and in determining the result of the conflict among the other fixed-technology centripetal and centrifugal forces. The results of this trade-off depend on which of the effects produced by different trade costs levels prevail. Particularly, if trade costs are very high, manufacturing ends up being completely agglomerated in the region that has an initial technological advantage, because firms in the lagging regions are unable to benefit from the interregional potential knowledge spill-overs. Thus, we like to stress that our results reverse the usual conclusion of New Economic Geography models that high trade costs favors economic dispersion by showing that high trade costs favor the agglomeration of firms in the more productive region.

Appendix A. Sustainability of agglomeration of the manufacturing sector in region v.

Agglomeration of the manufacturing sector in region v is an equilibrium if sales of a (potential) deviant firm relocating in region r are less than the level required to break even, that is if:

$$Q_{mir} < Q^*_{mir}$$

Let us consider as given the regional levels of the technology a_r and a_v.

A manufacturing firm has positive (negative) profits if its production is higher (lower) than the amount required to break even, Q^*_{mir}, that is given by

$$Q^*_{mir} = a_r$$

where $r = s, n$.

Let us consider the case in which the manufacturing sector is fully agglomerated in region v and a firm that is a potential deviant in region r. This firm decides to start its production in region r if the demand that it faces by producing in region r is higher than (or equal to) the amount Q^*_{mir} required to break even by producing in this region. The relationship between the two regional break even quantities is:

$$Q^*_{mir} = \frac{a_r}{a_v} Q^*_{miv} \tag{33}$$

where $r, v = n, s$ and $v \neq r$.

When the manufacturing sector is fully agglomerated in region v, the composite good price indexes in region v and in region r are respectively:

$$p_{mv} = n_v^{\frac{1}{1-\sigma}} p_v \qquad \text{and} \qquad p_{mr} = n_v^{\frac{1}{1-\sigma}} \tau p_v \tag{34}$$

The demand for variety i produced in region v is:

$$Q_{miv} = \frac{E_{mv} + E_{mr}}{n_v p_v} \tag{35}$$

Moreover, given the free entry and exit hypothesis for manufacturing firms, each firm in region v produces the quantity required to break even:

$$Q^*_{miv} = Q_{miv}$$

Hence, the zero profit level of output of the potential deviant firm in region r is given by:

$$Q^*_{mir} = \frac{a_r}{a_v} \frac{(E_{mv} + E_{mr})}{n_v p_v} \tag{36}$$

The demand for variety i produced by the potential deviant in r is:

$$Q_{mir} = p_r^{-\sigma} \left(\frac{1}{p_{mr}^{1-\sigma}} E_{mr} + \tau^{1-\sigma} \frac{1}{p_{mv}^{1-\sigma}} E_{mv} \right) \tag{37}$$

Substituting the price indexes from (34) into (37), it is possible to express the deviant firm's demand function as:

$$Q_{mir} = \left(\frac{p_r}{p_v} \right)^{-\sigma} \left(\frac{\tau^{\sigma-1} E_{mr} + \tau^{1-\sigma} E_{mv}}{n_v p_v} \right) \tag{38}$$

From (13) we can derive relative prices (p_r/p_v):

$$\frac{p_r}{p_v} = \frac{a_v}{a_r} \left(\frac{p_{mr}}{p_{mv}} \right)^{\mu} \left(\frac{w_{hr}}{w_{hv}} \right)^{\gamma} \left(\frac{w_{lr}}{w_{lv}} \right)^{1-\gamma-\mu}$$

From the regional price indexes of the composite good (34) we can derive the relative price index:

$$\frac{p_{mv}}{p_{mr}} = \tau^{-1}$$

In order to attract skilled workers in region r we know that the deviant firm has to offer them at least the same real wage that they gain in region v. Therefore, the following condition must hold:

$$\frac{w_{hr}}{w_{hv}} = \left(\frac{p_{mv}}{p_{mr}}\right)^{-\mu_c} = \tau^{\mu_c} \tag{39}$$

Moreover, the wage of unskilled workers in region r (w_{lr}) is equal to 1, because it is equal to the agricultural price (the numéraire of the model). Therefore, we may rewrite the ratio of the price of the varieties produced in the two regions as:

$$\frac{p_r}{p_v} = \frac{a_v}{a_r}\tau^{\mu+\gamma\mu_c}\left(\frac{1}{w_{lv}}\right)^{1-\gamma-\mu} \tag{40}$$

Substituting (40) into (38) and eliminating $n_v p_v$ yields the ratio between the demand for the potential deviant firm (Q_{mir}) and the break even amount for region r (Q^*_{mir}):

$$\frac{Q_{mir}}{Q^*_{mir}} = \left(\frac{a_v}{a_r}\right)^{1-\sigma}\tau^{1-\sigma(1+\mu+\gamma\mu_c)}\left(\frac{1}{w_{lv}}\right)^{-\sigma(1-\gamma-\mu)}\left(\frac{\left(\tau^{2(\sigma-1)}-1\right)E_{mr}}{E_{mv}+E_{mr}}+1\right) \tag{41}$$

Then we compute expenditures on manufactures in both regions, in order to substitute $E_{mr}/\left(E_{mv}+E_{mr}\right)$ in the previous expression. When firms and skilled workers are fully agglomerated in the region v, these are respectively:

$$E_{mr} = \mu_c \bar{L} \tag{42}$$

and

$$E_{mv} = \mu_c\left(w_{lv}\bar{L} + w_{hv}\bar{H}\right) + \mu n_v p_v Q_{miv} \tag{43}$$

Moreover, given the free entry and exit condition, the wages of skilled workers in region v correspond to the share γ of total revenues of firms in v:

$$w_{hv}\bar{H} = \gamma n_v p_v Q_{miv} \tag{44}$$

Using (35), (43) and (44) expenditures on the composite manufactured good in region v are:

$$E_{mv} = \frac{\mu_c w_{lv}\bar{L} + \left(\mu_c\gamma + \mu\right)E_{mr}}{\left(1-\mu_c\gamma-\mu\right)} \tag{45}$$

Finally, substituting E_{mr} from (42) into (45), we obtain that E_{mv} is:

$$E_{mv} = \frac{\mu_c w_{lv} \bar{L} + (\mu_c \gamma + \mu)\,\mu_c\,\bar{L}}{(1 - \mu_c \gamma - \mu)} \tag{46}$$

Therefore:

$$\frac{E_{mr}}{E_{mv} + E_{mr}} = \frac{(1 - \mu_c \gamma - \mu)}{w_{lv} + 1} \tag{47}$$

Substituting $E_{mr}/(E_{mv} + E_{mr})$ from (47) into (41), we obtain the following expression:

$$\frac{Q_{mir}}{Q^*_{mir}} = \left(\frac{a_v}{a_{sr}}\right)^{1-\sigma} \tau^{1-\sigma(1+\mu+\gamma\mu_c)} \left(\frac{1}{w_{lv}}\right)^{-\sigma(1-\gamma-\mu)} \left(\frac{\left(\tau^{2(\sigma-1)}-1\right)(1-\mu_c\gamma-\mu)}{w_{lv}+1} + 1\right) \tag{48}$$

Finally, we evaluate the wage of unskilled workers in the core region (w_{lv}) in order to substitute it into (48). We observe that this wage may be either equal to 1 or higher than 1. Indeed, we point out that the wage of unskilled workers in region v can never be smaller than 1, because in this case the traditional good would not be produced in the peripheral region r, given that the production cost and, therefore, the price would be smaller in region v.

Hence, when the wages of unskilled workers are the same for the two regions ($w_{lv} = w_{lr}$), then the traditional good may be produced in both of them because $w_{lv} = p_{av} = p_{ar} = w_{lr}$. By contrast, the traditional good is not produced in the core region r when $w_{lv} > 1$.

To obtain the wage of unskilled workers we compute the sum of expenditures on the composite good in the two regions from (42) and (46):

$$E_{mv} + E_{mr} = \frac{\mu_c}{1 - \mu - \mu_c \gamma} \left(w_{lv} \bar{L} + \bar{L}\right) \tag{49}$$

where $\mu_c \neq (1 - \mu)/\gamma$.

We know that, because of the free entry and exit condition of firms, the total amount of wages paid to unskilled workers in region v is equal to the share $(1 - \mu - \gamma)$ of total revenues:

$$w_{lv} \bar{L} = (1 - \mu - \gamma) n_v p_v Q_{miv} \tag{50}$$

From (35), (49) and (50) we derive the wages of unskilled workers as a function of the parameters of the model:

$$w_{lv} = \frac{(1 - \mu - \gamma)\mu_c}{(1 - \mu)(1 - \mu_c)}$$

where $\mu, \mu_c \neq 1, \mu_c \neq (1-\mu)/\gamma$.

Hence, $w_{lv} > 1$ when:

$$\mu_c > \frac{1-\mu}{2(1-\mu)-\gamma} = \mu_c^*$$

where $\gamma \neq 2(1-\mu)$. Wages cannot be lower than 1 because in this case the traditional good would be produced in region v and not in region r.

On the contrary, when $0 < \mu_c \leqslant \mu_c^*$, the wages of unskilled workers in the core v must be equal to 1 if the traditional good is produced in the periphery r.

Therefore we may have the two following cases.

When $0 < \mu_c \leqslant \mu_c^*$, agglomeration of manufacturing firms in region v is an equilibrium if the ratio Q_{mir}/Q_{mir}^* from (41) is smaller than 1:

$$\frac{Q_{mir}}{Q_{mir}^*} = \left(\frac{a_v}{a_r}\right)^{1-\sigma} \tau^{1-\sigma(1+\mu+\gamma\mu_c)} \left(\frac{\left(\tau^{2(\sigma-1)}-1\right)(1-\mu_c\gamma-\mu)}{2} + 1\right) < 1 \tag{51}$$

Otherwise, when $1 > \mu_c > \mu_c^*$, agglomeration of the manufacturing sector in region v is an equilibrium when:

$$\frac{Q_{mir}}{Q_{mir}^*} = \left(\frac{a_v}{a_r}\right)^{1-\sigma} \tau^{1-\sigma(1+\mu+\gamma\mu_c)} \left(\frac{(1-\mu)(1-\mu_c)}{(1-\mu-\gamma)\mu_c}\right)^{-\sigma(1-\gamma-\mu)} \left[\left(\tau^{2(\sigma-1)}-1\right)(1-\mu)(1-\mu_c)+1\right] < 1 \tag{52}$$

Appendix B.

To prove that profits in a neighborhood of a long run equilibrium can be written as a function of the number of firms n

$$\pi_i = u(n) \tag{53}$$

it is necessary to determine the short run equilibrium, which is defined as a set of solutions to equations (54)-(58) below, once n_n and n_s are given. We express them in matrix form. To this end, variables without suffix r define vectors, variables with superscript $\tilde{}$ are 2x2 diagonal matrix with