# What explains specialisation in Business Services?

## Agglomeration economies, Hirschmann linkages and knowledge in European regions

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# My privileges as a keynote speaker: the devil‘s advocate

- Providing a counter–argument to the focus on global(isation) by reminding that local(isation) of production processes still matters
- Focusing on Europe as a ‘warning‘ for LACs of the possible ‘side effects‘ of the growth of services
- Bringing back into the picture the role of industrial and innovation (local) policy

# Why Business Services?

- The most dramatic evidence of structural change after the first industrial revolution (Peneder, Kaniovsky, and Dachs, 2003; Schettkat and Yocarini, 2006)
- Interesting 'schizophrenic' attitude by scholars and policy makers:
  - from the threat of deindustrialisation linked to the productivity slowdown (Kaldor, 1966; Baumol, 1967; Rowthorn and Ramaswamy, 1999)
  - to the revamping optimism linked to the 'knowledge economy' (Beyers, 2002; EC, 2011) and the role of KIBS (Muller and Doloreux, 2009)
- Technological innovation enters the debate and seems to 'reconcile' the two opposites

# Outline

- Brief overview of the 'schizophrenia' revolving around services
- Services within Innovation Studies
- Empirical contribution nesting these two literatures, with an emphasis on the regional dimension:
  - Does specialising in services entail de–industrialisation **and/or** spatial polarisation of growth?
  - How should local/regional policies 'adjust' to the increasing specialisation of services?
- Implications for structural change and innovation policy in LACs
- Way forward: new challenges for RESER/REDLAS research agenda

# The three stages growth theory: a revival in emerging countries?

- The 'Old optimist' school (Fisher (1935); Clark (1940); Fourastié (1949))
  - Growth of services as an indicator of a further stage of development following mass industrialisation
  - A symptom of an increasing income– and consumption– capacity
  - A consequence of a shift of final consumption towards superior goods (Engel's Curve)

# The 'Side effects'

- The 'Old pessimist' school (Baumol and Bowen (1966); Baumol (1967); Kaldor (1966); Fuchs (1968))
  - The 'Baumol's cost disease' behind increasing shares of service employment in advanced economies
  - Absence of increasing returns to scale: the Kaldor–Verdoorn Law not verified in services
  - 'Side effects' of tertiarisation in terms of productivity slowdown
  - Threat of 'de–industrialisation' rather than relief of post–industrialisation

# Technical change enters this debate: 50 years of Innovation Studies

- Blossomy maturity or mid–life crisis? (Martin, 2010, 2012)
- From ‘visible‘ to ‘hidden‘ innovation (beyond R&D and patents)
- From innovation for productivity and growth to innovation for sustainability and development
- From entrepreneurial innovation to ‘inclusive‘ innovation (EU, 2010; Lundvall, 2012)
- From ‘winner take all‘ to ‘fairness for all‘ - inequality effect of innovation or the economics of ‘superstar‘ (Rosen, 1981)

# Services in 50 years of IS? The fate of 'residual'

- Innovation in services non–technological and non–radical in nature
- Not especially R&D–based (except the sector private R&D)
- Not measurable through traditional indicators (Patents, R&D)
- Information and Communication Technology as a general purpose technology for services
- ICT–based but not always productivity–enhancing

# Our contribution

- We look at the factors explaining regional specialisation in business services by:
  1. Nesting different theories – agglomeration economies, Hirschmann linkages and technology
  2. Testing them within a spatial econometric framework (LeSage, 2004; LeSage and Fischer, 2008)

# Why regions?

- Cross country growth divergences are to be found in regional polarisation of employment and productivity growth (Fagerberg, Verspagen, and Caniels, 1997)
- Regional convergence and catching–up are related to sectoral specialisation of regions and their ability to change their sectoral structures
- There is still quite a lively debate on the extent to which the 'World is flat (Leamer, 2007) or whether geographical proximity matters for knowledge flows across sectors
- EU is made of regional 'clubs' and spatial clusters of technology excellence (Verspagen, 2007)

# Marshall's 'Holy Trinity'

- Industrial 'atmosphere' (Marshall, 1920) and *localisation externalities* stemming from sectoral density (Van Oort, 2007; McCann and van Oort, 2009)
- Labour market conducive of specialised skills and knowledge endowments and *urbanisation externalities* from urban density independently from sectors (Glaeser, 1999; Glaeser, Kallal, Scheinkman, and Shleifer, 1992; Henderson, Kuncoro, and Turner, 1995)
- Local consumer and supplier markets and density of Hirschmann's backward and forward linkages (Hirschmann, 1958)

# Hirschmanns linkages

- Local development theories (Jones, 1976) focus on the 'inducement mechanisms' coming from 'high–linkages' sectors
- What are them? 'The input-provision, derived demand, or backward linkage effects, i.e. every non primary economic activity, will induce attempts to supply through domestic production the inputs needed in that activity. The output-utilization or forward linkage effects, i.e., every activity that does not by its nature cater exclusively to final demands, will induce attempts to utilize its outputs as inputs in some new activities (Hirschmann, 1958)
- Intermediate demand in general explains much of the growth of BS across countries (Guerrieri and Meliciani, 2005; Savona and Lorentz, 2006)
- Service firms tend to locate where their clients are; high intensive service users migrate where new specialised input–providers locate elsewhere, despite prophecies of 'flat world' (Duranton and Puga, 2005)

# ICT and knowledge infrastructure

- ICTs are the natural general purpose technology for business services (Cainelli, Evangelista, and Savona, 2006; Castellacci, 2008)
- Business services have turned into Knowledge Intensive Business Services – despite they do not make use of R&D (Gallouj and Savona, 2009)
- BS are intensive users of highly skilled human capital, specialised in both S&T and in 'soft' disciplines (Kox and Rubalcaba, 2007)

# Translating constructs into empirical proxies: Marshallian trinity

- Localisation externalities: BS = share of employment in BS over total employment of region $i$ at time $t$
- Urbanisation externalities:
  1. POP = population density
  2. CAPITALS = dummy for regions with capitals
  3. HC = share of population with tertiary education/employees with degrees in S&T
- S&T knowledge:
  1. RD = public R&D expenditures over GDP
  2. ICT = Patents in ICT over population

# Translating constructs into empirical proxies: Hirschmann linkages

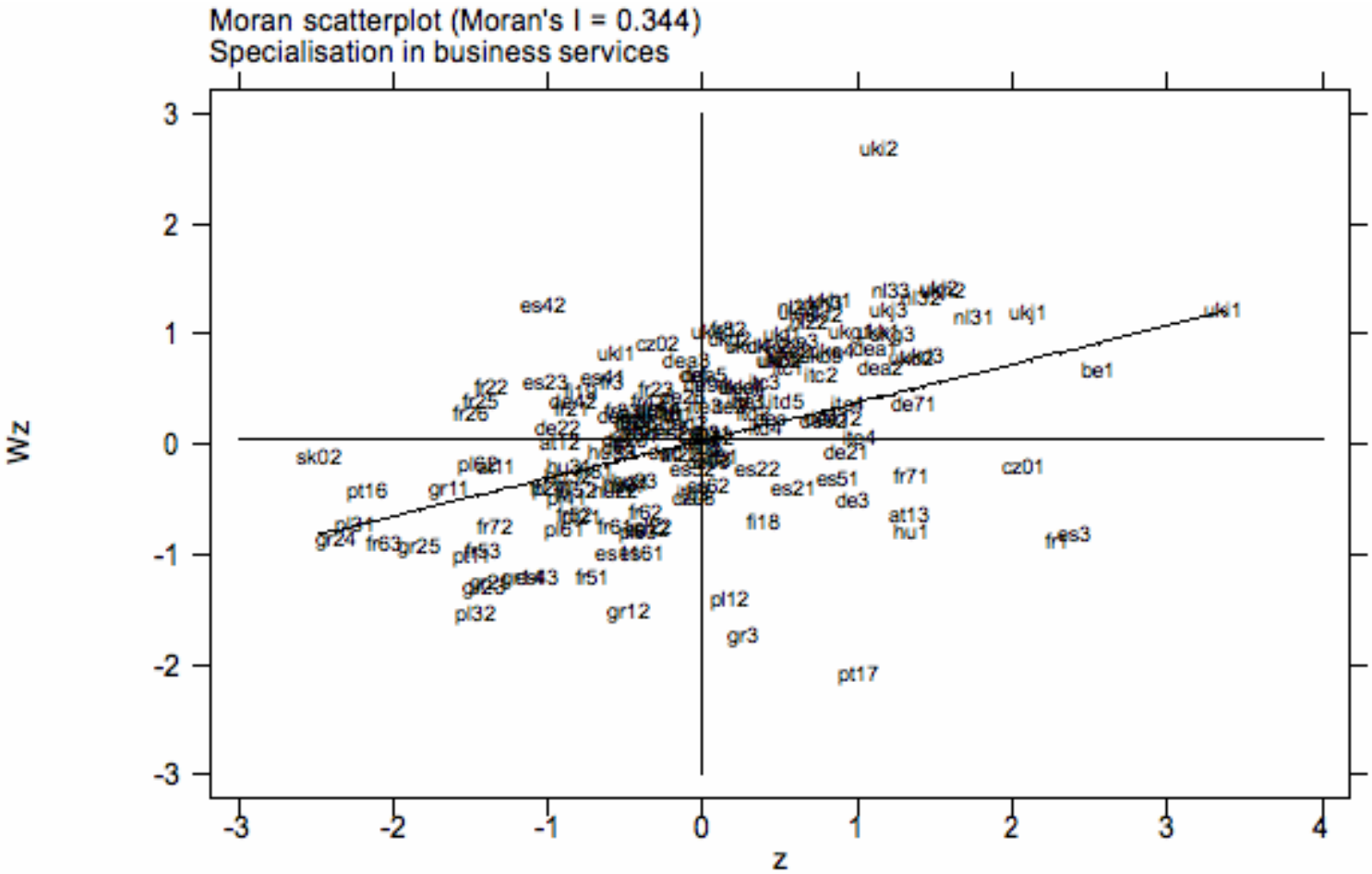
- Hirschmanns FW linkages: $INTDEM_{it} = \frac{\sum_{j=1}^{m} W_j E_{ijt}}{\sum_{j=1}^{n} E_{ijt}}$
  where: $i =$ region, $j =$sector, $t =$time, $m =$number of above average BS users manufacturing sectors, $n =$total number of sectors, $E =$employment, $W =$weight given by the average – across European countries – share of business services in total industry output computed from Eurostat symmetric I/O tables for 2000.

# Empirical strategy

- Descriptive overview of spatial distribution of key variables:
  1. Moran's scatterplot (linear associaltion between a vector of observed values and a vector of spatially weighted avgs of neighbouring values)
  2. Overview of the high and low specialised BS regions
- Spatial Durbin Model: what is the intuition? (LeSage and Fischer, 2008)
- A change in an explanatory var in the typical region $i$ has a:
  1. direct impact on region $i$
  2. indirect impact on neighbouring regions (like a propagation effect, labelled average total impact from an observation)
  3. **indirect impact from neighbouring regions** (effect of changes in neighbouring regions on the tipical region, labelled average total impact on an observation)

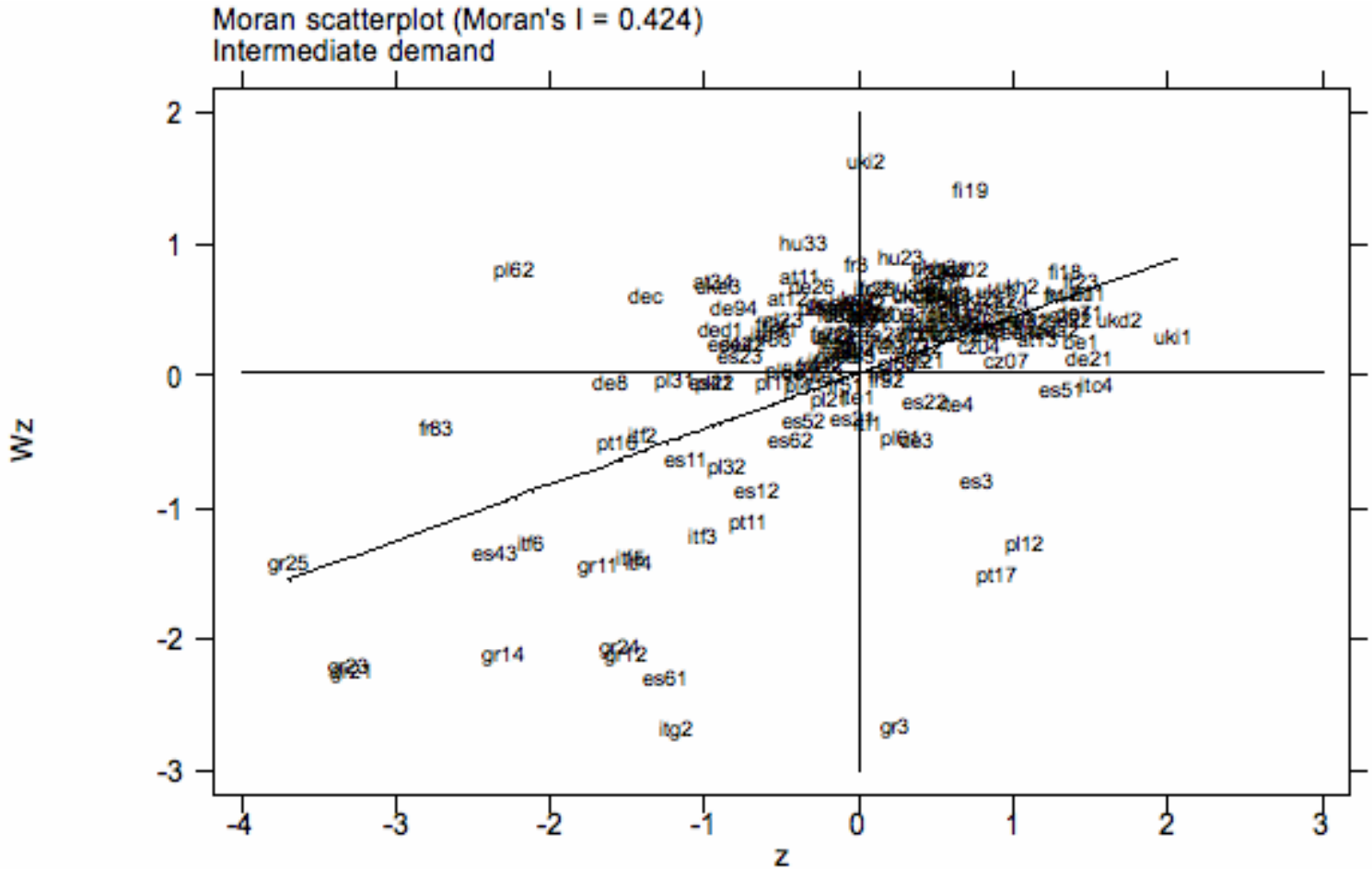
# Spatial distribution of key variables I

**Figure:** Moran's scatterplot of specialisation in business services



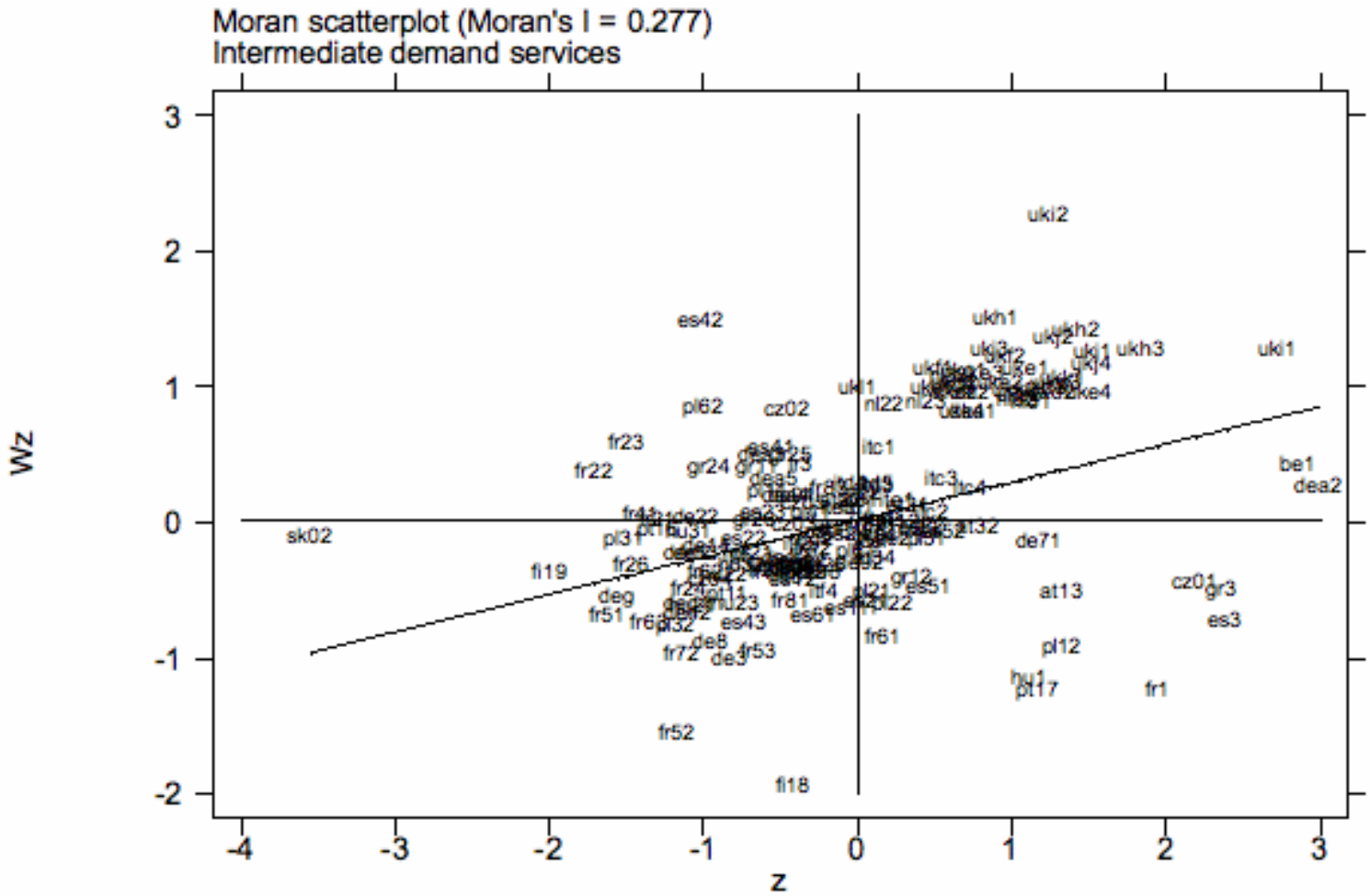
# Spatial distribution of key variables II

**Figure:** Moran's scatterplot of specialisation in high manufacturing users of BS



# Spatial distribution of key variables III

**Figure:** Moran's scatterplot of specialisation in high service users of BS



# Regional high specialisation in BS

**EU Regional Comparative Advantage in BS: Highly specialised regions**

| Regio | CA |
|---|---|
| Inner London | 5.81 |
| Rgion de Bruxelles-Capitale | 3.54 |
| Comunidad de Madrid | 3.14 |
| Ile de France | 2.98 |
| Berkshire, Bucks and Oxfordshire | 2.68 |
| Utrecht | 2.48 |
| Lisboa | 2.41 |
| Noord-Holland | 2.21 |
| Bedfordshire, Hertfordshire | 2.19 |
| Hamburg | 2.11 |
| Surrey, East and West Sussex | 2.05 |
| Darmstadt | 2.03 |
| Rhone-Alpes | 1.98 |
| Oslo og Akershus | 1.95 |
| Kozp-Magyarorszg | 1.95 |
| Hampshire and Isle of Wight | 1.95 |
| Wien | 1.94 |
| Cheshire | 1.91 |

# Regional low specialisation in BS

**EU Regional Comparative Advantage in BS**

| Regio | CA |
|---|---|
| Devon | 1.09 |
| Attiki | 1.08 |
| Leipzig | 1.07 |
| Tees Valley and Durham | 1.06 |
| Mazowieckie | 1.06 |
| Etela Suomi | 1.05 |
| Shropshire and Staffordshire | 1.05 |
| Zeeland | 1.04 |
| Oberosterreich | 1.04 |
| Veneto | 1.02 |
| Detmold | 1.02 |
| Umbria | 1.01 |
| Region Autonoma da Madeira (PT) | 1 |

# Sectoral distribution of intermediate demand of BS

**Share of BS on total input and output of selected industries, 2005, av. EU-27**

| Sectors | Share on inputs | Share on output |
|---|---|---|
| Agriculture and fishing | 0.04 | 0.02 |
| Mining and quarrying | 0.09 | 0.05 |
| Electricity, gas, water, constr. | 0.10 | 0.05 |
| High tech manufacturing | 0.11 | 0.07 |
| Medium-high tech manufacturing | 0.07 | 0.05 |
| Medium-low tech manufacturing | 0.05 | 0.04 |
| Low tech manufacturing | 0.06 | 0.04 |
| High tech KIS | 0.27 | 0.12 |
| KIS | 0.15 | 0.07 |
| Less KIS | 0.17 | 0.08 |
| Financial intermediation | 0.27 | 0.12 |
| Non market services | 0.19 | 0.08 |

# General form of Spatial Durbin Model

$$Y_t = \rho W Y_t + X_t \beta_1 + W X_t \beta_2 + \lambda_t e_N + \nu_t$$

where:

- $Y_t$ denotes a Nx1 vector of an obs for each spatial unit of the dependent var in time t
- $X_t$ is an NxK matrix of independent vars
- $W$ is a NxN non negative spatial weight matrix with zeros on diagonals
- $\rho$, $\beta_1$ and $\beta_2$ are response parameters
- $\lambda_t$ denotes a time–specific effect
- $\nu_t$ is a Nx1 vector of residuals for every spatial unit with mean=0 and variance $s^2$

# Which spatial specification?

- A SDM is appropriate when there is a spatial correlation among vars or disturbances - independently from economic considerations
- SDM nests a Spatial Autoregressive Model (SAR) when $\beta_2 = 0$ (included a spatial lag of dep. var.)
- SDM is reduced to a Spatial Error Model (SEM) when $\beta_2 = \rho(\beta_1)$ (errors spatially correlated)
- SDM boils down to a non–spatial specification if $= \rho = 0$ and $\beta_2 = 0$

# Testing spatial interactions

- Choice of spatial weight matrix: defining the boundaries within which spatial interactions between BS and their determinants occur, usually *distance based matrix*
- Defining distance: great circle distance between regional centroids (LeSage and Fischer, 2008)

  $w_{ij} = 0$, if $i = j$;
  $w_{ij} = \frac{1}{d_{ijk}}$ if $d_{ij} \leq D$;
  $w_{ij} = 0$ if $dij > D$
  $w_{ij}$ is an element of the row standardised weight matrix W;
  $d_{ij}$ great circle distance between region centroids;
  k defines the functional form (k=2 inverse of squared distance);
  D is the cut–off parameter above which spatial interactions are considered negligible (minimum allowing each region to have at least one neighbour)

# Spatial Durbin estimates

| Variables | Coefficient | Direct effect | Indirect effect | Total effect |
|---|---|---|---|---|
| INTDEM | 0.18 *** | 0.178 *** | -0.06 | 0.115 * |
| HC | 0 | 0.001 | 0.026 | 0.028 |
| ICT | 0.017 ** | 0.019 *** | 0.029 * | 0.048 *** |
| R&D | 0.034 *** | 0.035 *** | 0.012 | 0.047 |
| POP | 0.178 *** | 0.185 *** | 0.088 *** | 0.273 *** |
| CAPITALS | 0.390 *** | 0.360 *** | -0.44 *** | -0.07 |
| Lag BS | 0.487 *** | | | |
| Lag INTDEM | -0.12 *** | | | |
| Lag HC | 0.015 | | | |
| Lag ICT | 0.007 | | | |
| Lag R&D | -0.01 | | | |
| Lag POP | -0.04 | | | |
| Lag CAPITALS | -0.44 *** | | | |

$R^2$=0.697
Log-likelihood=-237.72
Observations=820

# Results

## Intermediate demand

BS have grown dramatically as a share of intermediate demand: in 2005 the share of BS services in total intermediate demand is as high as that of all manufacturing sectors (about 30%)

## Specialisation

Because of vertical linkages, BS specialisation of countries and regions is very much linked to specialisation in high-BS users sectors, confirming (Hirschmann, 1958)

## Agglomeration

BS have increasingly spatially concentrated across EU regions and - with the exception of capital regions - they have 'followed' their users

## Knowledge

Both ICTs and R&D *within* the region favour BS specialisation, *though not* human capital

# Results

## Spatial dependence: indirect effects

- Being surrounded by highly populated regions favours BS specialisation
- Being surrounded by capital regions exerts a displacing effect on BS specialisation
- Indirect intermediate demand has no significant effect: potential positive effect of intermediate demand coming from neighbouring regions might be compensated by a crowding–out effect
- Unlike ICT-related spillovers, public R&D seems to remain confined to the regional boundaries: complementarities between private and public R&D *within* the region though not *across* regions.

# Wrapping up

- Unifying framework accounting for intersectoral linkages beyond traditional agglomeration economies
- Accounting for the role and specificities of innovation in services, beyond traditional R&D
- Urban/periphery (both within and across regions) disparity seem to emerge and be favoured by BS concentration in cities: implications for regional and territorial cohesion policy
- BS tend to locate where there is a prior specialisation in high-tech manufacturing: de-industrialisation seems to be disproved - at least at the regional level
- Public–private R&D complementarity seems to be confined to the regional boundaries

# Implications for regional policy

- Findings support rejection of the 'footloose hypothesis' Wernerheim and Sharpe (2003)
- This implies that BS are **less responsive** to regional policy aiming at favouring their location in peripheral regions
- Effectiveness of subsidisation interventions aiming at facilitating location in regions not specialised in BS-user sectors is deemed to fail
- Rather, in line with Asheim et al., (2011) public policy aiming at 'contructing regional advantage' should aim at 'guiding' regions to diversify into 'related' sectors (Frenken et al., 2007) and new growth paths

# Implications for structural change and innovation policy

- In this context, advocacies for policy for ‘smart specialisation‘ make less sense if they disregard existing specialisation and do not aim to build on it
- A comparative advantage relying on KIBS (‘smart specialisation‘?) would not be achievable without a:
  - Appropriate mix of innovation and industrial policy to relaunch ‘old manufacturing‘ and rural areas
  - leading to an increasing demand for knowledge-based services
  - and an 'up-grading' of existing sectoral specialisation

# Implications for structural change and innovation policy in LACs

- KIBS and existing specialisation in some of LACs: a new model for structural change?
  - A potential comparative advantage of LACs might be linked to KIBS for Natural Resource Based Industries (Marin and Perez, various)
  - The conjecture is that technical change is creating opportunities for new Hirschmann linkages in both NR based industries AND services
  - This would potentially reverse the double 'curse' or 'disease' which has historically been attributed to both macro–sectors
  - Innovation is crucial for technological upgrading in both NR and services industries

# Implications for structural change and innovation policy in LACs

- Open questions:
  - To what extent this model would ensure 'inclusiveness'?
  - How would this shape the geography of structural change in LACs?
  - Would this model ensure a new positioning of LACs in the GVC of KIBS for NR based industries?

# Way forward: New challenges for RESER/REDLAS research agenda

- New scope for Hirschmann linkages: Structural changes and KIBS growth
- New challenges for innovation theory in relation to KIBS in emerging countries
- New challenges for (economics of) innovation studies on public and public–private services
- Complementarities between local and global policies are a must

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