Essays in New Economic Geography

Doctoral Thesis of Francesco Mureddu

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Contents of the Thesis: Literature Review

- In chapter one we give an overview of the principal New Economic Geography (NEG) models:
  - The Core-Periphery (Krugman (1991))
  - The Footloose capital (Martin and Rogers (1995))
  - The Footloose entrepreneurs (Ottaviano (1996))
- In chapter two we describe some of its further developments:
  - The introduction of endogenous growth in a NEG framework (Baldwin and Martin (2004) and Baldwin *et al.* (2004))
  - Possibility of a monotonic relation between agglomeration and integration (Bellone and Maupertuis, 2003 and Andres, 2007)
  - Introduction of firms heterogeneity (Melitz (2003), Baldwin and Okubo (2006) and Baldwin and Robert-Nicoud (2008))

Contents of the Thesis: Original Extensions to the Theory

- In chapter three we elaborate the model "Agglomeration and Growth with Endogenous Expenditure Shares" where we use a CES instead of a Cobb-Douglas utility function in the second-stage optimization problem
  - In particular we will focus on the study of stability analysis and growth rate. Our benchmark will be the model with global spillovers presented in Baldwin and Martin (2004)
- In chapter four we elaborate the model "Intersectoral Spillovers and Real Income Growth" where we introduce intersectoral knowledge spillovers from Innovation to a Non-tradable sector
  - In particular we will focus on the study of the real income growth. Our benchmark will be the model with localized spillovers presented in Baldwin, Martin and Ottaviano (2001)

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- Agglomeration and Growth with Endogenous Expenditure Shares
    - Basics
    - Stability Analysis
    - Growth Rate
- Agglomeration, Welfare and Regional Growth with Intersectoral Knowledge Spillovers
    - Basics
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Main Results in Baldwin and Martin (2004)

Using a CD utility function in the second-stage optimization the expenditure shares for Manufacture is constant and the elasticity of substitution between the Traditional and the Industrial goods is unitary

- Implications on the stability analysis:
  - Catastrophic agglomeration takes place in case of capital immobility: in this case when trade costs fall beyond a certain threshold agglomeration forces overcome the dispersion forces
- Implications on the growth analysis:
  - The growth rate is not influenced by the allocation of economic activities hence it is the same both in the core periphery and in the symmetric configuration
  - Moreover the growth rate is in no way affected by the degree of market integration (trade costs)

Extensions to BM (2004): Implications of Endogenous Expenditure Shares

Using a CES utility function in the second-stage optimization problem, allows for expenditure shares in Industrial goods to be endogenously determined and opens the room to the following implications:

- Catastrophic agglomeration may always take place, whatever the degree of market integration, provided that the Traditional and the Industrial goods are sufficiently good substitutes
- The regional rate of growth is affected by the interregional allocation of economic activities even in the absence of localized spillovers, so that geography always matters for growth
- The regional rate of growth is affected by the degree of market openness: in particular, depending on whether the Traditional and the Industrial goods are good or poor substitutes, economic integration may be respectively growth-enhancing or growth-detrimental

Main Results in Baldwin, Martin and Ottaviano (2001)

- In standard NEGG models the growth rate is equal in both regions both in cases of global and local spillovers
- In case of agglomeration workers remaining in the region where there is no longer industry face two opposite welfare effects:
  - A static loss due to the increase in transport costs paid on the Manufacture varieties that have to be imported
  - A positive dynamic effect: if industry is concentrated in case of localized knowledge spillovers the growth rate will be higher
- This is due to the introduction of endogenous growth and localized spillovers: growth is influenced by geography
- So the increase in economic growth led by agglomeration can be the welfare counterpart of the static loss, hence agglomeration is always welfare improving

Extensions to BMO (2001): Implications of Intersectoral Spillovers

By assuming intersectoral and localized knowledge spillovers from the Innovation sector to the Service sector, we show that firms' allocation affects regional real growth

- More precisely we assume that the unit labour requirements (and thereby the prices) in the Services production are a negative function of the output of Innovation, i.e. the stock of knowledge capital
- Due to this new specification, real growth rates in the two regions always diverge when the firms allocation pattern differs from the symmetric one
- This result has strong policy implications because it suggests that concentrating industries in only one region may also bring a dynamic loss for the periphery

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The Economy

- We have two symmetric regions: North and South (labeled by an asterisk) and three sectors: Modern (Manufacture), Traditional (agriculture) and Innovation
- There is only one type of workers interregionally immobile but intersectorally mobile (wages are equal among sectors)
- The Modern good is produced under Dixit-Stiglitz (1977) monopolistic competition with increasing returns to scale: the fixed cost is represented by a unit of capital while the variable cost is represented by a_M units of L
- The Traditional is homogeneously produced with constant returns to scale in perfect competition and unit labor cost
- The Modern good is shipped with Iceberg Trade Costs while the Traditional one is freely shipped

The Innovation Sector

- The Innovation sector works in perfect competition with endogenous growth *à la* Romer (1990)
- The cost of Innovation in the North is:

$$F = a_I w = \frac{w}{K^w}$$

- As we can see the cost of producing new knowledge decreases with the stock of knowledge already created
- The rate of growth of units of capital/varieties is:

$$g = \frac{\dot{K}}{K^w}; g^* = \frac{\dot{K}^*}{K^w}$$

Consumer's Problem

- We have an infinite lively consumer who maximizes the following preferences:

$$U = \int_{t=0}^{\infty} e^{-\rho t} \ln Q_t ; Q_t = \left[\delta (n^{w^{\frac{1}{1-\sigma}}} C_M)^{\alpha} + (1-\delta) C_T^{\alpha} \right]^{\frac{1}{\alpha}}$$

$$C_M = \left(\int_{i=0}^{K+K^*} c_i^{1-\frac{1}{\sigma}} \right)^{\frac{1}{1-\frac{1}{\sigma}}} di ; |\alpha| \leq 1$$

- It is arguable the intersectoral elasticity of substitution $\frac{1}{1-\alpha}$ is lower than the intrasectoral elasticity of substitution σ
- The optimal consumption path is given by the Euler equation:

$$\frac{\dot{E}}{E} = r - \rho$$

Analytical Deviations from the Benchmark Model

- Following Cerina and Pigliaru (2007) we use a CES instead of a Cobb-Douglas, thereby allowing the elasticity of substitution $(1/(1-\alpha))$ between Manufacture and Traditional good to diverge from the unit value
  - Hence the share of expenditure on Manufacture is no longer constant but it is affected by changes in the price index
- Following Murata (2008) and Blanchard and Kiyotaki (1987) we abstract from the love for variety
  - There are several empirical analysis assessing a value for the love of variety parameter lower than what assumed in standard NEGG models (see for instance Ardelean 2007)
  - The introduction of the restriction according to which love for variety is none is compensated by the introduction of the parameter α which, unlike the standard NEGG models, allows the elasticity of substitution to deviate from the unit value

Normalizations due to the No-specialization Condition

- The Traditional good is shipped without incurring in trade cost and is produced under perfect competition. It is therefore convenient to choose home labour as numeraire so that:

$$p_T = p_T^* = w_T = w_T^* = 1$$

- By the No-specialization condition the Traditional sector is present in both regions. This together with labor intersectoral mobility let Manufacture wages to be tied to agricultural wages which, in turn, remain fixed at the level of the unit price:

$$w_M = w_M^* = w_T = w_T^* = w = 1$$

Modern Firm Optimization (1)

- The optimal pricing rule is the following:

$$p = a_M \left(\frac{\sigma}{\sigma - 1} \right)$$

- If we take the units of labor per unit of output in Manufacture as $a_M = (\sigma - 1)/\sigma$ even the varieties' prices are normalizes to 1, so $p = w = 1$ and $p^* = \tau p$ (τ represents the trade costs)
- Setting p_M^{ij} the price of a particular variety produced in region i and sold in region j the Manufacture price index becomes:

$$P_M = \left(\int_0^n (p_M^{NN})^{1-\sigma} di + \int_0^{n^*} (p_M^{SN})^{1-\sigma} di \right)^{\frac{1}{1-\sigma}} = (s_n + (1 - s_n)\phi)^{\frac{1}{1-\sigma}} n^{w\,\frac{1}{1-\sigma}}$$

$$P_M^* = \left(\int_0^n (p_M^{NS})^{1-\sigma} di + \int_0^{n^*} (p_M^{SS})^{1-\sigma} di \right)^{\frac{1}{1-\sigma}} = (\phi s_n + 1 - s_n)^{\frac{1}{1-\sigma}} n^{w\,\frac{1}{1-\sigma}}$$

Modern Firm Optimization (2)

- The profits are respectively for northern and southern varieties:

$$\pi = \frac{E^w}{\sigma K^w}\left[\frac{s_E}{(s_n + (1-s_n)\phi)}\mu(s_n,\phi) + \frac{\phi(1-s_E)}{(\phi s_n + 1 - s_n)}\mu^*(s_n,\phi)\right]$$

$$\pi^* = \frac{E^w}{\sigma K^w}\left[\frac{\phi s_E}{(s_n + (1-s_n)\phi)}\mu(s_n,\phi) + \frac{(1-s_E)}{(\phi s_n + 1 - s_n)}\mu^*(s_n,\phi)\right]$$

- Where $\phi = \tau^{1-\sigma}$ is the so called "phi-ness of trade" which ranges from 0 (prohibitive trade) to 1 (costless trade)
- As we can see profits change with the expenditure shares

Expenditure Shares

- The expenditure shares, which are constant in steady state are:

$$\mu(s_n, \phi) = \left(\frac{1}{1 + \left(\frac{1-\delta}{\delta}\right)^{\frac{\alpha}{1-\alpha}} \left(s_n + (1 - s_n)\phi\right)^{-\frac{\sigma}{(1-\alpha)(1-\sigma)}}} \right)$$

$$\mu^*(s_n, \phi) = \left(\frac{1}{1 + \left(\frac{1-\delta}{\delta}\right)^{\frac{\alpha}{1-\alpha}} \left(\phi s_n + 1 - s_n\right)^{-\frac{\sigma}{(1-\alpha)(1-\sigma)}}} \right)$$

- A crucial feature for our analysis is that the expenditure shares depend on Manufacture location and trade costs

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Stability of the Symmetric Equilibrium

- The ratio of northern and southern Tobin's q is:

$$\frac{q}{q^*} = \frac{\left[\frac{s_E}{(s_n+(1-s_n)\phi)}\mu(s_n,\phi) + \frac{\phi(1-s_E)}{(\phi s_n+1-s_n)}\mu^*(s_n,\phi)\right]}{\left[\frac{\phi s_E}{(s_n+(1-s_n)\phi)}\mu(s_n,\phi) + \frac{(1-s_E)}{(\phi s_n+1-s_n)}\mu^*(s_n,\phi)\right]} = \gamma(s_E, s_n, \phi)$$

- Starting from $\gamma(s_E, s_n, \phi) = 1$, an increase (decrease) in $\gamma(s_E, s_n, \phi)$ will make investments in the North (South) more profitable and thus will lead to a production shifting
- Hence, the symmetric equilibrium will be stable (instable) if:

$$\left|\frac{\partial\gamma(s_E, s_n, \phi)}{\partial s_n}\right|_{s_n=s_E=1/2} < (>)0$$

Endogenous Expenditure Shares: the Capital Imm. Case

In case of capital immobility we have:

$$\left.\frac{\partial\gamma\left(s_E, s_K, \phi\right)}{\partial s_K}\right|_{s_K=s_E=1/2} = 4\underbrace{\left(\frac{1-\phi}{1+\phi}\right)^2 \frac{\alpha\left(1-\mu\left(1/2,\phi\right)\right)}{\left(\sigma-1\right)\left(1-\alpha\right)}}_{\text{Substitution}} \underbrace{-4\left(\frac{1-\phi}{1+\phi}\right)^2}_{\text{Market-crowding}} \underbrace{+4\frac{\left(1-\phi\right)}{\left(1+\phi\right)}\frac{\partial s_E}{\partial s_K}}_{\text{Demand-linked}}$$

- If $\alpha > (<) 0$ the substitution effect acts as a new agglomeration (dispersion) force thereby agglomeration is reached for lower (higher) values of freeness of trade
- Moreover if $\alpha > 0$ there are values of the parameter for the symmetric equilibrium to be unstable for every level of trade cost

Mechanism of the Substitution Effect

The variability of the expenditure shares gives birth to a new force called substitution effect. Let's see how it works:

- If Manufacture and the Traditional commodities are good substitutes ($\alpha > 0$) an increase in the share of firm present in a region (say North) determines a decrease in the price index for Manufacture
- Hence the share of expenditure in Manufacture (and also the profits) will rise determining an increase in the incentive to invest
- This rise in the incentive to invest will augment the share of firms owned a region, thereby feedbacking the mechanism
- If Manufacture and the Traditional commodities are poor substitutes ($\alpha < 0$) the mechanism is reversed

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Growth Always Depends on Geography

- In the benchmark model growth does not depend on geography and is the same both in Core-Periphery and symmetry:

$$g = \frac{2\mu L - (\sigma - \mu)\rho}{\sigma}$$

- Instead in our analysis the growth rate depends on geography both in symmetry and in Core-Periphery:

$$g_S = \frac{2L(\sigma - \mu(1/2, \phi)) - \rho(\sigma - \mu(1/2, \phi))}{\sigma}$$

$$g_C = \frac{L(\mu(1, \phi) + \mu^*(1, \phi)) - \rho(\sigma - \mu(1, \phi))}{\sigma}$$

- Clearly the Core-Periphery growth rate can be higher (lower) than the symmetric one according to parameters value:

$$\mu(1, \phi) + \mu^*(1, \phi) > (<) 2\mu(1/2, \phi) \Rightarrow g_C > (<) g_S$$

Integration Always Affects Growth Rate

- The growth rate in our analysis depends on trade costs in Core-Periphery and in the symmetric equilibrium
- In particular if Manufacture and Agriculture are good/poor substitutes the impact of integration (lowering trade costs) can be positive/negative:

$$\alpha > (<) 0 \Rightarrow \frac{\partial g_S}{\partial \phi}, \frac{\partial g_C}{\partial \phi} > (<) 0$$

Economic Intuitions and Policy Implications

- If the freeness of trade or the share of firms in a region increase, the price index decreases. Then if $\alpha > (<) 0$ the share of expenditure in Manufacture augments/diminishes. Hence firms gain more/less profits and the incentive to invest is enhanced/decreased, thus boosting/slowing down growth
- Growth Rate Depends on Geography: if the growth rate is higher/lower in Core-Periphery hence the conclusion of the benchmark model stating that agglomeration is welfare enhancing is reinforced/rejected
- Growth Rate Depends on Trade Costs: if $\alpha > (<) 0$ an increase in trade costs is growth enhancing/harming hence the conclusion of the benchmark model stating that integration is welfare improving is reinforced/rejected

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Introducing Intersectoral Spillovers: the Picture Changes

- The result displayed in Baldwin, Martin and Ottaviano (2001) saying that agglomeration of industry benefits both regions is questionable
- Introducing the possibility of intersectoral spillovers between knowledge production and Services it is arguable that clustering Innovation and the Modern sector in a unique region would influence also the productivity of the Non-tradable sector
- Thereby agglomeration would bring to two losses for South:
  - A *static loss* due to the increase in trade costs paid
  - A *dynamic loss* (lower real growth rate) in the region where remain only the Traditional and the Non-tradable sectors
- Hence in case of agglomeration we have ever increasing welfare inequality between regions

Deviations from the Canonical Case

- In our work we focus on the analysis of the real growth rate
- The mechanisms of agglomeration and the growth rate analysis are equal to the benchmark case
- We introduce a further sector that is not traded: the Services
- The productivity of the Services depends positively on the quantity of knowledge capital already present in the same region
- This dependence is due to the introduction of localized intersectoral spillovers
- In case of agglomeration this modification let the negative rate of growth of the price index to be different between the two regions

The Economy

The analytical framework is very similar to the one presented in the first session for the Endogenous Expenditure Shares case. The differences are the following:

- We reintroduce the Cobb-Douglas in the second step of utility maximization, like in the benchmark model
- We consider the case of localized spillovers between the Innovation sectors in the two regions so that the innovation cost is $a_I = 1/AK^w$ where $A = (s_K + \lambda(1 - s_K))$
- We introduce the Non-tradable sector: Services are produced under perfect competition and constant returns to scale, and are not interregionally traded

The Non-tradable Sector

- The Services production function, where $a_S(\cdot)$ represents the units of labor necessary to produce a unit of output is:

$$S = \frac{L_S}{a_S(\cdot)}$$

- The profit function is:

$$\pi_S = p_S S - wL_S$$

- Optimization implies (int. labor mobility drives wages to 1):

$$p_S = a_S(\cdot)$$

- We assume knowledge intersectoral spillovers from Innovation to Services: the productivity parameter is a negative function of K, i.e. we have $\dot{a}_S(K) < 0$

Consumer's Problem (1)

- We have an infinite lively consumer that maximizes:

$$U = \int_{t=0}^{\infty} e^{-\rho t} \ln Q dt;\ Q = ln\left[C_M^{\alpha} C_T^{\beta} C_S^{\gamma}\right];\ C_M = \left(\int_{i=0}^{K+K^*} c_i^{1-\frac{1}{\sigma}} di\right)^{\frac{1}{1-\frac{1}{\sigma}}}$$

- Where C_M and C_T are respectively the demand of the Modern (CES) and Traditional good and C_S is the demand for Services
- The optimal consumption path is given by the Euler equation:

$$\frac{\dot{E}}{E} = r - \rho$$

Consumer's Problem (2)

- The maximization of the Cobb-Douglas gives the following relations[1]:

$$P_M C_M = \alpha E; p_T C_T = \beta E; p_S C_S = \gamma E$$

- Where p_S is the price of the Non-tradable good
- As we can see consumers devote a fixed share of expenditure to the three commodities
- Finally the optimizations of the composite index gives the CES demand function for the typical variety:

$$c_j = \frac{p_j^{-\sigma}}{P_M^{1-\sigma}} \alpha E$$

[1] We assume $\alpha + \beta + \gamma = 1$

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Income Growth Rate

Real growth merely stems from the constant fall in the price index that is driven by a continuously widening range of varieties

- Steady state income in the two regions is the sum of labour income plus profit income and can be written as:

$$Y = L + \pi s_K K^w = L + \frac{\alpha E^w}{\sigma}\left[\frac{s_E}{(s_K + (1 - s_K)\phi)} + \frac{\phi(1 - s_E)}{(\phi s_K + 1 - s_K)}\right]$$

$$Y^* = L + \pi^*(1 - s_K)K^w = L + \frac{\alpha E^w}{\sigma}\left[\frac{\phi s_E}{(s_K + (1 - s_K)\phi)} + \frac{1 - s_E}{(\phi s_K + 1 - s_K)}\right]$$

- Being s_K, s_E and E^w constant in steady state, Y and Y^* are constant as well:

$$\frac{\dot{Y}}{Y} = \frac{\dot{Y}^*}{Y^*} = 0$$

The income growth is zero unregarding the location of industry

Price Index

- The Cobb-Douglas price index for the consumer is:

$$P = P_M^{\alpha} p_T^{\beta} p_S^{\gamma}; P^* = P_M^{*\alpha} p_T^{*\beta} p_S^{*\gamma}$$

- The growth rate of prices in the two regions becomes:

$$\frac{\dot{P}}{P} = \alpha \frac{\dot{P}_M}{P_M} + \beta \frac{\dot{p}_T}{p_T} + \gamma \frac{\dot{p}_S}{p_S}$$

$$\frac{\dot{P}^*}{P^*} = \alpha \frac{\dot{P}_M^*}{P_M^*} + \beta \frac{\dot{p}_T^*}{p_T^*} + \gamma \frac{\dot{p}_S^*}{p_S^*}$$

- Hence the real income growth rate is:

$$\frac{\dot{Y}}{Y} - \frac{\dot{P}}{P} = -\alpha \frac{\dot{P}_M}{P_M} - \beta \frac{\dot{p}_T}{p_T} - \gamma \frac{\dot{p}_S}{p_S}$$

$$\frac{\dot{Y}^*}{Y^*} - \frac{\dot{P}^*}{P^*} = -\alpha \frac{\dot{P}_M^*}{P_M^*} - \beta \frac{\dot{p}_T^*}{p_T^*} - \gamma \frac{\dot{p}_S^*}{p_S^*}$$

Price Index Manufacture

- The price index for the Manufacture good is:

$$P_M = (s_n + (1 - s_n)\phi)^{\frac{1}{1-\sigma}} K^{w\frac{1}{1-\sigma}}$$

$$P_M^* = (\phi s_n + (1 - s_n))^{\frac{1}{1-\sigma}} K^{w\frac{1}{1-\sigma}}$$

- The growth rate of prices for the Manufacture good is:

$$\frac{\dot{P}_M}{P_M} = \frac{\dot{P}_M^*}{P_M^*} = \frac{1}{1-\sigma}\frac{\dot{K}^w}{K^w} = -\frac{g}{\sigma - 1}$$

Traditional Good Price Index

- The normalized price for the Traditional good:

$$p_T = p_T^* = 1$$

- The growth rate of prices for the Traditional good is:

$$\frac{\dot{p}_T}{p_T} = \frac{\dot{p}_T^*}{p_T^*} = 0$$

Non-tradable Good Price Index

- Instead the optimizing price for Services in North and South is:

$$p_S = a_S(K); p_S^* = a_S^*(K^*)$$

- The growth rate of prices for the Non-tradable good is:

$$\frac{\dot{p}_S}{p_S} = \frac{\dot{a}_S(K)}{a_S(K)} = \frac{\partial a_S(K)/\partial K}{a_S(K)} K \frac{\dot{K}}{K} = \theta(K)\frac{\dot{K}}{K}$$

$$\frac{\dot{p}_S^*}{p_S^*} = \frac{\dot{a}_S^*(K^*)}{a_S^*(K^*)} = \frac{\partial a_S^*(K^*)/\partial K^*}{a_S^*(K^*)} K^* \frac{\dot{K}^*}{K^*} = \theta^*(K^*)\frac{\dot{K}^*}{K^*}$$

- Where $\theta(K)$ and $\theta^*(K^*)$ are the (negative) elasticities of Services production cost with respect to capital in the two regions

Real Growth Rate

- The difference in the real growth rate between the two regions is given by:

$$\theta^*(K^*)\frac{\dot{K}^*}{K^*} - \theta(K)\frac{\dot{K}}{K} \Rightarrow \left(\frac{\dot{Y}}{Y} - \frac{\dot{P}}{P}\right) - \left(\frac{\dot{Y}^*}{Y^*} - \frac{\dot{P}^*}{P^*}\right)$$

- Thus we have a positive steady state real growth differential if:

$$\theta^*(K^*)\frac{\dot{K}^*}{K^*} > \theta(K)\frac{\dot{K}}{K} \Rightarrow \left(\frac{\dot{Y}}{Y} - \frac{\dot{P}}{P}\right) > \left(\frac{\dot{Y}^*}{Y^*} - \frac{\dot{P}^*}{P^*}\right)$$

Geography Affects Growth

- In the symmetric equilibrium $\frac{\dot{K}^*}{K^*} = \frac{\dot{K}}{K} = g$ hence the real income growth is the same:

$$\theta^*(K^*)g = \theta(K)g \Rightarrow \left(\frac{\dot{Y}}{Y} - \frac{\dot{P}}{P}\right) = \left(\frac{\dot{Y}^*}{Y^*} - \frac{\dot{P}^*}{P^*}\right)$$

- In each asymmetric equilibrium $\frac{\dot{K}^*}{K^*} = g^* = 0 \neq \frac{\dot{K}}{K} = g$ thus the real income growth diverges:

$$\theta^*(K^*)g^* = 0 > \theta(K)g \Rightarrow \left(\frac{\dot{Y}}{Y} - \frac{\dot{P}}{P}\right) > \left(\frac{\dot{Y}^*}{Y^*} - \frac{\dot{P}^*}{P^*}\right)$$

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Real Growth Rate in the North

The North enjoys two dynamical gains from agglomeration

- Indeed the northern real growth rate in symmetry is:

$$\varphi_{sym} = \frac{(\alpha L(1+\lambda) - \rho(\sigma-\alpha))(\alpha - \gamma\theta(K)(\sigma-1))}{\sigma(\sigma-1)}$$

- Instead in core-periphery the northern real growth rate is:

$$\varphi_{cp} = \frac{(2\alpha L - \rho(\sigma-\alpha))(\alpha - \gamma\theta(K)(\sigma-1))}{\sigma(\sigma-1)}$$

- Clearly the real growth rate of the North is higher in core-periphery:

$$\varphi_{cp} > \varphi_{sym}$$

Real Growth Rate in the South

On the contrary the South may loose from agglomeration

- The southern real growth rate in symmetry is:

$$\varphi^*_{sym} = \frac{(\alpha L(1+\lambda) - \rho(\sigma-\alpha))(\alpha - (\sigma-1)\gamma\theta^*(K^*))}{\sigma(\sigma-1)}$$

- Whilst in core periphery the real growth rate becomes:

$$\varphi^*_{cp} = \frac{(2\alpha L - \rho(\sigma-\alpha))\alpha}{\sigma(\sigma-1)}$$

- Hence agglomeration is welfare harming for the South if:

$$\lambda > \frac{\alpha^2 L + (\alpha L - \rho(\sigma-\alpha))(\sigma-1)\gamma\theta^*(K^*)}{\alpha L(\alpha - (\sigma-1)\gamma\theta^*(K^*))}$$

If spillovers are less localized (λ higher) the firms' location is less important therefore the dynamic gain from agglomeration is lower

Conclusions and Policy Implications

In agglomeration we have different effects for the two regions

- The core would be better off enjoying two dynamic gains:
  - The first one is an increase in the growth rate of Manufacture due to the localized knowledge spillovers
  - The second one is a decrease in the decrease in the Services price index growth due to the intersectoral knowledge spillovers
- Instead the periphery would experience two opposite effects:
  - A dynamic gain given by the increase in the growth rate of Manufacture (that is imported from the core) due to the localized knowledge spillovers
  - A dynamic loss due to the fact that southern capital does no longer grow hence the Services price is fixed
- This conclusion clashes with BMO (2001) who state that agglomeration is welfare improving for both regions

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