

Innovation Dynamics as Co-evolutionary Processes:
A Longitudinal Study of the Computer Services Sector
in the Region of Attica, Greece

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Panorama

- Introduction
- Innovation Dynamics
 - Innovation Systems Approach
 - Sectoral & Regional Level
- Co-evolution: Theoretical and Empirical Inquiries
 - Conceptual Framework
- Research Methodology, Design and Strategy
 - Qualitative Retrospective Field Research
- The Empirics: Attica Region as a Computer Service Innovation Hot Spot
 - Regional Characteristics: Attica Region
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- Conclusion and Discussion



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- We elaborate on the notion of innovation systems, and examine the case of the Computer Services Sector in the Region of Attica, Greece
- Based on the coevolutionary framework of Lewin et al., (1999), we question the co-evolutionary dynamics between the sector and the region and
- examine the conditions under which innovation performance emerges.
- Study the function and development of a SIS (Computer Services Sector) in a RIS (Region of Attica), and this within a NIS (Greece).

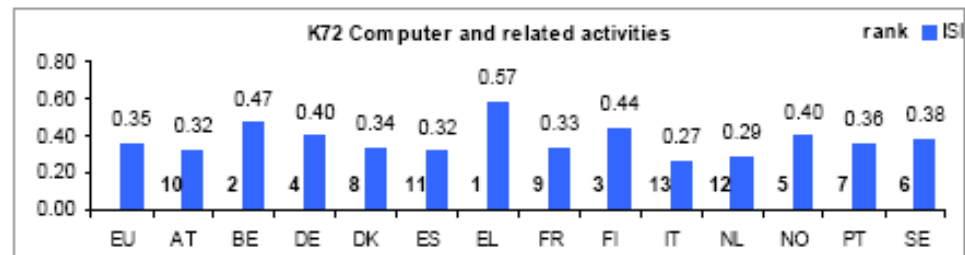


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The Motive &
the Paradox

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- Sectoral characteristics
 - Innovation, knowledge intensive, age, maturity, location, documentation, etc
- Horizontal sector
 - Significance
- Recent European Trend Chart Reports present the Hellenic Computer Services sector as an innovation leader in Europe.
- Greece appears to be an innovation leader in the “Computer Services and Related Activities” sector for years 2004, 2005, 2006, followed by Belgium and Finland.

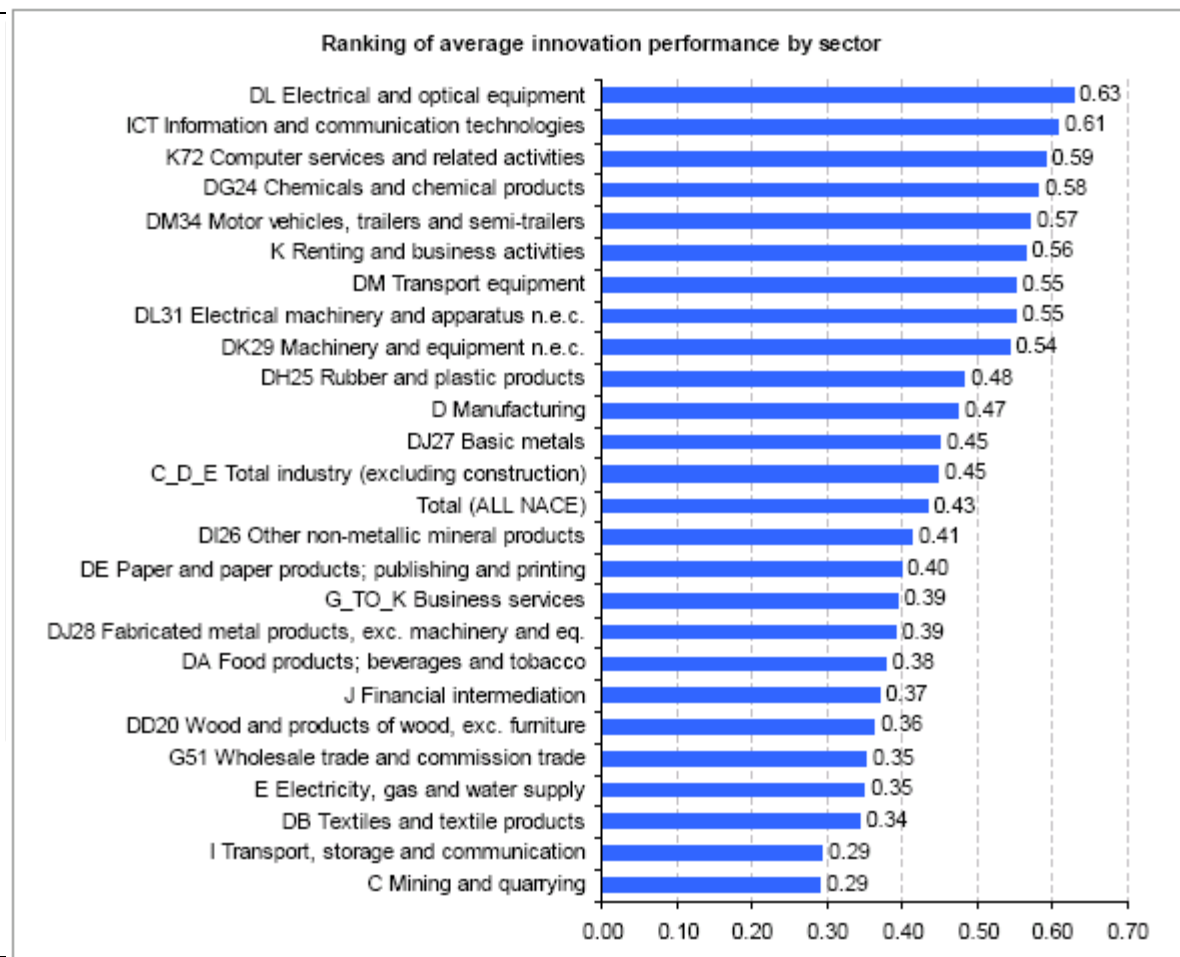


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Innovation Performance

Indicators EIS-ERIS-ESIS

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Innovation Systems Approach

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- A Teleological approach of production systems.
- Built on evolutionary theories of economic and technological change, the systems of innovation literature conceptualizes innovation as an evolutionary and social process at the same time (Edquist, 2004).
- Innovation is stimulated and influenced by many actors and factors, both internal and external to the firm (Dosi 1988).
- The social aspect of innovation refers to the collective learning process between several departments of a company (for example R&D production, marketing, commercialization, etc.)
- as well as to external collaborations with other firms, knowledge providers, finances, training, etc. (Cooke et al. 2000).

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Sectoral & Regional Level

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- Following Malerba (2001, p.6) a Sectoral System of Innovation can be defined as “composed of set of heterogenous actors carrying out market and non-market interaction for the generation, adoption and use of new and established knowledge and for the creation, production and use of new and established products”.
- A Regional Innovation System is a complex of innovation actors and institutions in a region that are directly related with the generation, diffusion, and appropriation of technological innovation and an interrelationship between these innovation actors.
- The basic - main innovation actor groups are:
 - universities,
 - industrial enterprises, and
 - public research institutions
 - etc...

Evolution Theory

Theoretical and Empirical Inquiries

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- Evolution theory applied to change in organizations proceeds as a recurrent, cumulative and probabilistic progression of variation, selection and retention of forms of organization:
 - **Variation**, meaning the creation of novel forms of organization, is viewed as “just happening” .
 - **Selection** of organization occurs through the competition for scarce resources; the environment “selects” entities that best fit the resource base of an environmental niche.
 - **Retention** involves forces (including inertia and persistence) that perpetuate and maintain certain organizational forms. If evolution would operate without mechanisms of retention, there could be an infinite creation and destruction of new organizational forms.
- The evolutionary lens seeks to explain how populations persist and evolve over time, according to population dynamics that need to be specified.
- Hence, the evolutionary theory enables depiction of global changes in organizational industries and sectors (Caron et al, 1989).

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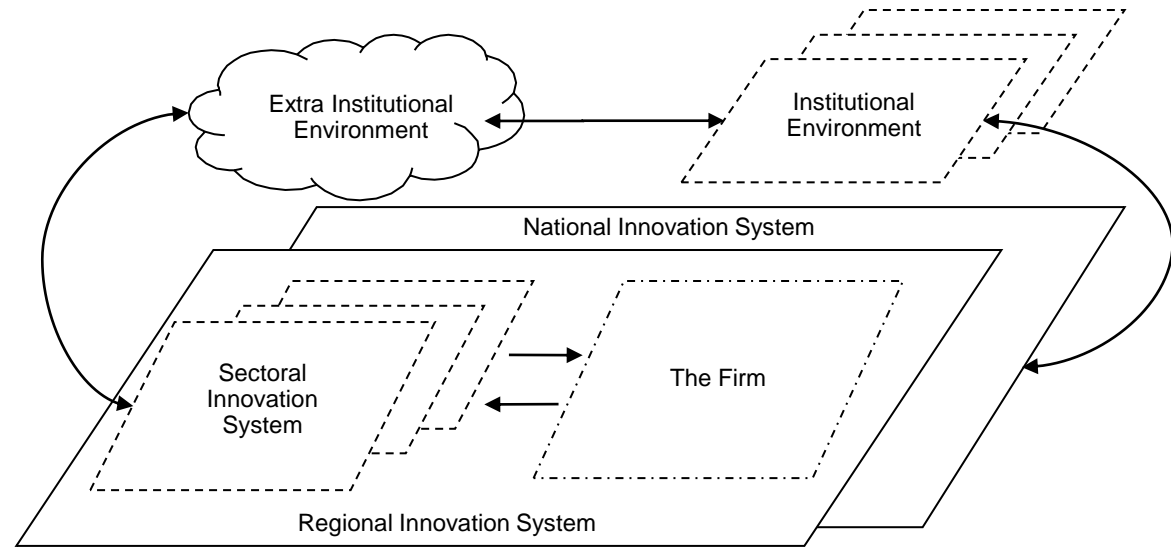
Co-evolution: Theoretical and Empirical Inquiries

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- Co-evolution is defined (Lewin et al., 1999) as “the joint outcome of managerial intentionality, environment, and institutional effects.”
- ...assumes that change may occur in all interacting populations of organizations. Change can be driven by direct interactions and feedback from the rest of the system. Can be recursive, not an outcome of either managerial adaptation or environmental selection but rather the joint result of managerial intentionality and environmental effects.
- The strength of the coevolution perspective lies in its generalized ability and integrative view of the “interplay between the adaptation of individual organizations, their competitive dynamics, and the dynamics of the institutional systems within which firms and industries are embedded” (Lewin et al. 1999, p.536).
- In theorizing and in the empirical research within a co-evolutionary inquiry system involves the following:
 - Studying organizations over time (McKelvey, 1999) within a historical context (Calori et al., 1997, Kieser 1994),
 - Multidirectional causalities between micro- and macro-evolution (McKelvey, 1999),
 - Mutual, simultaneous, lagged, and nested effects,
 - Restricting and enabling constraints of organization path dependence.



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Research Methodology

Design and Strategy

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- Co-evolutionary research requires longitudinal methods of analyses and time series. Lewin et al. (1999) suggests that longitudinal co-evolutionary research will require a richer arsenal of methods and techniques beyond traditional time series methods:
- Mixed Methodology.
 - Quantitative data
 - industry (sector) and the environment conditions.
 - Qualitative research strategy
 - on identifying events, activities and choices over time, revealing who did what, when, why (Langley, 1999; Candace, 2001).
 - This helps in developing a narrative and timeline of key events, and mapping relationships among industry's key players.
- The triangulation of quantitative and qualitative data can be achieved by using multiple qualitative sources and quantitative data, multiple theoretical lenses, and multiple sense-making strategies.
- Co-evolutionary research involves multiple levels of analysis (*multilevel analysis*) (Lewin and Volberda, 1999). In our case, data at four different levels capture processes and identify generative mechanisms:
 - firm, industry, regional and national level.

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- The goal of the co-evolutionary enquiry in the retrospective field research scheme is to understand how the structure of direct interactions and feedback within organization-environment systems give rise to their dynamic behavior.
- Empirical investigation takes the form of retrospective data collection and analysis in searching for the processes that generated and established the evolution.
- Research Questions
 - How are sectoral systems of innovation changing during the development of the sector?
 - Which elements and mechanisms are persistent and which change?
 - Is there a systematic interaction between sectoral and local systems of innovation?

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Quantitative Field Research Design

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- 2005(6)~1994
- Sectoral & Regional Information (Meso Level)
 - Sector analyses for the above years
 - Demographics of the sector with the region
 - Secondary data on economy, GDP, inflation, growth, etc
- Firm level (Micro level)
 - Financial statements (~500 firms)
 - Change of growth
 - Selection for cs research
- National level (Macro level)
 - R&D policies
 - EU Structural funds
 - etc



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The Empirics: Attica Region as a Computer Service Innovation Hot Spot

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- All Recent European Trend Chart Reports (2004-2006) present Greece, followed by Belgium and Finland, as the innovation leader in the computer services sector.
- Computer services enjoy a high knowledge creation and knowledge diffusion intensity meaning that the hot spots exploiting such services position high on an innovation intensity scale (ETCR, 2004).
- More specifically, the number one position of Greece in the computer related service activities is translated through the country's lead, compared to the other EU countries, in:
 - Number of SMEs cooperating,
 - Innovation expenditures,
 - Share of firms that receive public innovation support,
 - Gross investment in machinery and equipment,
 - R&D expenditures, and
 - Growth rate of employment.



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The Region:

Attica Region in Greece

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- **Access to a huge market**
 - 51% of the urban population of the country,
 - 55% of the banking activity,
 - 80% of the heavy industry, and 80% of the sea-borne commerce,
- **High Growth rates and incensement of consumption and investments**
- **Production: 64,6% tertiary, 33,8% secondary, 1,6% primary sector,**
- **Contribution to Regional GDP: 70%, 28% and 2% respectively.**
- **Access to Public Administration Institutions**
- **Access to human resources and infrastructures**
 - 12/20 Higher education institutions
 - 55% of the scientific personnel of the country
 - 65% of university graduates



The Sector: Computer Services Sector

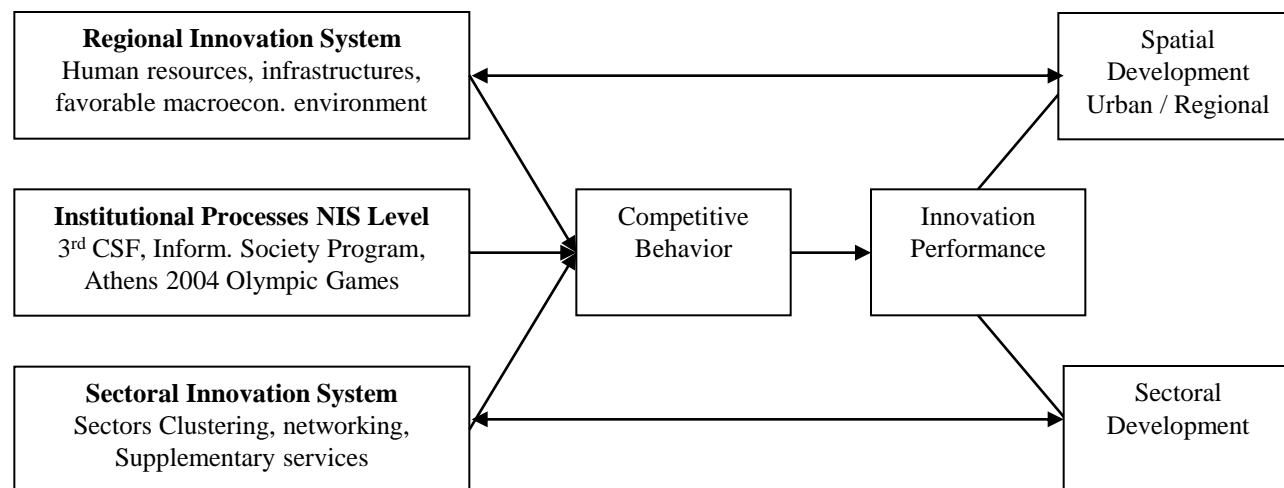
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- The Structure of the Sector
 - Computer and related activities NACE 72
 - Hardware, software consultancy and supply NACE 72.1, 72.2
 - Data processing and Database activities NACE 72.3, 72.4
 - Maintenance and repair of office, accounting and computing machinery and other activities NACE 72.5, 72,6
- Complementary sector/ crucial in order to support development
- Vertical and horizontal alliances and networking of the firms
- Wide range of applications
 - Business applications, ICT, MIS, ERP systems, etc
 - Education and vocational training
 - Culture
 - e-governance
 - Transportation
 - e-commerce
- Over 100,000 people are already employed in more than the 500 firms.

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- The 3rd Community Support Framework (2000-2006) materialized through the “Information Society Program”:
 - Implemented through several actions
 - Reserves 27% of the total community financing (through the 3rd CSF) for IT investments in a country, that represents only 3% of the European population
- The “Athens 2004” Olympic Games
- Need for modernization of both the Public Administration institutes and of the Greek firms is a strong driving force that leads them to favor investments in new technologies
- IT expenditures at the 5,3% of the Greek GDP (2007)

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- The sustainable development of the hot spot and its related sectors has to prove itself by:
 - increasing its contribution to employment through more job creation,
 - the geographical expansion, the financial growth and through the formation of partnerships with diversified external organizations in order to avoid introversion.
- The ultimate goal is to sustain its openness by coevolving in relation to both market trends and consumers needs.
- Fields and Markets for Development:
 - The software industry, the public sector, manufacturing, banking services, food and beverages, pharmaceuticals, health and insurance services,
- Major Products:
 - ERP and web applications, data bases and CRM, internet and security applications.
- Major Opportunities:
 - The recent enlargement of the European Union, the Black Sea and the Region of Middle East.
- Critical is the dissemination of IT in sectors of the economy where the need for developing technology is large, such as in agriculture and tourism.

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τμήμα διοικητικής επιστήμης και τεχνολογίας
εργαστήριο διοικητικής επιστήμης - msl

thank you!

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