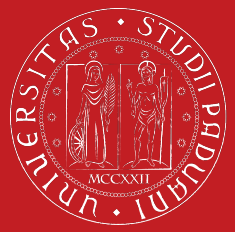

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Urban density and vertical disintegration

The case of KIBS in Milan and Lombardy

Roberto Antonietti*

Giulio Cainelli

Department of Economics and Management "Marco Fanno"
University of Padua
*E-mail: roberto.antonietti@unipd.it

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Agenda

- Aim of the research programme
- Background literature
- Data and variables
- Estimation results
- Preliminary comments
- Future research

Aim

- Empirically assess the relationship between spatial agglomeration and firm boundaries
- In particular, the role of the spatial concentration on vertical disintegration
- Look at service firms, and in particular knowledge-intensive business services (KIBS)
- Follow-up of previous research (see Antonietti and Cainelli, *Int. J. Services Technology and Management*, vol. 10, n. 2/3/4, Special Issue on KIBS
- Geographical context: Lombardy region + metropolitan area of Milan

Backround literature: theory

- Literature on the determinants of vertical disintegration/outsourcing
  - Transaction costs economics Vs Industrial Organization
- Focus on regional and urban economics literature ➔ spatial concentration of industry and vertical (dis)integration of firms
- Stigler (1951) + Hoover (1943) + Chinitz (1961): concentration of industry may encourage vertical disintegration, i.e. the tendency to obtain inputs from specialised outside suppliers rather than making them within an integrated plants
- Main theoretical motivations:
  1. reduction in transport, search, and managerial costs (Goldstein and Gronberg, 1984)
  2. reduction in opportunistic behaviour by increased mutual visibility and reciprocal trust (Helsley and Strange, 2007), particularly when dealing with innovation processes and complex transactions (Love and Roper, 2001)

Backround literature: empirical evidence

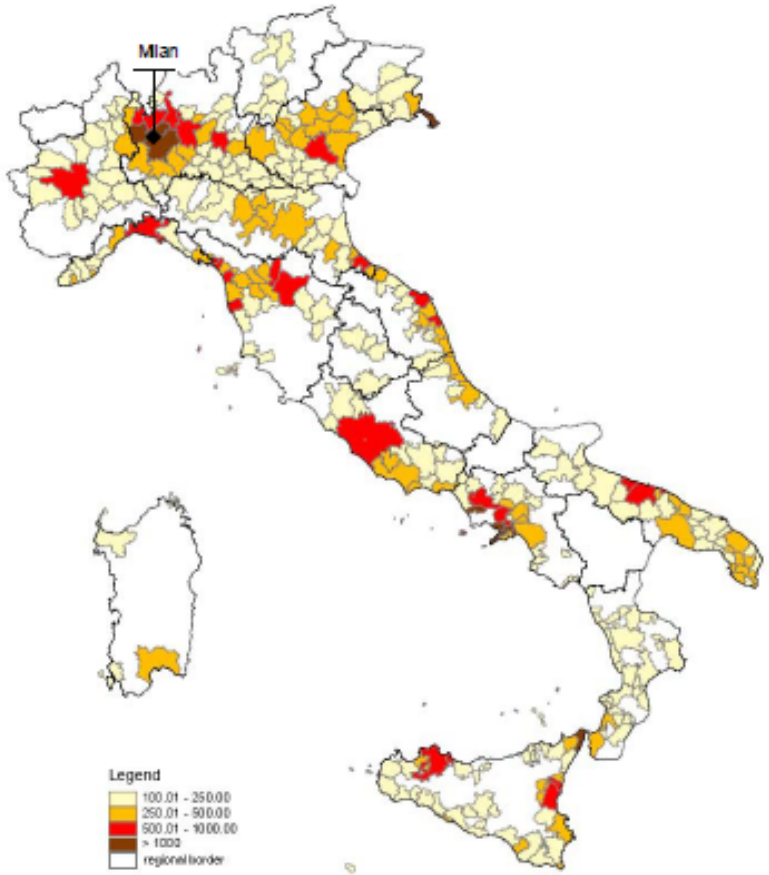
- Holmes (1999): Census data on US manufacturing plants in 1987
- Intensity of (material) inputs purchase is positively correlated to the level of employment of neighbouring plants in the same industry (1000 increase in emp = +0.04% using standard OLS)
- Similar results by Li and Lu (2009) for Chinese manufacturing firms in 2002 (+0.017% OLS, +0.098% IV)
- Ono (2001, 2006), US manufacturing firms 1992
- A final producers is more likely (+7-25%) to outsource services when located in thicker markets ➔ higher availability of suppliers, lower prices
- Taymaz and Kiliçaslan (2005) for Turkish manifacturing (1993-2000)
- Rama and Calatrava (2002) + Rama et al. (2003) for Spanish electronic industry (1995-1997)
- For Italy: Antonietti and Cainelli (2008) on **KIBS** + Antonietti, Ferrante and Leoncini (2009) with data from *Studi di Settore* + Burker and Minerva (2010), on social capital at the Province level + Cainelli and Iacobucci (2009, 2011) on Italian business groups + Mazzanti et al. (2009)

Data

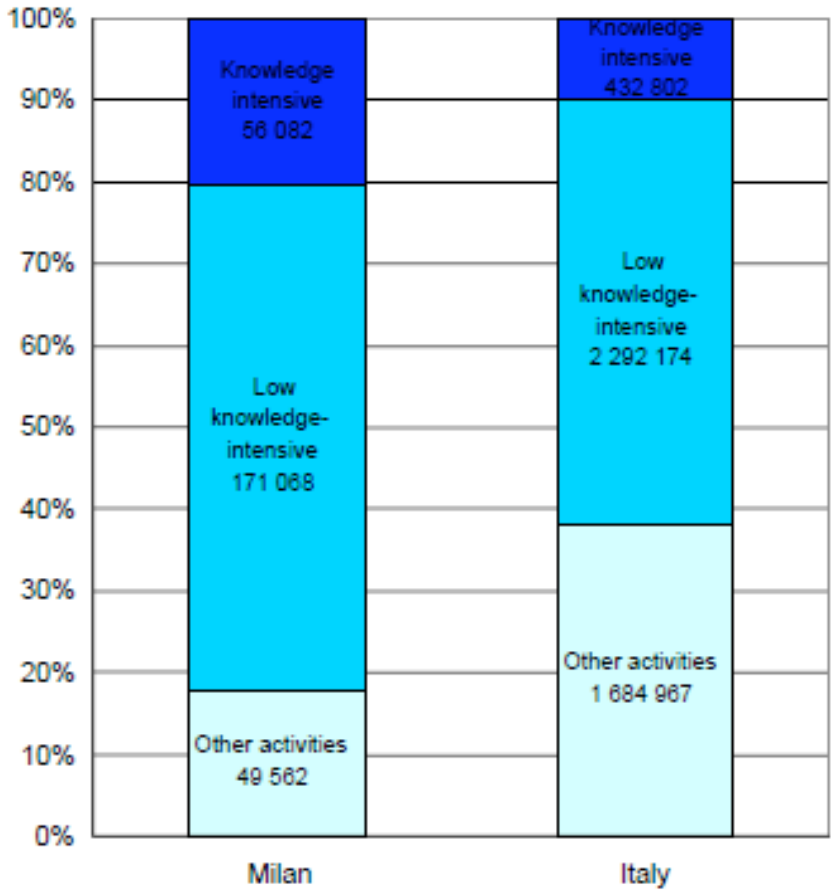
- Dataset AIDA (Bureau Van Dijk)
- Information on balance sheet data
- **1st dataset**: service firms (headquarters) located in the Metropolitan Area of Milan (almost 82000 in 2008)
- KIBS = professional, technical and scientific activities

Milan

- The most densely populated area of Italy (Istat, 2001)



- Key role of (knowledge-intensive) business services



Variables

- Vertical disintegration index $$VDIS_{it} = \left(\frac{CS}{TC} \right)_{it}$$

- CS = value of purchased business services (energy, transport, travel and accomodation, repairing and maintenance, advertising and marketing, reinbursements, cleanings, vigilance and security, training…
- TC = total production costs = CS + depreciation + labour costs + other costs
- Explanatory variables:
  - AGE = 2008 – birth date of the firm (in natural logarithm)
  - SIZE = 2008 value of output (in natural logarithm)
  - $SIZE^2$
  - URBAN DENSITY = Population/Km^2 (at LLS level, 2001)

Descriptive statistics

Table 1. Sample firms distribution by industry and degree of vertical disintegration

	Firms		Vertical disintegration	
	N.	%	Mean	St. Dev.
Retail and wholesale trade	21,808	26.9	0.219	0.190
Transport and storage	3,480	4.3	0.472	0.283
Hotels and restaurants	4.188	5.2	0.217	0.153
Information and communication services	6,788	8.4	0.491	0.245
Finance and insurance	2.028	2.5	0.529	0.249
Real estate	24,122	29.7	0.398	0.276
Professional, scientific and technical services	11,508	14.2	0.546	0.265
Renting, travel agencies, business services	4,674	5.8	0.460	0.280
Arts, sports and enteirtainment activities	1,526	1.9	0.464	0.247
Other service activities	1,055	1.3	0.321	0.204
Total	**81,177**	**100.0**	**0.380**	**0.273**

Descriptive statistics

Table 2 – Vertical disintegration by geographic areas

GEOGRAPHIC AREA	Vertical disintegration	
	Mean	*St.dev.*
Milan – municipality	0.424	0.280
Outside Milan but within Milan LLs	0.349	0.260
Outside LLS_Milan	0.340	0.263
Total	**0.380**	**0.273**

Table 4 – Summary statistics

	Obs.	Mean	St.dev.	Min.	Max.
Vdis	81,177	0.380	0.273	0.008	0.988
$\ln(age)$	80,770	2.171	1.064	0	4.983
$\ln(output)$	81,177	12.770	2.185	0	23.846
$\ln(output)^2$	81,177	167.851	52.433	0	568.649
$\ln(density)$	81,177	7.309	0.705	3.146	7.741

Econometric specification

- OLS estimation: $VDIS_{i2008} = \beta_0 + X_{i2008}' \beta_1 + \beta_2 DENSITY_{k2008} + \varepsilon_{i2008}$
- Potential endogeneity issues:
  - Unobserved firm-specific and province-specific characteristics
  - Reverse causality
- We also include industry-specific and province-specific fixed effects (dummy variables)
- We adopt an instrumental variable GMM approach ➔ instrument = (nat log) total land area (Ciccone, 2002 *EER*)
- Static (cross-sectional)analysis
- Pay attention! ➔ headquarters, not local units

Preliminary results

ESTIMATION METHOD:	OLS		IV_GMM		IV_GMM	
	Coeff.	*t-values*	*Coeff.*	*t-values*	*Coeff.*	*t-values*
$\ln(density)_{s,t}$	0.024***	6.9	…	…	…	…
$\ln(density)_{s,t\ inst.}$	…	…	0.036***	5.9	0.024***	2.7
$\ln(age)_{i,t}$	0.008***	9.7	0.007***	10.6	0.007***	8.6
$\ln(output)_{i,t}$	-0.019***	-11.4	-0.019***	-14.1	-0.019***	-12.6
$\ln(output)^2_{i,t}$	-0.00005	-1.3	-0.00008**	-2.5	-0.00008***	-2.9
G	-0.081***	-18.2	-0.081***	-17.4	-0.080***	-18.0
H	0.175***	50.2	0.176***	55.5	0.175***	53.0
I	-0.103***	-10.2	-0.102***	-9.5	-0.103***	-9.8
J	0.168***	53.0	0.167***	45.3	0.166***	50.6
K	0.188***	35.5	0.186***	41.7	0.186***	38.3
L	0.057***	9.9	0.057***	10.1	0.058***	10.2
M	0.219***	52.6	0.216***	45.8	0.216***	50.2
N	0.145***	39.9	0.143***	35.0	0.143***	39.9
R	0.141***	13.7	0.142***	15.0	0.141***	13.9
S	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Geographic dummy	No	No	No	No	Yes	Yes
N. Obs.	80,770		80,770			80,770
Centered R^2	0.225		0.224		0.228	
Underidentification test (p-values)	…		0.000		0.000	
Hansen J statistic (p-values)	…		0.000		0.000	

*** significant at 1%; ** significant at 5%; * significant at 10%
Standard errors are clustered at the 32 LLSs level
Instruments:

Preliminary results

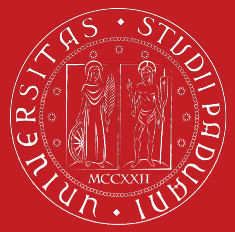
Estimation method: IV_GMM	KIBS		No-KIBS	
	Coeff.	*t-values*	*Coeff.*	*t-values*
$\ln(density)_{s,t}$ *inst.*	0.043***	3.73	0.033***	2.6
$\ln(age)_{i,t}$	-0.036***	-34.8	0.011***	15.4
$\ln(output)_{i,t}$	-0.002	-0.7	-0.021***	-18.3
$\ln(output)^2_{i,t}$	-0.0003***	-4.8	-0.0004***	-4.8
Geographic dummy	Yes	Yes	Yes	Yes
N. Obs.	13.469		67,301	
Centered R^2	0.035		0.071	
Underidentification test (p-values)	0.000		0.000	
Hansen J statistic (p-values)	0.000		0.000	

*** significant at 1%; ** significant at 5%; * significant at 10%
Standard errors are clustered at the 32 LLSs level
Instruments: lsup_sll

Dynamic analysis

- **2nd dataset**: AIDA, unbalanced panel 2004-2009
- Sample of almost 15.000 KIBS firms (headquarters) located in Lombardy region (more than 50.000 obs.)
- Sectors included: 69 - legal and accountability activities; 70 - head offices and management consultancy; 71 - architectural and engineering, testing; 72 - scientific R&D; 73 - advertising and marketing; 74 - other professional and techical activities; 75 - veterinary activities
- Dynamic panel analysis ➔ effect of short-run variation in spatial agglomeration on DIS patterns + control for persistency effects + endogeneity biases typical of studies on agglomeration economies
- Econometric specification (one-step system GMM):

$$DIS_{it} = \beta_1 DIS_{it-1} + \beta_2 AGE_i + \beta_3 SIZE_{it} + \beta_4 DENSITY_{kt} + \beta_5 DENSITY_{it}^2 + \eta_i + \mu_t + \varepsilon_{it}$$



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Descriptive statistics

Sector	Obs.	Mean DIS	Std. Dev.
69	5887	0.498	0.265
70	25548	0.560	0.283
71	12392	0.542	0.263
72	1878	0.519	0.275
73	13809	0.575	0.264
74	10220	0.521	0.261
75	67	0.501	0.172

Preliminary results

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------------------------------------------------------------------------------
Group variable: codice                          Number of obs      =     51364
Time variable : time                            Number of groups   =     14162
Number of instruments = 36                      Obs per group: min =         1
Wald chi2(25) =   5474.95                                      avg =      3.63
Prob > chi2   =     0.000                                      max =         5
------------------------------------------------------------------------------
             |               Robust
         dis |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         dis |
          L1. |   .9244885   .1064614     8.68   0.000      .715828    1.133149
              |
       lprod |  -.0078194   .0038625    -2.02   0.043    -.0153897   -.0002491
        lage |   .0063215   .0044566     1.42   0.156    -.0024134    .0150563
     den_occ |   .1459721   .0707241     2.06   0.039     .0073555    .2845888
    den_occ2 |  -.0137143   .0061144    -2.24   0.025    -.0256983   -.0017302
         d05 |   -.002275   .0024605    -0.92   0.355    -.0070975    .0025475
         d07 |   .0022235   .0023984     0.93   0.354    -.0024772    .0069243
         d08 |  -.0018425   .0026211    -0.70   0.482    -.0069797    .0032947
         d09 |   -.013115   .0034076    -3.85   0.000    -.0197939   -.0064362
         d_69 |   -.038373   .0091051    -4.21   0.000    -.0562186   -.0205273
         d_70 |  -.0345915   .0104726    -3.30   0.001    -.0551173   -.0140656
         d_71 |   -.030387   .0108853    -2.79   0.005    -.0517218   -.0090523
         d_72 |  -.0372753    .010316    -3.61   0.000    -.0574944   -.0170562
         d_73 |   -.031237    .013436    -2.32   0.020    -.0575712   -.0049029
         d_74 |  -.0351077    .009877    -3.55   0.000    -.0544662   -.0157492
         d_bg |  -.0240636   .0377236    -0.64   0.524    -.0980004    .0498732
         d_bs |  -.0273776   .0348971    -0.78   0.433    -.0957746    .0410194
         d_co |    -.02349   .0393117    -0.60   0.550    -.1005396    .0535595
         d_cr |  -.0213226   .0277794    -0.77   0.443    -.0757693     .033124
         d_lc |  -.0277015   .0361364    -0.77   0.443    -.0985276    .0431245
         d_lo |  -.0366675   .0345574    -1.06   0.289    -.1043988    .0310638
         d_mn |  -.0213068   .0263842    -0.81   0.419    -.0730189    .0304052
         d_mi |   .0067089   .0370467     0.18   0.856    -.0659014    .0793191
         d_mb |   .0047497   .0388415     0.12   0.903    -.0713782    .0808776
         d_pv |  -.0250556   .0277551    -0.90   0.367    -.0794546    .0293434
         d_va |  -.0205791   .0396369    -0.52   0.604     -.098266    .0571079
        _cons |  -.2023014   .1923321    -1.05   0.293    -.5792653    .1746625
------------------------------------------------------------------------------
```

Comments

- Positive and statistically significant effect of urban density on vertical disintegration
- Static model on Milan: full-sample estimated coefficient ranges from 0.024 to 0.034…
- … while for KIBS is 0.043!
- Dynamic model on Lombardy region:
  - Density coefficient raises to 0.146
  - Decreasing returns ➔ non-linearities
  - Strong persistency effects (path dependency)

Future research

- From knowledge of geographical coordinates (AIDA) ➔ data geo-referenciation (GIS)
- Define rings of 250 m. and count the number of firms per each ring
- Distance-based urban density effects ➔ geographical scope + spatial decay
- Static analysis on the city f Milan ➔ control for density effects related to the presence of firms:
  - belonging to the same 3-digit industry (specialization)
  - belonging to other industries (variety)
  - distance after which urban density effects on VDIS disappear