Do migrants follow market potentials?
An estimation of a new economic geography model

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Literature

- Fujita, M., Krugman, P. R., Venables, A. J. (1999) The Spatial Economy: Cities, Regions and International Trade. Cambridge: MIT Press.

- Hanson, G. H. (1998) Market potential, increasing returns, and geographic concentration. Working Paper 6429, National Bureau of Economic Research. Revised version: mimeo December 2001.

- Hirschman, A. R. (1958) The Strategy of Economic Development. New Haven: Yale University Press.

- Krugman, P. R. (1991) Increasing returns and economic geography. Journal of Political Economy, 99: 483-499.

- Tabuchi, T., Thisse, J.-F. (2002) Taste heterogeneity, labour mobility and economic geography. Journal of Development Economics, 69: 155-177.

Motivation:

- Although a great deal of theoretical literature has contributed to an improved analysis of economic agglomerations (Fujita, Krugman and Venables, 1999, Neary, 2001), the new economic geography (NEG) has not yet generated a comparable volume of empirical literature.

  Fujita et al. (1999) : “*[. . .] we clearly need much more [empirical] work as closely tied to the theoretical models as possible. [. . .]*”

- considerable interest from researchers and policymakers, especially in the European Union: further integration and successive enlargements may threaten regional cohesion (Puga, 2002)

Research agenda:

- The aim of this paper is
  - to help fill the gap between theoretical and empirical staff
  - answer the questions raised by Fujita et al. (1999):

  – Under what conditions do economies really spontaneously evolve a core-periphery pattern?

  – Is Europe really going to be able to maintain its polycentric industrial geography?

Methodology

- Krugman's (1991) original model describes a Hirschman-type cumulative process (Hirschman, 1958) of spatial agglomeration based on the interaction of **two centripetal forces**:
  - **backward linkage** - influences the *location choice of firms*;
  - **forward linkage -** influences the *location choice of individuals*;

- most empirical investigations referring to NEG models are mainly devoted to the assessment of **backward linkage**:
  1. **HME:** *Davis & Weinstein (1999), Head and Ries (2001), Trionfetti (2001)*, have found strong evidence of HME.
  2. **firms' location choice:** *Friedman et al. 1992, Devereux and Griffith 1998, Head and Mayer 2002, Crozet et al. 2004*, confirm that plants are drawn to regions with good access to demand
  3. **equilibrium equation of the NEG**: *Hanson (1998)* found that greater access to markets ensures higher profits for local firms*, Redding and Venables (2004)* demonstrated that good access to sources of supply and demand positively affects per capita incomes

- In the spirit of Hanson (1998), author performed estimations of a NEG model derived from Krugman (1991)

- unlike most of the empirical literature on the new economic geography, the focus here is on **forward linkage**:

    - the paper examines whether access to markets has a significant positive influence on migration choices analyzing the **core equation of the NEG** model that relates *labour migrations* across regions to the *geography of production* through real wage differentials.

Theoretical framework

- Following Hanson (1998), author extend Krugman's (1991) framework, introducing a *non-traded good* which generates more realistic spatial dynamics.

Production and Consuption:

- R regions, 2 factors: immobile and mobile labour
- 3 goods:
  - a homogeneous "traditional" good (z): PC,CRS, no trade costs, immobile labour, p_z=1
  - services (y) (non-traded between regions) :
  - manufactured goods (x) (iceberg transport costs)

horizontally differentiated varieties, MC, IRtS mobile labour

- $n_{xi,t}$ and $n_{yi,t}$ number of varieties of good x and y in region i at date t
- $L_{i,t}$ total number of mobile workers in region i at date t: $L_{i,t} = L^x_{i,t} + L^y_{i,t}$

$$L^x_{i,t} = n_{xi,t}(\beta_x q_{xi,t} + \varepsilon_x) \quad \text{and} \quad L^y_{i,t} = n_{yi,t}(\beta_y q_{yi,t} + \varepsilon_y) \quad i \in [1, R]$$

- Consumers have identical C-D preferences: $U_{i,t} = C^{\phi}_{yi,t} C^{\mu}_{xi,t} C^{1-\phi-\mu}_{zi,t}, \quad i \in [1, R]$

$$C_{yi,t} = \left(\sum_{m'=1}^{n_{yi,t}} c(m')_{yi,t}^{(\sigma_y - 1/\sigma_y)} \right)^{\sigma_y/(\sigma_y - 1)} \qquad C_{xi,t} = \left(\sum_{m=1}^{n_{x,t}} c(m)_{xi,t}^{(\sigma_x - 1/\sigma_x)} \right)^{\sigma_x/(\sigma_x - 1)}$$

where $\sigma_x,\ \sigma_y$ is elasticity of substitution between varieties, $c(m)_{xi,t}$ is the quantity consumed of variety *m* in region *i* at date *t*, $n_{x,t}$ is the number of available varieties in the economy: $n_{x,t} = \sum_{i=1}^{R} n_{xi,t}$

- as usual in this framework, all producers have the same profit-maximizing price, which is a constant markup over marginal cost => *fob* price is:

$$p_{xi,t} = \frac{\sigma_x}{\sigma_x - 1} \beta_x w_{i,t} \quad \text{and} \quad p_{yi,t} = \frac{\sigma_y}{\sigma_y - 1} \beta_y w_{i,t} \quad i \in [1, R] \tag{1}$$

- using equilibrium condition (free-entry in each sector leads to zero-profit):

$$n_{xi,t} = \frac{L_{i,t}^{x}}{\varepsilon_x \sigma_x} \qquad n_{yi,t} = \frac{L_{i,t}^{y}}{\varepsilon_y \sigma_y} \tag{2}$$

- transport cost is assumed to be an increasing function of the distance between the two regions:

$$\tau_{ij} = B d_{ij}^{\delta} \quad \forall i, j \in [1, R], \quad \delta > 0, \quad B > 0$$

Market potential function:

$$Market\ Potential_i = \sum_{r=1}^{R} (Y_r / d_{ir}) \quad \text{(related to } \textit{Harris 1954}\text{)}$$

- real wage of mobile workers in region i is: $$\omega_{i,t} = \frac{w_{i,t}}{P_{yi,t}^{\phi} P_{xi,t}^{\mu}} \qquad (3)$$

  where $P_{xi,t}$ ($P_{yi,t}$) is the CES price index of the aggregate of industrial (service) goods in region i:

$$P_{xi,t} = \left[\sum_{r=1}^{R} \left(\sum_{m=1}^{n_{xr,t}} \left(\tau_{ir}\, p_{xr,t} \right)^{1-\sigma_x} \right) \right]^{1/(1-\sigma_x)} = \left[\sum_{r=1}^{R} n_{xr,t} \left(B d_{ir}^{\delta}\, p_{xr,t} \right)^{1-\sigma_x} \right]^{1/(1-\sigma_x)} \qquad (4)$$

$$P_{yi,t} = \left(\sum_{m'=1}^{n_{i,t}} \left(p_{yi,t} \right)^{1-\sigma_y} \right)^{1/(1-\sigma_y)} = n_{yi,t}^{1/(1-\sigma_y)}\, p_{yi,t} \qquad (5)$$

price index of manufactured goods can be thought of as the inverse of a market potential function: it exhibits a comparable sum of market sizes in all regions weighted by distances.

- The price index is higher in remote regions where consumers have to import a large part of their demand from distant locations. Similarly, holding constant the nominal wage, workers' real income is lower in regions offering a relatively small number of service varieties. This *price index effect* makes regions with a high density of services and low-cost access to large manufacturing markets more attractive places to live. It is precisely the Hirschman-type **forward linkage** that contributes to the cumulative process of spatial agglomeration.

Migration choice: (model of migration follows that of Tabuchi and Thisse 2002)

- mobile worker *k* from region *j* chooses location among R regions (including *j*)
- his or her migration choice results from a comparison of the perceived quality of life in the various locations.
- migration decisions are based only on **migration costs** and **current expected real wage differences**
- For empirical convenience, author assumes that the migration decision is designed to maximize the following objective function:

$$\pi_{ji,t}^{k} = V_{ji,t}^{k} + \varepsilon_i^k = \ln\left[\omega_{i,t}\rho_{i,t-1}\left[d_{ij}(1+bF_{ij})\right]^{-\lambda}\right] + \mathbf{e}_i^k \qquad i \in [1, R]$$

- where $\rho_{i,t}$ is the employment probability for an immigrant in region *i* at date *t*
- $\left[d_{ij}\left(1+bF_{ij}\right)\right]^{\lambda}$ is a migration cost which increases with the distance between home and host regions ($\lambda > 0$, $b > 0$)
- F_{ij} is a dummy variable: $F_{ij} = \begin{cases} 1, & \text{regions } i \text{ and } j \textbf{\textit{ do not }} \text{share a common border} \\ 0, & \text{otherwise} \end{cases}$
- $\mathbf{e}_i^k$ is a stochastic component capturing *k*'s personal perception of the characteristics of region *i*

- To avoid an endogeneity problem when turning to empirical application, it assumed that migration choices at date t are determined from a comparison of π_{kji} across regions at date $t-1$

- therefore, individual k will choose to locate in region i if $V^k_{ji,t-1} > V^k_{jr,t-1}, \quad \forall r \neq i$

- with convenient assumptions on distribution of $\mathbf{e}^k_i$, the probability of choosing region i is given by the logit function:

$$prob(M_{ji,t}) = e^{V^k_{ji,t-1}} \Big/ \sum_{r=1}^{R} e^{V^k_{jr,t-1}}$$

- the expected migration flow from region j to i and the total outflow from j are:

$$L_{j,t}\, prob(M_{ji,t}), \quad L_{j,t}\left[1 - prob(M_{jj,t})\right]$$

- the share of emigrants from region j choosing to go to region i is:

$$\frac{migr_{ji,t}}{\sum_{i'\neq j} migr_{ji',t}} = \frac{e^{V^k_{ji,t-1}}}{\sum_{r=1}^{R} e^{V^k_{jr,t-1}} - e^{V^k_{jj,t-1}}}$$

using equations (1), (2), (3), (4), (5) and definition of $V^{k}_{ji,t}$, this share can be written as:

$$\ln\left(\frac{migr_{ji,t}}{\sum_{i'\neq j} migr_{ji',t}}\right)=\underbrace{\ln\left[\left(L^{y}_{i,t-1}\right)^{\phi/(\sigma_y-1)}\right]}_{\text{price index for services}}+\boxed{\underbrace{\ln\left[\left(\sum_{r=1}^{R}L^{x}_{r,t-1}\left(w_{rt-1}d^{\delta}_{ij}\right)^{1-\sigma_x}\right)^{\mu/(\sigma_x-1)}\right]}_{\text{price index for manufactured goods}}}+\underbrace{\ln\left[w^{1-\varphi}_{i,t-1}\rho_{i,t-1}\right]}_{\text{expected wage}}+ \tag{6}$$

$$+\underbrace{\ln\left[d_{ij}\left(1+F_{ij}\right)\right]^{-\lambda}}_{\text{measure of mobility cost}}+\tilde{a}_{j,t-1},\quad \text{with}\quad \tilde{a}_{j,t-1}=-\ln\left(\sum_{r=1}^{R}e^{V^{k}_{jr,t-1}}-e^{V^{k}_{jj,t-1}}\right)$$

- corresponds to a market potential function
- relates labour migration to the location of industrial activities $\Rightarrow$ $\boxed{\textbf{forward linkage}}$
- main parameters of the NEG framework (the elasticity of substitution and the parameters of the trade cost function) can be estimated from this price index function

Econometric specifications and data

- *two specifications* of equation (6) were estimated: → gravity equation → NEG equation
- equation (6) is closely related to a simple *gravity equation:* besides **nominal wages** and **employment probability**, the migration flow between two regions increases with the **size of the host region** and decreases with the **geographic distance between the two locations**.

several issues to address before performing estimations:

- a proxy for the **probability of finding a job** would be **the regional employment rate** $E_{i,t-1}$ (i.e. one minus unemployment rate). This variable may be correlated with nominal wages . Hence, to avoid multicolinearity problems, author considers the **expected nominal wage** as a single variable defined by the ***product of nominal wage and employment rate*** (Harris and Todaro, 1970): prob($w_{i,t-1}$)= $w_{i,t-1} E_{i,t-1}$
- variables $\tilde{a}_{j,t-1}$ do not depend on destination region *i*, allow for a more robust specification replacing $\tilde{a}_{j,t-1}$ with a **time trend** and **fixed effects** relative to home regions
- the logarithm of the area of host region log(S_i) in order to control for the bias resulting from the inclusion of unequally-sized regions in the sample
- a dummy variable set to 1 for host regions that are eligible for the European Commission regional funds given under Objectives 1 or 2 (obj_i)

- the **gravity equation** estimated by ordinary least squares is:

$$\log\left(\frac{migr_{ji,t}}{\sum_{i'\neq j} migr_{ji',t}}\right) = \beta_1 \log(L_{i,t-1}) + \beta_2 \log(probw_{i,t-1}) + \beta_3 \log(d_{ij}) + \\ + \beta_4 F_{ij} + \beta_5 \log(S_i) + a_j + \beta_6 \log(trend) + obj_j + \nu_{ij,t} \tag{7}$$

where $L_{i,t-1}$ is total employment in region i, a_j is a full set of home region fixed effects standing in for variables $\tilde{a}_{j,t-1}$ in equation (6), and $\nu_{ij,t}$ is an error term.

- the second specification to be estimated is directly taken from the **theoretical NEG model**. Introducing prob($w_{i,t-1}$), S_i , ob_{ji} , a_j and trend into equation (6), we obtain the following nonlinear testable equation:

$$\log\left(\frac{Migr_{ji,t}}{\sum_{r\neq j} Migr_{jr,t}}\right) = \frac{\mu}{(\sigma_x - 1)} \log\left(\sum_{r=1}^{R} L^x_{r,t-1}\left(w_{r,t-1} d_{ij}^{\delta}\right)^{1-\sigma_x}\right) + \\ + \alpha_1 \log(L^y_{i,t-1}) + \alpha_2 \log(probw_{i,t-1}) - \lambda \log(d_{ij}(1 + bF_{ij})) + \\ + \alpha_3 \log(S_i) + a_j + \alpha_4 \log(trend) + obj_j + u_{ij,t} \tag{8}$$

- definition of the *traditional* sector problem:

According to the theoretical framework, the difference between sector x ('manufactured goods') and z ('traditional good') lies in market structure and the presence of scale economies: the 'traditional' sector should stand for all homogeneous productions with constant returns to scale, while all tradable and differentiated productions with increasing returns to scale should be considered as 'manufactured goods'.

Unfortunately, we do not have detailed sectoral data at the regional level allowing such a classification. The simplest solution, therefore, is to consider **agriculture** as a proxy for 'traditional' production, so that the x sector stands for all manufactured goods (model 1). To test the robustness of the results, we also perform regressions considering both manufactured and agricultural goods as belonging to the x sector. In this specification (referred to as model 2)

It is not possible to provide an estimation of both μ and σx since μ. A simple way to overcome this problem is to treat μ as an exogenous parameter. Recalling that μ is the expenditure share of x goods, we impose $\mu = 0.4$ in model 1 (where x stands for manufactured goods only) and $\mu = 0.6$ in model 2 (where x represents both agriculture and manufacturing).

Data

- **Migration Data***: Regio* database (Eurostat):

- Germany 1983-1992. 10 regions (NUTS 1)
- Italy 1983-1993. 18 regions (NUTS 2)
- Spain 1983-1993. 15 regions (NUTS 2)
- Netherland 1988-1994. 10 regions (NUTS 2)
- Great Britain 1980-1985. 10 regions (NUTS 1)

✪ provides annual bilateral migration data at the regional level

✭ no data at a very detailed geographic level

✭ intra-country migration only

✭ different time span

separate regressions for each country were performed

- **Market size and expected wages**:
  Regio also provides data on:
- sectoral employment
- wages
- unemployment rates
- areas at a regional level

- **Distances**:
  distances are estimated using an electronic road atlas that calculates the length of the quickest route between the two cities (data involving overseas territories, islands and Ulster were dropped)

  The internal distance is proxied by $d_{ij} = (2/3)\sqrt{S_i/\pi}$, where S_i denotes the area of the region (Redding and Venables, 2004).

Results

Gravity-type equation Dependant variable: $\log(migr_{jit}/\sum_{i'\neq j} migr_{ji't})$

	Germany (a)	Germany (b)	Germany (a)	Germany (b)	Spain (a)	Spain (b)	Great Britain (a)	Great Britain (b)
Total employment	0.934^a		0.735^a		0.944^a		0.794^a	
$\log(L_{i(t-1)})$	(0.039)		(0.032)		(0.013)		(0.020)	
Service employment		0.818^a		0.788^a		1.039^a		0.718^a
$\log\left(L^y_{i(t-1)}\right)$		(0.104)		(0.104)		(0.041)		(0.076)
Indus. employment		-0.137		-0.210^b		-0.168^a		0.055
$\log\left(L^z_{i(t-1)}\right)$		(0.093)		(0.090)		(0.042)		(0.086)
Agri. employment		0.264^a		0.302		0.043^a		-0.031
$\log\left(L^z_{i(t-1)}\right)$		(0.045)		(0.043)		(0.020)		(0.064)
Prob-wage	$-2.708^{a\S}$	$-1.126^{a\S}$			-0.357^a	-0.239^a	0.796^a	0.754^a
$\log(w_{i(t-1)}E_{i(t-1)})$	(0.325)	(0.387)			(0.039)	(0.042)	(0.052)	(0.109)
Distance	-0.919^a	-0.907^a	-0.908^a	-0.906^a	-0.807^a	-0.793^a	-0.454^a	-0.489^a
$\log(d_{ij})$	(0.041)	(0.041)	(0.043)	(0.041)	(0.035)	(0.035)	(0.035)	(0.034)
No-border	-0.667^a	-0.602^a	-0.643^a	-0.586^a	$-0,648^a$	-0.671^a	-0.417^a	-0.402^a
F_{ij}	(0.052)	(0.051)	(0.054)	(0.051)	(0.044)	(0.047)	(0.035)	(0.035)
Surface	-0.017	-0.014	0.115^a	0.003	0.043^a	-0.005	0.025	0.020
$\log(S_i)$	(0.024)	(0.037)	(0.018)	(0.033)	(0.013)	(0.017)	(0.022)	(0.033)
a_j (sign)	(+)	(+)	(-)	(-)	(-)	(-)	(-)	(-)
Nb. Obs.	900	900	900	900	2310	2310	540	540
R^2	0.9788	0.9799	0.9772	0.9792	0.9789	0.9798	0.9905	0.9907
F-Stat	2402	2143	2365	2241	4619	4437	3205	2914
Schwarz Criterion	1238.7	1101.6	1300.2	1103.4	3564.1	3404.2	166.7	168.7

Standards errors in parenthesis; a, b = significance at 1 and 5% levels.

§: significant multicollinearity affects the fixed effect and the coefficients relating to Prob-wage.

Gravity-type equation Dependant variable: $\log(migr_{jit}/\sum_{i' \neq j} migr_{ji't})$

	The Netherlands (a)	The Netherlands (b)	The Netherlands (a)	The Netherlands (b)	Italy- Total (a)	Italy- Total (b)	Italy- North (a)	Italy- North (b)
Total employment	0.652^a		0.584^a		0.936^a		0.945^a	
$\log(L_{i(t-1)})$	(0.016)		(0.017)		(0.019)		(0.021)	
Service employment		0.101		-0.013		0.537^a		0.326^a
$\log\left(L^y_{i(t-1)}\right)$		(0.078)		(0.085)		(0.038)		(0.053)
Indus. employment		0.506^a		0.558^a		0.254^a		0.681^a
$\log\left(L^x_{i(t-1)}\right)$		(0.072)		(0.078)		(0.035)		(0.047)
Agri. employment		0.144^a		0.152^a		0.162^a		-0.168^a
$\log\left(L^z_{i(t-1)}\right)$		(0.041)		(0.045)		(0.017)		(0.047)
Prob-wage	$-0.462^{a\S}$	$-4.489^{a\S}$			-0.407^a	0.183	0.801^a	0.705^a
$\log(w_{i(t-1)}E_{i(t-1)})$	(0.414)	(0.411)			(0.089)	(0.121)	(0.136)	(0.136)
Distance	-1.050^a	-1.109^a	-1.146^a	-1.216^a	-0.231^a	-0.241^a	-0.836^a	-0.883^a
$\log(d_{ij})$	(0.035)	(0.038)	(0.037)	(0.040)	(0.024)	(0.025)	(0.036)	(0.040)
No-border	-0.386^a	-0.353^a	-0.353^a	-0.313^a	-0.809^a	-0.789^a	-0.522^a	-0.508^a
F_{ij}	(0.034)	(0.035)	(0.037)	(0.038)	(0.034)	(0.035)	(0.038)	(0.038)
Surface	0.051	-0.149^a	0.137^a	-0.095	-0.024	-0.062	-0.156^a	-0.081^b
$\log(S_i)$	(0.035)	(0.057)	(0.037)	(0.062)	(0.035)	(0.039)	(0.035)	(0.040)
a_j (sign)	(+)	(+)	(-)	(-)	(-)	(-)	(-)	(-)
Nb. Obs.	630	630	630	630	3366	3366	2033	2033
R^2	0.9909	0.9912	0.9891	0.8912	0.9782	0.9782	0.9841	0.9847
F-Stat	3948	3631	3486	3631	6244	5727	5231	5036
Schwarz Criterion	290.7	284.4	400.8	390.4	5856.9	5891.2	3014.8	2946.0

Standards errors in parenthesis; ^{a}, ^{b}= significance at 1 and 5% levels

§: significant multicollinearity affects the fixed effect and the coefficients relating to Prob-wage.

Results

Local manufacturing employment has very little influence on regional attractiveness, and its influence is even significantly negative for Germany and Spain.

- There are possibly two reasons for this:

1. spatial distribution of manufacturers does not influence migrants' location choices

   → workers would not move for better access to manufactures, contrary to the price index effect at the heart of NEG models.

2. local employment in the tradable good is not a relevant proxy for regional access to markets

   → this result justifies the use of a **real market potential function** in the spirit of NEG framework.

- the estimation of equation (8) should settle this issue

Nonlinear Least Squares / Fixed Effects. Dependant variable: $\log(migr_{jit} / \sum_{i' \neq j} migr_{ji't})$

	Germany		Germany		Spain		Great Britain	
	model 1	model 2	model 1	model 2	model 1	model 2	model 1	model 2
σ_x	$3.740^{\#}$	$5.130^{\#}$	$3.850^{\#}$	$5.250^{\#}$	$1.534^{\#}$	$1.601^{\#}$	$1.304^{\#}$	$1.534^{\#}$
(elast. of substitution)	(0.663)	(0.999)	(0.674)	(1.001)	(0.159)	(0.216)	(0.108)	(0.229)
δ	3.619^{a}	2.490^{a}	3.760^{a}	2.560^{a}	0.461^{a}	0.621^{a}	1.536^{a}	1.018^{a}
(transport cost)	(0.524)	(0.351)	(0.521)	(0.348)	(0.161)	(0.164)	(0.210)	(0.138)
α_1	0.723^{a}	0.716^{a}	0.722^{a}	0.715^{a}	0.904^{a}	0.909^{*}	0.725^{a}	0.724^{a}
(service employment)	(0.031)	(0.031)	(0.031)	(0.031)	(0.012)	(0.012)	(0.022)	(0.022)
α_2	-0.079	-0.057			-0.394^{a}	-0.323^{a}	0.205^{a}	0.208^{a}
(prob. wage)	(0.073)	(0.073)			(0.046)	(0.044)	(0.023)	(0.023)
λ	0.922^{a}	0.922^{a}	0.923^{a}	0.923^{a}	0.764^{a}	0.752^{a}	0.475^{a}	0.475^{a}
(migration cost)	(0.040)	(0.040)	(0.04)	(0.04)	(0.035)	(0.035)	(0.036)	(0.036)
b	0.862^{a}	0.856^{a}	0.851^{a}	0.848^{a}	1.412^{a}	1.453^{a}	1.265^{a}	1.267^{a}
(no-border)	(0.145)	(0.145)	(0.143)	(0.144)	(0.220)	(0.229)	(0.289)	(0.288)
α_4	0.684^{a}	0.700^{a}	0.703^{a}	0.715^{a}	0.036^{a}	0.037^{a}	0.235^{a}	0.235^{a}
(surface)	(0.079)	(0.079)	(0.078)	(0.079)	(0.014)	(0.015)	(0.041)	(0.041)
a_j (sign)	(+)	(+)	(-)	(-)	(-)	(-)	(-)	(-)
Nb. Obs	900	900	900	900	2310	2310	540	540
R^2	0.8798	0.8786	0.8796	0.8785	0.8271	0.8269	0.8806	0.8817
MSE	0.1991	0.2011	0.1992	0.2010	0.2472	0.2475	0.0720	0.0713
Schwarz Criterion	1211.6	1220.5	1206.2	1214.4	3495.6	3499.6	212.1	206.8

White consistent standard errors in parenthesis; ^{a},^{b} = significance at 1% and 5% levels; $^{\#}$= greater than 1 at 1% level.

Nonlinear Least Squares / Fixed Effects. Dependant variable: $\log(migr_{jit}/\sum_{i'\neq j} migr_{ji't})$

	The Netherlands		The Netherlands		Italy - Total		Italy - North	
	model 1	model 2	model 1	model 2	model 1	model 2	model 1	model 2
σ_x	$4.316^{\#}$	$5.630^{\#}$	$3.647^{\#}$	$4.626^{\#}$	$3.579^{\#}$	$4.165^{\#}$	$2.751^{\#}$	$3.283^{\#}$
(elast. of substitution)	(1.101)	(1.715)	(0.709)	(1.060)	(0.381)	(0.430)	(0.326)	(0.392)
δ	1.416^{a}	1.074^{a}	1.783^{a}	1.366^{a}	3.545^{a}	2.357^{a}	2.711^{a}	1.915^{a}
(transport cost)	(0.298)	(0.241)	(0.299)	(0.241)	(0.160)	(0.106)	(0.226)	(0.153)
α_1	0.463^{a}	0.469^{a}	0.429^{a}	0.435^{a}	0.974^{a}	0.963^{a}	0.936^{a}	0.945^{a}
(service employ.)	(0.027)	(0.029)	(0.027)	(0.027)	(0.020)	(0.019)	(0.022)	(0.022)
α_2	-0.454^{a}	-0.453^{a}			-0.059^{b}	0.043	0.044	0.073^{b}
(prob. wage)	(0.077)	(0.077)			(0.027)	(0.027)	(0.036)	(0.036)
λ	1.019^{a}	1.023^{a}	1.022^{a}	1.027^{a}	0.313^{a}	0.291^{a}	0.819^{a}	0.812^{a}
(migration cost)	(0.041)	(0.041)	(0.042)	(0.041)	(0.023)	(0.023)	(0.037)	(0.037)
b	0.514^{a}	0.508^{a}	0.516^{a}	0.509^{a}	9.044^{a}	11.836^{a}	0.884^{a}	0.901^{a}
(no-border)	(0.075)	(0.074)	(0.077)	(0.076)	(2.632)	(3.77)	(0.129)	(0.132)
α_4	0.469^{a}	0.452^{a}	0.601^{a}	0.584^{a}	0.032	0.047	0.001	-0.019
(surface)	(0.078)	(0.079)	(0.077)	(0.078)	(0.034)	(0.032)	(0.035)	(0.034)
a_j (sign)	(+)	(+)	(-)	(-)	(-)	(-)	(-)	(-)
Nb. Obs	630	630	630	630	3366	3366	2057	2057
R^2	0.9135	0.9136	0.9086	0.9088	0.7851	0.7932	0.8599	0.8591
MSE	0.0875	0.0873	0.0922	0.0921	0.3489	0.3357	0.2366	0.2379
Schwarz Criterion	356.1	355.2	384.1	383.2	6073.1	5943.1	3044.4	3056.4

White consistent standard errors in parenthesis; ^{a}, ^{b}= significance at 1 and 5% levels; $^{\#}$= greater than 1 at 1% level.

Results – NEG Equation

- all the parameters defining the **market potential function** are significant.

- In accordance with the NEG model’s prediction, access to **manufactured** commodities do influence **workers’ mobility** since it is measured by a grounded market potential function.

- as expected, migrants do follow market potentials

Simulations exercices

- **The break point:**

Breaking points (Threshold relative distances $[d_{ij}/d_{ii}]_{Break}$)

	Germany	Spain	Italy	Great Britain	The Netherlands
Model 1	1.21	BH	1.63	BH	1.56
Model 2	1.35	BH	2.49	BH	2.00

BH = *black hole condition*

$$\left(\frac{d_{ij}}{d_{ii}}\right)_{Break} = \left[\frac{[\sigma_x(1+\mu)-1]\,(1+\mu)}{[\sigma_x(1-\mu)-1]\,(1-\mu)}\right]^{1/[\delta(\sigma_x-1)]}.$$

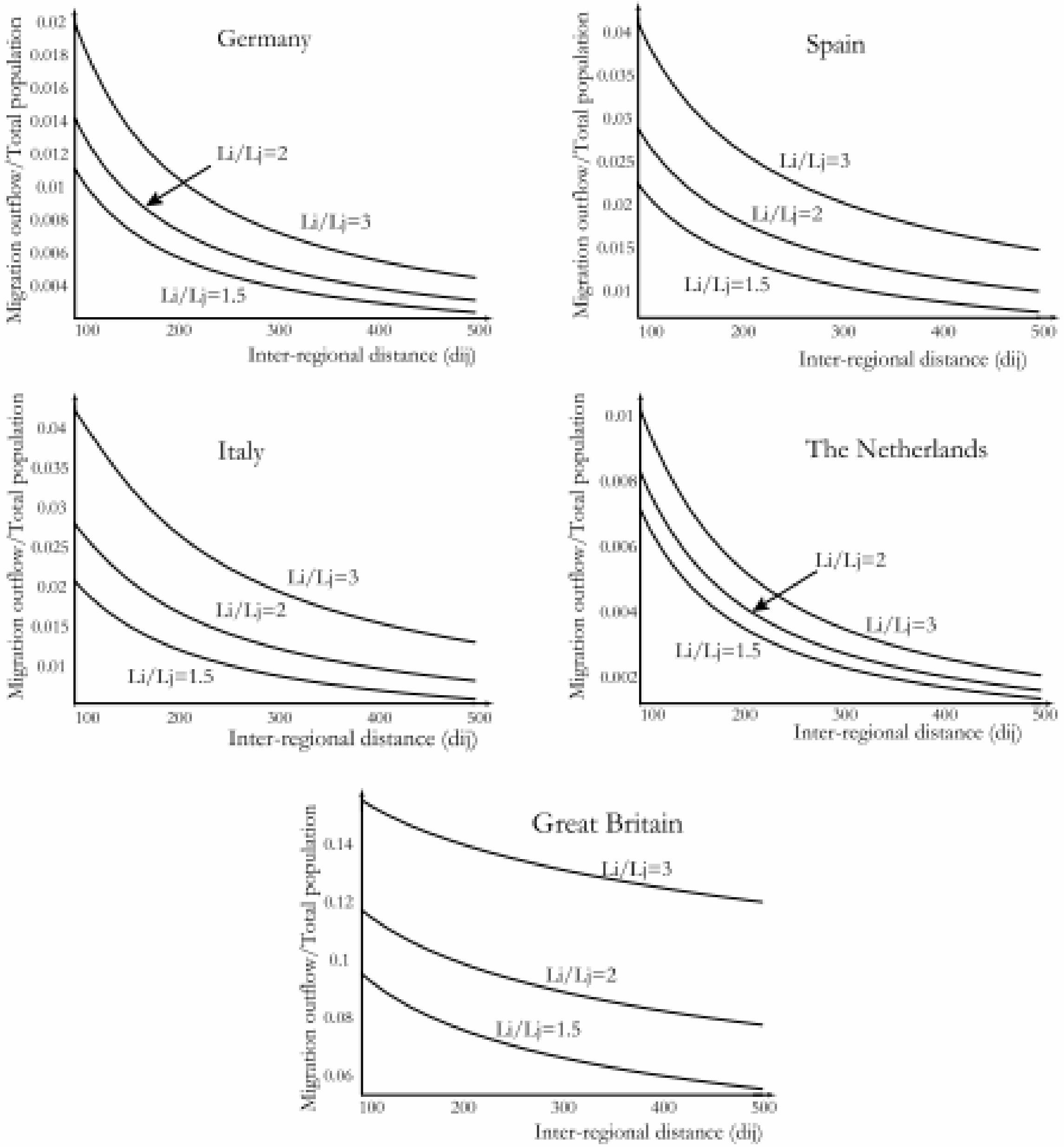
in Germany, Italy and the Netherlands the threshold relative distances are relatively short (between 1.2 and 2.5 times the internal distance of a central region), which suggests that the scope of centripetal forces is small.

- **Predicted migration flows:**

The author figure the predicted gross share of emigrants for different relative regional sizes. Such a simulation shows, using all estimated parameters, the strength of the response of the European workforce facing a given regional inequality.

$$\frac{Migr_{ji}}{L_j} = \frac{\Delta}{\Delta + [d_{ij}(1+b)]^{\lambda}} \quad ; \quad \Delta = \frac{L_i^{\alpha_1}\left(L_i(d_{ii}^{\delta(1-\sigma_x)}) + L_j(d_{ij}^{\delta(1-\sigma_x)})\right)^{\mu/(\sigma_x-1)}}{L_j^{\alpha_1}\left(L_j(d_{jj}^{\delta(1-\sigma_x)}) + L_i(d_{ij}^{\delta(1-\sigma_x)})\right)^{\mu/(\sigma_x-1)}}.$$

Rates of emigration: $Migr_{ji}/L_j$. ($w_i = w_j$; $d_{ii} = d_{ij} = 100$)



Conclusions

Gravity equation:

- The results indicate that wealthy regions attract more migrants. However, this is mainly due to the influence of the local supply of **services**, whereas local **manufacturing employment** seems to have **no** influence on migration flows.

failure of the ***price index effect*** hypothesis

Migration equation derived from a NEG model:

- The relatively good fit displayed by the NEG model and the concordance in sign and magnitude between the estimated parameters and the theoretical predictions proves the empirical validity of this theoretical framework.

forward linkage emphasized by NEG models is relevant.

Conclusions

Simulations of the theoretical model, based on the parameters estimated, suggest that **centripetal forces -** except in Spain and Great Britain - are **very limited** in geographic scope.

Moreover, in all of the five countries, barriers to migration are high enough to balance the centripetal forces.

It seems very unlikely that a catastrophic core-periphery pattern will emerge within European countries.

Thank you for attention