



# Contribution of Italian scholars to Regional Science

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# Prolegomena (1)

Studies in 'Regional Science' in Italy started well before the establishment of the Italian section of RSAI (AISRe) in 1980.

They have always been characterized by some peculiarities:

- theoretical reflections linked to **real problems** of the country (Mezzogiorno, role of cities, small size of firms, international migrations);
- space interpreted as '**territory**': set of functional, hierarchical and social relationships embedded in geographical space (Camagni, 1981);
- '**institutions**' and institutional policies at the basis of development /lack of development (Nitti, 1903; Salvemini, 1910; Gramsci, 1934);
- **a relational** and network approach to local development;
- the **market** considered as **a socio-economic construct** (Bagnasco, 1977): socio-economic proximities behind its working.



## Prolegomena (2)

Another typical feature concerns a strong **interdisciplinarity**:

- in the past: economists, political scientists, historians;
- more recently: sociologists (Bagnasco), economists (Becattini, Fuà), planners (Secchi, Ceccarelli, Indovina), mathematicians (G. Leonardi), geographers (Dematteis);
- nowadays mainly regional and urban economists, urban sociologists, geographers, systems analysts, wide-area and urban planners.

The development of the Italian Section of RSAI generated a cultural jump in methodologies, together with international openness and cooperation never seen before.



# The Italian contribution at a glance

Themes	Before AISRe		After AISRe			
	1950 and 1960	1970	1980	1990	2000	2010 onward
Regional disparities	<b>Italian dualism</b> <b>Public intervention</b> <b>Inter-reg. I-O</b>	<b>Southern cities</b>			<b>Non-parametric estimates of regional disparities</b> <b>Spatial econometrics</b>	
Development (endogenous)		<b>Industrial districts</b>	<b>Indigenous potential</b>	<b>Social capitalism;</b> <b>Community market;</b> <b>Innovative milieux</b>	<b>Local synergies;</b> <b>Collective learning</b>	<b>Territorial capital</b>
Sources of competitiveness		<b>Generative regional growth econometric model</b>	<b>Intersectoral shifts</b>	<b>Relative location advantage</b>	<b>Absolute vs. relative advantage</b>	<b>Regional growth forecasting model; FDI-led development; Creativity-led development</b>
Agglomeration economies			<b>Endogenous agglomeration economies</b>		<b>NEG and industrial districts</b> <b>Normative implications from NEG</b>	<b>Human capital migration</b>
Innovation			<b>Adoption vs. diffusion and economic proximity</b>	<b>Network externalities and regional growth</b>	<b>Technological proximity</b> <b>Institutional proximity in regional innovation</b>	<b>Technological knowledge spillovers (two large FDI databases)</b> <b>KIBS</b> <b>Regional patterns of innovation</b> <b>Local synergies in innovation processes</b>
Macroeconomic, regional and urban policies					<b>Regional impact of macroeconomic policies</b> <b>Regional competitiveness policies</b>	<b>Evaluation methods for regional policies</b> <b>Indicators of smart specialization strategy</b>
Urban growth and urban form			<b>Urban self-organizat. Definition of urban systems</b>	<b>Urban rent</b> <b>City networks</b>	<b>Sustainable urban form</b> <b>Urban milieu</b>	<b>Urban growth by coalescence</b>
Spatial interaction modeling			<b>Dynamic SIM</b> <b>Logit models</b> <b>Mathematical ecology</b>	<b>Chaos theory</b> <b>Fractal theory</b> <b>Volterra-Lotka m.</b>	<b>Urban milieux</b> <b>Geo-computational m.</b> <b>Neural networks</b> <b>Multi agent systems</b>	<b>MAS in urban system recognition</b>



# The period before AISRe

Themes	1950 and 1960	1970
<b>Regional disparities</b>	<b>Italian dualism</b> Spaventa, 1959 Graziani, 1983 <b>Public intervention</b> Saraceno, 1952 <b>Inter-regional I-O</b> Pilloton 1959; 1965	<b>Southern cities</b> Cafiero, 1976  <b>Inter-regional integration</b> Camagni, 1976
<b>Development (endogenous)</b>		<b>Industrial districts</b> Becattini, 1975; 1979 Bagnasco, 1977; Brusco, 1982
<b>Sources of competitiveness</b>		<b>'Generative' regional econometric model</b> Cappellin, 1975



***The 1950s and 1960s (and before)***

***Economic dualism in Italian growth***

***The first (North) Italian miracle***



# Regional disparities: causes of dualism in Italian economic growth

**Historical institutions:** the geography of share-cropping and latifundia in agriculture (entrepreneurship); rent-seeking classes (absenteeist land-owners, public bureaucracies) (Gramsci, 1934; Salvemini, 2010).

**Post-unitary (1861) national policies:** trade policies and protectionism in favour of northern industry; fiscal policies (increased taxation on the South and public investments in the North); huge inter-regional wealth transfers South → North (Nitti, 1903).

**Political agreement** between northern capitalism and southern feudalism; southern professional classes linked to ruling classes (G. Dorso, 1924).

Mezzogiorno supplying cheap labour force to internationalising North (1958-1965): **low wages and international technologies** in the first Italian miracle (Graziani, 1983; Del Monte, Giannola, 1982).

Italian dualism not depending on segmentation of sectors and monopolistic labour markets, as suggested by neoclassical economists, but on higher capital productivity stemming from **technical progress**, reinforcing strong areas cumulatively (Spaventa, 1959; Felice, 2016).



# Regional disparities: the role of public intervention

Modern vision on the role of public policies (Saraceno, 1952):

- investments for productive sectors;
- investments for a balanced development;
- public investments in industries to support export (development poles);
- public action not for channelling income transfers but as a necessary and crucial strategic planning opportunity.

Social disparities create more obstacles to development than low-value added sectors.

Drawbacks of N/S integration policies through I-O analysis:

- Public expenditure in the South benefitting the North (Pillotton, 1959)
- Infrastructure integration, income transfers and growth poles strategy destroying the trade balance of the South (Camagni, 1976)



***The 1970s***

***The Third Italy:  
The second Italian miracle***



# Industrial districts: a new economic paradigm

Initially an inductive theory born to explain the (largely unexpected) miracle of the “Third Italy” area (between the N-W and the Mezzogiorno).

Often simplified and interpreted as a mere specialized and flexible clustering of firms, a *Marshallian Industrial District* is (Becattini, 1975; 1979):

*“a local area with a strong concentration of small and medium-sized firms, each specialized in one or a few phases of the production process, and rooted in a social and cultural system of shared values which penetrates the market and structures its workings”.*

*“Institutional thickness providing strong local externalities”*



# Industrial districts: theoretical pillars

**I – The role of social capital (*fifteen years before Putnam*)**

***Socio-economic proximity makes the market work more efficiently*** (Becattini, 1979; Dei Ottati, 1995; Bellandi, 2003).

**II – Economic behaviour of agents is regulated by social norms and sanctions**

- concept of «community market» (Dei Ottati, 1995)

**III – Role of trust, cooperation and collective action**

- Local synergies give rise to increasing returns and locational advantage of district firms (Sforzi, 1990).

**IV – The district is not a cluster: socio-economic and cultural proximities instead of pure geographical proximity.**

Concepts revisited by the French school of proximity (Rallet, Torre, 1995) and the Dutch approach (Boschma, 2005).



# Sources of competitiveness

Thanks to the new approach to industrial districts, sources of competitiveness started to be looked for in the specificities (and institutions) of single areas:

→ *local assets beyond K, L1, L2 (non-neoclassical supply approach)*

Based on the endogenous development approach, a **'generative' regional forecasting model** - very modern for that time - was developed for an Italian region, namely Lombardy (Cappellin, 1975).



## 1980: AISRe

In 1980 in Rome, the Italian section of RSAI was established, allowing:

- an **enlargement on themes, issues and methods**, typical of the realm of regional science, became fields of studies by Italian scholars;
- **a strong internationalization of spatial disciplines** (thanks to people like Bertuglia, G. Bianchi, Cappellin, Costa, La Bella);
- **strong inter-disciplinary cooperation.**



# After the establishment of AISRe: previous themes relaunched and enlarged

	1980	1990	2000	2010 onward
Regional disparities			<b>Non-parametric estimates of regional disparities</b> Magrini, 2002 Basile, 2008 <b>Spatial econometrics</b> Arbia 2006 Basile 2008	
Development (endogenous)	<b>Indigenous Potential:</b> Ciciotti Wettman, 1981; <b>Productive decentralization:</b> Brusco, 1982 <b>Reg.Dev.Patterns</b> Arcangeli, 1980; Camagni Cappellin, 1984; Camagni 1991 <b>Districts transformation:</b> Garofoli, 1989 <b>Intersectoral shifts</b> Camagni Cappellin, 1985	<b>Social capitalism</b> Leonardi, Nannetti, 1988, <b>Community market</b> Dei Ottati, 1995 <b>Innovative milieux</b> Camagni, 1991; Maillat, Senn, 1993; Ratti Bramanti Gordon 1997 <b>Efficiency of local institutions:</b> Bellini, 1996, Arrighetti, Seravalli 1999 <b>Relative location advantage</b> Camagni Capello, 1990 Patterns of growth Camagni, 1991	<b>Measuring the unmeasurable</b> Rabellotti, 1997; Pietrobelli98 Capello, 1999 Maggioni Riggi, 2002 <b>Collective learning</b> Camagni and Capello, 2002	<b>Territorial capital</b> Camagni, 2009 Mazzola 2013
Sources of competitiveness			<b>Absolute vs. relative advantage</b> Camagni 2000  <b>Regional growth forecasting model</b> Capello, 2007; Capello and Fratesi 2010; Capello and Caragliu, 2018 <b>FDI-led development</b> (Resmini, 2007, 2014 and 2017; Mariotti, Mutinelli, 2005; Piscitello, 2002; Antonietti and Cainelli, 2008; Iammarino and McCann, 2013; Crescenzi and Gagliardi, 2018.	<b>Creativity-led development</b> Lazzeretti, 2007; Cerisola, 2017; Comunian, Faggian, Li, 2010). <b>Human capital migration</b> Comunian and Faggian, 2011; Faggian, McCann, Sheppard, 2007 <b>Role of different types of proximity on knowledge diffusion.</b> Caragliu and Nijkamp, 2015; Boschma, Marrocu and Paci, 2015



# Recent studies in regional disparities

Studies on regional disparities have developed in a number of directions:

- **non parametric methods to measure regional disparities** innovating with discrete space the approach by Quah (Magrini, 1999, 2004);
- **new spatial econometric technics applied to regional disparities** (Arbia, 2006; Basile, 2008).
- **Construction of longitudinal data** (since the Italian unification) on Italian regional economies and **their interpretation** (Ciccarelli and Fenoaltea, 2017; Felice, 2007; 2010; 2013)



# Recent studies in endogenous development: theoretical approaches

The genuine district paradigm developed in several streams:

- **indigenous potential** (Ciciotti, Wettman, 1981): local firms networks determining the speed and scope of technical modernization and ability to enter new markets;
- **productive decentralization** towards SMEs (Brusco, 1982);
- **social capitalism** (Leonardi, Nanetti, 1988): emphasis on local social elements facilitating economic interactions;
- **districts transformation** and evolution (Garofoli, 1989);
- **innovative milieu** (Camagni, 1991; Maillat, Senn, 1993; Ratti, Bramanti, Gordon, 1997): **evolutionary approach** to districts emphasizing role of cognitive proximity: **uncertainty reduction** and **collective learning** in innovation processes.



# Space vs. territory

## The concept of *territory* replaces that of *space*:

- a system of assets and localized externalities;
- of localized skills and know-hows;
- of localized proximity relations (“relational capital”);
- of similar cultural elements and shared values (“identitarian capital”);
- of accepted rules and economic practices (“institutional capital”).

**The concept of territorial capital** (Camagni, 2009; Mazzola et al., 2013; Perucca, 2013): a wide set of local assets - material and non-material, private and public, cognitive and relational – defining the competitive advantage of places.

- in a spatial production function, territorial capital explains the residual (which can be called *territorial relational surplus*), as technological progress does in a time series production function à la Solow (Camagni, 2019).



# Recent studies in endogenous development: empirical approaches

- **measuring the un-measurable.** Quantitative empirical analyses on:
  - **industrial atmosphere** (Rabellotti, 1997; Pietrobelli, 1998);
  - local synergies and **milieu effects** (Capello, 1999);
  - efficiency of **local institutions** (Bellini, 1996; Arrighetti, Seravalli, 1999);
  - **collective learning** (Camagni, Capello, 2002; Capello, Faggian, 2005);



# Recent sources of competitiveness (1)

- **Intersectoral shifts** and productivity gains (Camagni Cappellin, 1985);
- **relative location advantages** (Camagni, Capello, 1990): the success of local areas depends on relative advantage with respect to external areas (territorial productivity / remunerations ratio);
- **absolute vs. comparative advantage** (Camagni, 2002): regions compete on the basis of an “absolute” advantage, not on the Ricardian principle of comparative advantage;
- **regional growth forecasting model - MASST** (Capello, Camagni, Fratesi, Caragliu, 2008; 2013; Capello and Caragliu, 2018), territorial capital elements explain regional shifts and macroeconomic elements explain national growth;



## Recent sources of competitiveness (2)

- **FDI-led development.** First database at NUTS2 for all Europe (Resmini, 2014) and for Italian regions (Mariotti, Mutinelli, 2005). Role of territorial capital for FDI attraction (Resmini, 2017). Technological transfer through FDI (Piscitello, 2002; Resmini, 2007; Antonietti and Cainelli, 2008; Iammarino and McCann, 2013; Crescenzi and Gagliardi, 2018).
- **Creativity-led development** (Lazzeretti, 2007; Cerisola, 2017). Creativity as a mediator between cultural heritage and local development. The joint role of human capital and creativity (Comunian, Faggian, Li, 2010).
- **Human capital migration** (Comunian and Faggian, 2011; Faggian, McCann, Sheppard, 2007). Original first micro analysis of migration behaviour of individuals with high human capital. Role on local development.
- **Role of different types of proximity on knowledge diffusion** (Caragliu and Nijkamp, 2015), introducing the asymmetric effects (Boschma, Marrocu and Paci, 2015)



# After the establishment of AISRe: new themes

	1980	1990	2000	2010 onward →
<b>Agglomeration economies</b>	<b>Endogenous agglomeration economies</b> Faini, 1984	<b>City networks</b> Dematteis, 1984 Camagni, 1993 Camagni, Salone, '93	<b>NEG and industrial districts</b> Basevi and Ottaviano, 2002 <b>Normative implications from NEG:</b> Ottaviano, 2003	<b>Agglomeration economies and Equilibrium Urban Size</b> Camagni, Capello, Caragliu, 2012, 2013 and 2016
<b>Innovation</b>	<b>Adoption vs. diffusion and proximity</b> Camagni, 1985 Capello, 1988 <b>Role of producer services</b> Cappellin, 1980; Cappellin, Grillenzoni, 1983; Ciciotti, 1987	<b>Network externalities and regional growth</b> C. Antonelli, 1993 Capello, 1994	<b>Technological Proximity:</b> Breschi, 2000, Paci, Usai, 2000 <b>Techn. knowledge spillovers</b> Piscitello, 2002, Resmini, 2008 <b>KIBS</b> Cappellin, 2007 Antonietti and Cainelli, 2007 Cappellin and Wink, 2009	<b>Cooperation networks</b> Maggioni, Nosvelli, Uberti, 2007; Capello, Caragliu, '12 <b>Territorial capital in innov. Processes:</b> Caragliu, 2010 <b>Regional innovation patterns</b> Capello, Lenzi 2013 <b>Smart Innovation Policies</b> Camagni, Capello, 2013
<b>Urban growth and urban form</b> <b>Spatial Interaction Models (SIM)</b>	<b>Urban self-organization.</b> Camagni, Diappi, Leonardi, 1986; Diappi, Pompili, 1993 <b>Definition of urban systems:</b> Sforzi, 1990 <b>Dynamic SIM:</b> Lombardo, Rabino, '83a,b; Mela, Preto, Rabino 1987; Nijkamp, Reggiani, 1988. <b>Logit m.:</b> Leonardi 81,83,85 Nijkamp, Reggiani, 1988b <b>Dynamic Logit models</b> Leonardi 1983b, 1987, Leonardi, Campisi, 1981	<b>Urban rent</b> Camagni, 1992 <b>Urban Sustainability</b> Camagni, 1996; Camagni, Capello, Nijkamp, 1998 <b>Integrated SIM with innovation and lab. mkt</b> Occelli, Rabino, 1990; Bertuglia, Leon, Wilson, 90 <b>Chaos th:</b> Reggiani, 1990 <b>Fractal theory: urb.form</b> Diappi, Bolchi, 1993 <b>Volterra-Lotka models:</b> <b>Rent/profit:</b> Camagni, '92	<b>Urban form</b> Camagni, Gibelli and Rigamonti, 2001, 2002 <b>Urban milieu</b> Camagni, 1999, Cusinato, 2008 <b>Geocomputational Models:</b> <b>Neural networks:</b> Diappi, 2004; Griguolo, 2004; Diappi et al, 04; Virgilio, Lonardoni, 2004; Fusco Girard, 2005 <b>Multi-agent systems:</b> Diappi, 09; Diappi, Bolchi, 2008; Occelli, Bellomo, 2004; Cutini, 2009 <b>VLotka r/pop:</b> Capello Faggian '02	<b>Urban growth by coalescence</b> Calafati, 2011 <b>MAS in urban pattern recognition</b> Diappi, 2012; Semboloni, 2012; Murgante et al., 2013; Las Casas, Murgante, 2012



# After the establishment of AISRe: new themes

	1980	1990	2000	2010 onward
<b>Macroeconomic regional and local policy evaluations</b>				<p><b>Regional impact of macroeconomic policies</b> (Camagni and Capello, 1990 and 2015; Mazzola, Pizzuto and Furceri, 2018).</p> <p><b>Creation of indicators for smart specialization strategy</b> (Iacobucci and Guzzini, 2014)</p> <p><b>Regional competitiveness policies</b> (Barca, McCann, Rodriguez-Pose, 2012)</p> <p><b>Cohesion policy and regional disparities</b> (Rodriguez-Pose, Fratesi, 2004).</p> <p><b>Local fiscal policies</b> (Petretto, 2013; Lattarulo Petretto, 2016)</p>
<b>Evaluation methods for regional policies and programmes</b>			<p><b>Regional input-output tables</b> (Costa, 1978; Camagni, 1989; Casini Benvenuti, 2000; Falocci, Paniccià, Stanghellini, 2009)</p> <p><b>Multicriteria and territorial impact assessment models</b> (Camagni, 2009)</p> <p><b>Cohesion policy assessment on regional disparities with disaggregated data by fields of intervention</b> (Rodriguez-Pose, Fratesi, 2004)</p>	<p><b>Statistical and econometric methods. Non-experimental comparison group method, regression discontinuity design</b> (Pellegrini et al., 2013; Gori, Mariani, Lattarulo, 2017)</p> <p><b>Counterfactual methods applied to firms' database</b> (Mazzola, 2015; Caloffi and Mariani, 2018; Caragliu, Landoni, Sala, 2018; Comi, Resmini, Vittucci, 2018, Di Cataldo, 2017)</p>



# Innovation (1)

**Innovation adoption vs. diffusion:** innovation is not only a matter of diffusion but of **receptivity** (absorptive capacity) of local areas (Levinthal and Cohen's concept developed many years before), depending on:

- economic structure and accessibility of regions (Camagni, 1985; Capello, 1988; Boitani, Ciciotti, 1990);
  - presence of producer services (Cappellin, 1980; Cappellin, Grillenzoni, 1983; Ciciotti, 1987);
  - network externalities and local conditions to exploit them (C. Antonelli, 1992; Capello, 1994);
  - technological proximity for knowledge diffusion (Paci, Usai, 2000; Breschi, 2000).
- **Knowledge-Intensive Business Services (KIBS):**
    - measuring KIBS: Momigliano and Siniscalco, 1980;
    - KIBS as vehicles for innovation adoption and knowledge acquisition for SMEs: a different innovation pattern than through R&D (Cappellin, 2007; Antonietti, Cainelli, 2007; Cappellin, Wink, 2009).



# Innovation (2)

- **Inter-regional cooperation networks:**
  - structure and efficiency of interregional cooperation networks (Maggioni, Nosvelli, Uberti, 2011);
  - interpretation of the role of different proximities on knowledge exchange (synergies and non-linearities) (Capello, Caragliu, 2012).
- **Territorial capital in innovation processes** (Caragliu, 2010).  
The role of synergies between non-material elements of territorial capital.
- **Regional patterns of innovation** (Capello, Lenzi, 2013): spatial break-down of the knowledge → innovation logical path on the basis of local preconditions for knowledge and innov. creation; related **Smart innovation policies** (Camagni, Capello, 2013).
- **Knowledge creating-milieus:** hermeneutic interpretation of the inspirational role of places (Cusinato and Philippopoulos-Mihalopoulos, 2016).



# Macroeconomic, Regional and Local Policies

- **Regional impact of macroeconomic policies** (Camagni and Capello, 1990 and 2015; Mazzola, Pizzuto and Furceri, 2018).  
Macroeconomic policies have spatially differentiated effects.
- **Regional competitiveness policies** (Barca, McCann, Rodriguez-Pose, 2012), place-based – rather than space-neutral – regional policies.
- **Creation of indicators for smart specialization strategy** (Iacobucci and Guzzini, 2014). Indicators for the identification of regional technological capabilities for SSS.
- **Cohesion policy and regional disparities** with disaggregated data by fields of intervention (Rodriguez-Pose, Fratesi, 2004).
- **Local fiscal policies** (Petretto, 2013; Lattarulo, Petretto, 2016).  
Interegional equity and public transfers; reform of local taxation systems; fiscal federalism.



# Evaluation methods for regional policies and programmes

- **Regional input-output tables** (Costa, 1978; Camagni, 1989; Casini Benvenuti, 2000; Falocci, Paniccià, Stanghellini, 2009).
- **Multicriteria and territorial impact assessment models** (Camagni, 2009). Tequila model.
- **Statistical and econometric methods.** Non-experimental comparison group method, regression discontinuity design (Pellegrini, Terribile, Tarola, Muccigrosso, 2013; Gori, Mariani, Lattarulo, 2017).
- **Counterfactual methods** applied to firms' database (Mazzola, 2015; Caloffi and Mariani, 2018; Caragliu, Landoni, Sala, 2018; Comi, Resmini, Vittucci, 2018; Mariani, 2018; Di Cataldo, 2017).



# Agglomeration economies and NEG

- **Endogenous agglomeration economies** (Faini, 1984): Faini was a predecessor of the main ideas developed by Krugman, with a model with economies of scale and agglomeration economies avoiding the assumption of perfect competition.
- **NEG and industrial districts** (Basevi and Ottaviano, 2002): the growth of a local district depends on the choice of the firms between positive local spillovers sustaining endogenous invention and the opportunity to circumvent trade barriers with international relocation.
- **Normative implications of NEG** (Ottaviano, 2003): a landmark in the history of NEG that for the first time listed the possible policy implications of NEG models.



# Agglomeration economies and city networks

- **City networks** (Dematteis, 1984) are theorized as horizontal cooperation flows among cities of similar size allowing to reach a critical mass without increasing size, through either “synergy networks” or “complementarity networks” (Camagni, 1993; Camagni, Salone, 1993).
- **Agglomeration economies and “equilibrium city sizes”** depend not just on demographic size but on a wide array of elements impinging on urban costs and urban benefits (Camagni, Capello, Caragliu, 2012 and 2013).
- **Dynamic agglomeration economies** (Camagni, Capello, Caragliu, 2016) and not static ones for the explanation of urban growth.



# Urban growth and urban form

- **Urban self-organization models:** a family of supply oriented dynamic models on the evolution of the urban system (SOUDY) based on schumpeterian innovation modelled through a master equation: Camagni, Diappi, Leonardi, 1986. With a löschian system: Diappi, Pompili, Stabilini, 1990; with city networks: Camagni, Diappi, 1990.
- Definition of marxian “**absolute**” **land rent** as the counterpart of agglomeration economies: Camagni, 1992.
- Definition of “**urban**” **sustainability** as co-evolution and creation of cross-externalities among the three urban subsystems: economy, society, (built and natural) environment: Camagni, 1996, 1998; Camagni, Capello, Nijkamp, 1998.
- Quantitative measurement of the **collective cost of urban form and sprawl**: Camagni, Gibelli, Rigamonti, 2001, 2002.
- **Urban milieux and cognition**: Camagni, 1999; Cusinato, 2008.
- **Urban growth by coalescence** in Third Italy: Calafati, 2011.



# Spatial Interaction Models: theoretical achievements

- **Dynamic Spatial Interaction Models:** in the evolution of the urban hierarchy and commerce structure (Lombardo, Rabino, 1983 a and b; Mela, Preto, Rabino, 1987);
- Theoretical demonstration of the **stability of the dynamic simulation** emerging from optimal control formulations (Nijkamp, Reggiani, 1988a and 1992);
- **Logit Models: demonstration of the asymptotic equivalence** between Random Utility theory, Logit models and Entropy maximization (Leonardi, 1981, 1983a, 1985; Nijkamp, Reggiani, 1988b);
- **Dynamic Logit Models**, mainly in transport analysis: expectations of households on future benefits from (“time-nested RUTh”): Leonardi, 1983b, 1987; Leonardi, Campisi, 1981; Cascetta, 2001.
- Link between **Dynamic Logit model and Chaos theory:** (Reggiani, 1990).



# Spatial Interaction Models: theoretical applications

- **Fractal Theory** applied to urban form and morphogenesis: Diappi, Bolchi, 1993;
- **Volterra-Lotka** math. ecology models, applied to rent/profit and rent/populat. conflict in urban growth: Camagni, 1992; Capello, Faggian, 2002;
- **Geo-computational models: macro interpretations through micro data:**
  - **Neural Networks as pattern recognizers:** Diappi, 2004; Griguolo, 2004; Diappi et al. 2004 (urban sustainab); Virgilio, Lonardoni 04 (urb. competit)
  - **Cellular automata** (urban gentrification and housing mrk, based on rent-gap theory): Diappi, 2009; Diappi, Bolchi, 2009;
  - **Multi-Agent Systems:** Occelli, Bellomo 2004 (commuting vs. teleworkg) Diappi, 2008 (gentrification and housing mkt) and 2012 (resid. Mobility and urban cycles); Murgante, Las Casas 2012 (urban renewal); Murgante et al 2013 (sprawl); Semboloni, 2011 (urban hierarchy), Cutini, 2009 (segreg).



# Contributions to Regional and Urban Policies

Most of theorizations illustrated here have strong policy and normative applications.

We mention only three explicit documents and reports:

- the launching of **Strategic Urban Planning** in Italy (“reticular and visionary”) (Curti, Gibelli, 1995);
- Report on “**Cities in Europe**”, presented by the Italian EU Presidency to Ministerial Meeting in Venice, advocating for an European Urban Agenda (Camagni, Gibelli, 1996);
- The **Barca Report** to Commissioner Danuta Hübner, advocating for “**place based**” **European policies** (Barca, 2009).

The launching of «perequazione» as equitable and efficient tool in land-use planning (Micelli, 2015, Moroni, 2015).



**THANK YOU VERY MUCH FOR  
YOUR ATTENTION!**