

# The Economics of European Regions: Theory, Empirics, and Policy

Dipartimento di Economia e Management

Co-funded by the  
Erasmus+ Programme  
of the European Union



Project funded by  
European Commission Erasmus + Programme –Jean Monnet Action  
Project number 553280-EPP-1-2015-1-IT-EPP/JO-MODULE

Davide Fiaschi    Angela Parenti<sup>1</sup>

October 31, 2019

---

<sup>1</sup>davide.fiaschi@unipi.it, and angela.parenti@unipi.it.

- Solow model with poverty trap or better **multiple equilibria** (but why only two?)
  - ✓ **endogenous investment rate**
  - ✓ **endogenous growth rate of population/employment**
  - ✓ **increasing returns to scale (change in output composition)**
  - ✓ **endogenous level of human capital**
- ⇒ **Factor reallocation** across regions
- Core-periphery model: **two sector economy** and factor reallocation across regions
- Solow with **limited technological spillovers**
- Solow with **factor reallocation** across regions and **limited technological spillovers**
- Solow with **many intermediate goods**

# Factor mobility

Two main types of factor mobility:

- Labour mobility
- Capital mobility

Many papers on the effect of factor mobility take into account only one of two. This is however crucial for the result.

For example the famous model by Paul Krugman in 1991 on the emergence of a *core-periphery* structure assume that **only skilled workers migrate** from one region to the other, while unskilled labour no. It also excludes any type of capital mobility.

# Factor mobility (cont.d)

Main determinants of factor mobility:

- Differences in the **actual returns on factors** (i.e. wage, interest rate)
- Differences in the **expected dynamics** of some key variables (i.e. differences in expected growth rates of regional income)
- Differences in **provision of public goods** (i.e. differences in health services, welfare benefits, etc.)
- Differences in **local amenities** (i.e. differences in non-economic variables entering in individual well being as climate, cultural norms, social ties, etc.)

We will take into account only the first determinant, even though many studies suggest that the last two determinants are also crucial in the explanation of migration flows among EU countries and regions

# Labour mobility

- Labour mobility under usual hypothesis of decreasing marginal product to labour lead to a convergence in GDP per worker if workers migrate according to the differences in wages
- Consider two regions, R (rich) and P (poor), with the following Cobb-Douglas production functions:

$$Y_R = K_R^\alpha (A_R L_R)^{1-\alpha} \quad (1)$$

$$Y_P = K_P^\alpha (A_P L_P)^{1-\alpha} \quad (2)$$

where  $K_i$  is the endowment of physical capital of region  $i$ ,  $A_i$  its level of technological progress, and  $L_i$  its level of employment and

$$L = L_R + L_P.$$

# Labour mobility (cont.d)

Under the assumption that labour is paid to its marginal productivity (i.e. factor markets are competitive) we have that real wages  $w$  in the two regions are given by:

$$w_R = \frac{\partial Y_R}{\partial L_R} = (1 - \alpha) K_R^\alpha A_R^{1-\alpha} L_R^{-\alpha} = (1 - \alpha) \frac{Y_R}{L_R} \quad (3)$$

and

$$w_P = \frac{\partial Y_P}{\partial L_P} = (1 - \alpha) K_P^\alpha A_P^{1-\alpha} L_P^{-\alpha} = (1 - \alpha) \frac{Y_P}{L_P} \quad (4)$$

and the reallocation of labour between the two regions should follow:

$$\dot{L}_R > 0 \text{ and } \dot{L}_P < 0 \text{ if } w_R > w_P, \quad (5)$$

and analogously

$$\dot{L}_P > 0 \text{ and } \dot{L}_R < 0 \text{ if } w_P > w_R. \quad (6)$$

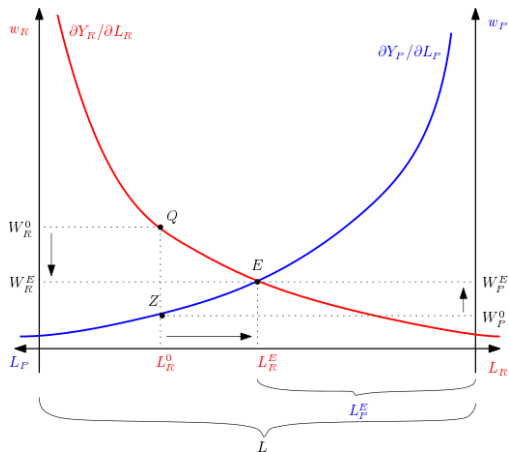
# Labour mobility (cont.d)

In a more complex framework the choice of migration should take into account the **cost of moving**, the **unemployment rate**  $u$ , and the fact that this choice has **intertemporal implications**. Therefore:

$$\dot{L}_R > 0 \text{ if } \sum_{t=0}^T \frac{(1 - u_R) w_R(t)}{(1 + r)^t} > \sum_{t=0}^T \frac{(1 - u_P) w_P(t)}{(1 + r)^t} + \text{Cost of moving,} \quad (7)$$

where  $T$  is the length of working life for a risk-neutral worker, and the probability to be unemployed is assumed to be independent of history.

# Labour mobility (cont.d)



**Figura:** Allocation of labour between the two regions

- The marginal productivity of labour is assumed to be decreasing.
- If the allocation of labour between the two regions is  $(L_R^0, L_P^0)$ , then the differences in wages ( $w_R^0 > w_P^0$ ) causes a reallocation of workers from region  $R$  to region  $P$
- This reallocation will continue until wages in the two regions will be equal, i.e. employment will be  $(L_R^E, L_P^E)$ .



# Labour mobility (cont.d)

The convergence of wages poses serious concern in terms of **political feasibility** given that this implies a declined in  $w^R$ .

In the real world this declines could be offset by the increase in the accumulation of physical capital and of technological progress. In particular, the dynamics of  $w^R$  is given by:

$$\frac{\dot{w}^R}{w^R} = \alpha \frac{\dot{K}^R}{K^R} + (1 - \alpha) \frac{\dot{A}^R}{A^R} - \alpha \frac{\dot{L}^R}{L^R} \quad (8)$$

An example can be the dynamics of wages in Germany after the Reunification.

# Labour mobility (cont.d)

In  $E$  the GDP per worker in the two regions will be the same:

$$w_R^E = w_P^E \Rightarrow \left( \frac{Y_R}{L_R} \right)^E = \left( \frac{Y_P}{L_P} \right)^E \quad (9)$$

- **Migration** is therefore a **strong force of convergence**. This is because there exists a focus of European policy in favour of labour mobility among EU regions and there exists a specific agreement on free mobility of people among the most of EU countries (**Schengen Agreement**).

- Unfortunately, so far this phenomenon was not strong enough to reduce the regional disparities, maybe with the exception of migration from regions of Eastern countries.

- There are many reasons for these insufficient migration flows, the difference in **languages** among EU countries is one of the most important, as well as difference in **cultural norms** and existence of strong **social ties**.

# Increasing returns and output specialization

In a famous contribution in 1991 Paul Krugman discusses how also with labour mobility the presence of **increasing returns to scale** leads to disparities among regions. The aim of the model is also to stress the importance of **structural change** as a crucial perspective to study such a type of phenomenon, i.e. as output specialization can help to explain differences in the level of development.

- Consider two regions, region  $A$  specialized in agriculture, and region  $M$  specialized in manufacturing.
- The production function of the two types of goods are respectively given by:

$$Q_A = F_A(L_A), \quad (10)$$

and

$$Q_M = \kappa F_M(L_M)., \quad (11)$$

where  $\kappa$  is a parameter measuring the technological progress in manufacturing.

# Labour mobility and increasing returns to scale (cont.d)

- Workers can freely move between the two regions and their total number is  $L$ , therefore:

$$L_A + L_M = L. \quad (12)$$

- Assuming that factor markets are competitive, then nominal wage in the two regions are given by:

$$W_A = P_A \frac{\partial F_A}{\partial L_A} \quad (13)$$

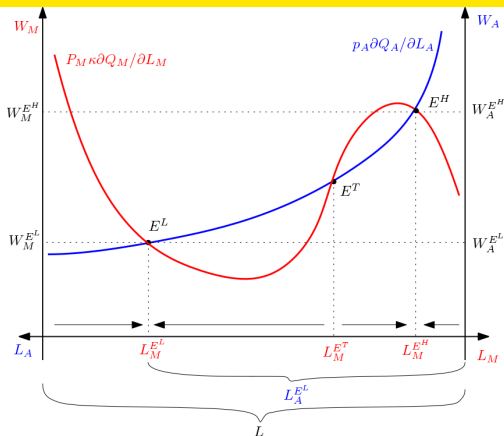
and

$$W_M = P_M \kappa \frac{\partial F_M}{\partial L_M}. \quad (14)$$

- In equilibrium with free mobility between the two regions:

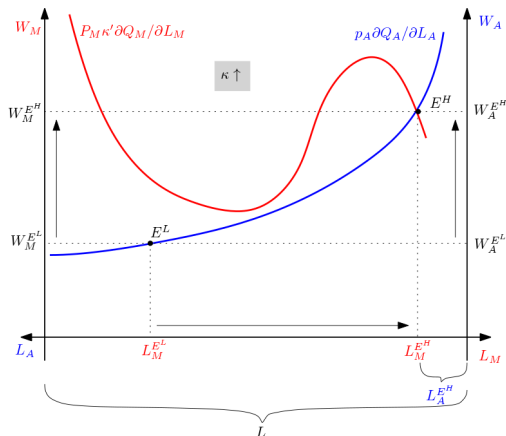
$$W_A = W_M. \quad (15)$$

## Labour mobility and increasing returns to scale (cont.d)



**Figura:** Allocation of labour between the two regions with increasing returns to scale in manufacturing

- The marginal productivity of labour is assumed to be decreasing only in agriculture, while in manufacturing there exists a range of increasing returns to scale, generally justified by the presence of fixed cost in the production of mass consumption goods.
- If the initial allocation of labour in manufacturing is below  $L_M^{E^T}$ , then the size of manufacturing is enough to exploit increasing returns to scale and the two regions converges to low-wage equilibrium  $E^L$ .



**Figura:** Reallocation of labour between the two regions when technological progress increases in manufacturing

- With the increase in the technological progress in manufacturing  $\kappa$  only the high-wage equilibrium  $E^H$  remains.
- There will be a strong migration from agricultural to manufacturing region, with an increase in wage paid in both regions. Such dynamics could happen in a very short time, as during the industrial revolution in many European countries.

Some final remarks:

- In the original model of Paul Krugman there are **high** and **low skilled workers** and only the former can migrate. This lead to differences in GDP per worker in the two regions, i.e. the model can explain **regional specialization, migration, and regional disparities**.
- **History** of a region, i.e. the size of labour markets and the type of production of a region, is the main determinant of the long-run outcome of the region. But also **expectations** can play a role in presence of increasing returns to scale, because the expectations of high returns in manufacturing can lead to a shift of workers in the sector/region, and the latter, in turn, could lead to a change in the long-run outcome.
- **Policy**, e.g. in favour of a reallocation of workers from agriculture to manufacturing, can have a role in presence of multiple equilibria.

# References

Krugman, P. (1991). Increasing returns and economic geography. *Journal of political economy*, 99(3), 483-499.

Krugman, P. R. (1991). *Geography and trade*. MIT press.

Fujita, M., Krugman, P. R., & Venables, A. (1999). *The spatial economy: Cities, regions, and international trade*. MIT press.

Partridge, M. D. (2010). The duelling models: NEG vs amenity migration in explaining US engines of growth. *Papers in Regional Science*, 89(3), 513-536.