# Spatial analysis of commuting behaviour: Evidence for Italy

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RSA Annual conference
May 25, 2015

# Agenda

# Relevance

Commuting is defined as *the movement of an individual from her or his place of residence to her or his place of work and back again using some mode of travel*.

It is related to several topics and, among others, it can be considered as "an important spatial equilibrating mechanism in the labour market" [Persyn, 2012].

According to the co-location hypothesis workers change their house location or workplace in order to minimize transport costs and congestion, but recent data confirm that the average commuting distance is increasing overtime in Europe [Eurostat, 2013].

# Focus of the analysis

**How do the shape and the urbanization economies of the local labour market influence the average commuting distance?**

How much do increments in distance represent an obstacle in commuting in Italy?

Do differences in the average commuting distance exist among labour markets?

Could these discrepancies be related to the spatial characteristics of the area where commuting takes place?

# State of the art and novelty

There is a wide literature about the influence of spatial urban form on commuting distance [Bento, 2005; Boussauw et al., 2012] but few studies that focus on commuting behaviour related to the spatial economic features of the labour market [Melo, 2012].

The aim of the present research is to improve the literature:

- Using an heterogeneous area of analysis
- Using new measures to describe commuting behaviour and the spatial aspects of the labour market:
  - Include generalized cost of travel as deterrent in commuting
  - Include new measures to describe the spatial features of the labour market

# The model

A two stages model

- estimation of the distance decay parameter of an unconstrained spatial model for each labour market
  - exponential specification

$$F_{ij} = c * {V_i}^{\alpha} * {V_j}^{\beta} * exp(-\gamma d_{ij}) \quad (1)$$

  - power specification

$$F_{ij} = c * {V_i}^{\alpha} * {V_j}^{\beta} * (d_{ij})^{\gamma} \quad (2)$$

- regression of the estimates on various variables summarizing the spatial structure of the labour markets

$$|\gamma_c| = Q + \sum_{k}^{K} b_k X_{ck} \epsilon_c \quad (3)$$

# The data

The main dataset used for the empirical analysis has been provided by the Italian National Bureau of Statistics (ISTAT) and belongs to the "Rilevazione Continua delle Forze di Lavoro 2009"

- 13859 individual observations
- 686 travel-to-work-areas
- 107 provinces
- 8100 municipalities

# The first stage

To estimate the distance decay parameter both specifications with power decay function and exponential function have been used

$$lnF_{ij} = lnC + \beta lnPopOrigin_i + \sigma lnEmplDestination_j + \gamma ln(d_{ij}) + \epsilon_{ij} \quad (4)$$

$$lnF_{ij} = lnC + \beta lnPopOrigin_i + \sigma lnEmplDestination_j + \gamma d_{ij} + \epsilon_{ij} \quad (5)$$

# Findings of the first stage

Power decay function: elasticity

| | OLS b/se | POISSON b/se | PPML b/se | NB b/se |
|---|---|---|---|---|
| Impedance | -0.5061 (0.1184) | -1.5692 (0.3041) | -1.5673 (0.1992) | -1.8932 (0.3528) |

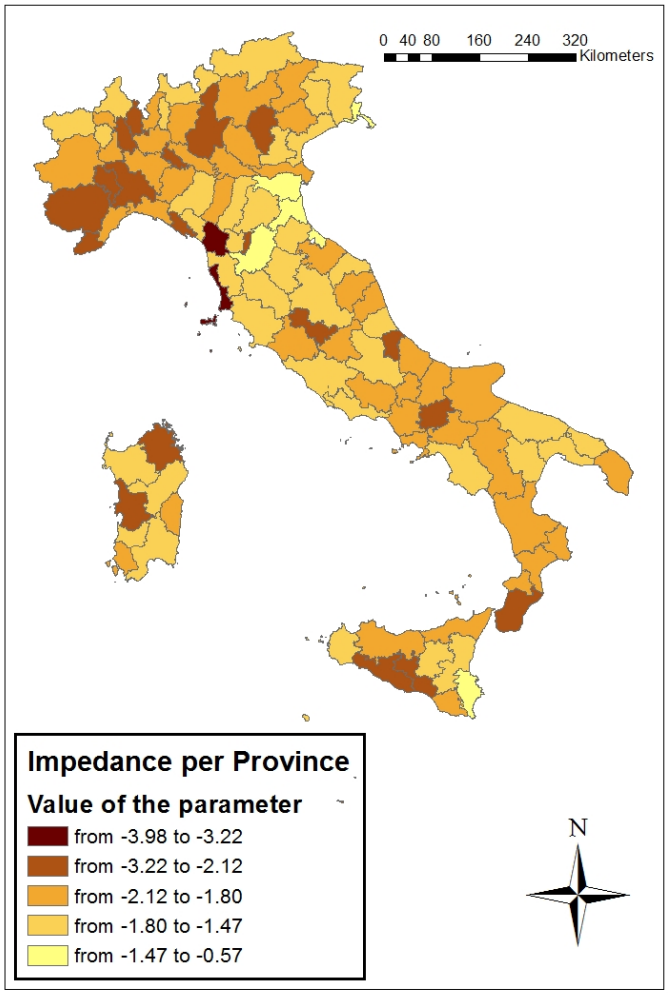
Table: values of the estimate impedance parameter on average in Italy

Exponential decay function: semi-elasticity

| | OLS b/se | POISSON b/se | PPML b/se | NB b/se |
|---|---|---|---|---|
| Impedance (se) | -0.0688 (0.0292) | -0.4121 (1.3044) | -0.3771 (0.9494) | -0.4091 (1.1891) |

Table: values of the estimate impedance parameter on average in Italy

# Impedance parameter per Province



# The second stage

Differences in the decay parameter among provinces is explained through two measures of shape and two measures related to the way in which the job market is based across space.

| Description | Measure |
|---|---|
| Land area | Area($km^2$) |
| Circularity | Circularity ratio |
| Employment density | Workers per $km^2$ |
| Urbanization | Share of employment in urban municipalities |

Therefore the equation is:

$$\gamma_c = Q + \beta_1 lnarea_c + \beta_2 Circ_c + \beta_3 Urban_c + \beta_4 EmpDens_c + \epsilon_c \quad (6)$$

# Findings of the second stage

| | Model 1 | Model 2 |
|---|---|---|
| logarea | -0.104** | -0.087** |
| | (0.03) | (0.03) |
| Circularity | 0.079* | 0.191* |
| | (0.22) | (0.21) |
| Urbanization | 0.128** | 0.156** |
| | (0.06) | (0.06) |
| Employment | 0.207* | |
| Density | (0.12) | |
| constant | -0.930** | -1.106*** |
| | (0.28) | (0.27) |
| Goodness of fit | 172.41 | 175.50 |
| Prob $>$ *chi*2 | 0.0000 | 0.0000 |

Table: Estimates obtained using a weighted least square regression

# Conclusions

- The size of the area of the LLM influences commuting. *Ceteris paribus*, in bigger Labour Markets commuting is longer
- The shape of the LLM influences commuting. In more circular areas commuting is, on average, lower.
- The presence of urban economies influences commuting. The average commuting distance is lower in areas where the most of employment is based in urban municipalities

# In progress

Possible improvements:

- Use data from Italian Census (2011)
- Include generalized cost of travel in the estimation
- Use Trave-To-work-Areas as proxy of the local labour market
- Use more spatial features in the second stage:

| Description | Measure |
|---|---|
| Employment | Number of workers |
| Monocentrcity | Slope of the distribution of municipality employment respect to the employment-weighted centroid of the area |
| Job-housing imbalance | Gini coefficient for the distribution of residents and employment at a municipality level |
| Industrial specialization | Hirshmann-Herfindhal Index |

Thank you very much!
We have just started this research and the results are preliminary.
Any comment or suggestion will be welcome