Ebenstein, A., A. Harrison, M. McMillan, and S. Phillips (2011): "Estimating the impact of trade and offshoring on American workers using the current population surveys," Policy Research Working Paper Series 5750, The World Bank.

Eicher, T., and J. W. Kang (2005): "Trade, foreign firect investment or acquisitions : optimal entry modes for multinationals," *Journal of Development Economics*, 77, 207–228.

Falk, M., and B. M. Koebel (2002): "Outsourcing, Imports and Labour Demand," *Scandinavian Journal of Economics*, 104(4), 567–86.

Feenstra, R. C. (2010): *Offshoring in the Global Economy: Microeconomic Structure and Macroeconomic Implications*, vol. 1 of *MIT Press Books*. The MIT Press.

Grossman, G. M., and E. Rossi-Hansberg (2006): "Trading Tasks: A Simple Theory of Offshoring," NBER Working Papers 12721, National Bureau of Economic Research, Inc.

——— (2008): "Task Trade between Similar Countries," NBER Working Papers 14554, National Bureau of Economic Research, Inc.

Gustafsson, P., and P. S. Segerstrom (2011): "NorthâĂŞSouth Trade With Multinational Firms And Increasing Product Variety," *International Economic Review*, 52(4), 1123–1155.

Hanson, G., R. Mataloni, and M. Slaugher (2003): "Expansion Abroad and the Domestic Operations of U.S. Multinational Firms," *Mimeo*.

Harrison, A., and M. McMillan (2009): "Offshoring Jobs? Multinationals and US Manufacturing Employment," Discussion paper.

Hijzen, A., H. Gorg, and R. C. Hine (2005): "International Outsourcing and the Skill Structure of Labour Demand in the United Kingdom," *Economic Journal*, 115(506), 860–878.

Jakobsson, A., and P. S. Segerstrom (2013): "In support of the TRIPs Agreement," *Unpublished work*.

Keuschnigg, C., and E. Ribi (2007): "Outsourcing, Unemployment and Welfare Policy," (0720).

Lin, P., and K. Saggi (2005): "Multinational firms, exclusivity, and the degree of backward linkages," Discussion Paper Series 1: Economic Studies 2005,10, Deutsche Bundesbank, Research Centre.

——— (2007): "Multinational firms, exclusivity, and backward linkages," *Journal of International Economics*, 71(1), 206–220.

Rama, M. (2003): "Globalization and the Labor Market," *World Bank Research Observer*, 18(2), 159–186.

Riker, D. A., and S. L. Brainard (1997): "U.S. Multinationals and Competition from Low Wage Countries," (5959).

Schwarz, C., and J. Suedekum (2011): "Global Sourcing of Complex Production Processes," Discussion paper.

Segerstrom, P., and E. Dinopoulos (2007): "Trade Liberalization and Productivity Growth," .

Shapiro, C., and J. E. Stiglitz (1985): "Can Unemployment Be Involuntary? Reply [Equilibrium Unemployemnt as a Worker Discipline Device]," *American Economic Review*, 75(5), 1215–17.

Strauss-Kahn, V. (2003): "The Role of Globalization in the Within-Industry Shift Away from Unskilled Workers in France," (9716).

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