

# Giorgio Fagiolo

## Curriculum Vitae

### Personal Data

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Birth Date: 2 February 1971  
Place of Birth: FIUGGI (FR), ITALY  
Gender: M  
Citizenship: Italian

### Education

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- Ph.D. in Economics at the European University Institute, S. Domenico di Fiesole (Florence). Committee Members: Alan Kirman (GREQAM, Marseille), Supervisor; Karl Schlag (EUI, Florence), Internal Advisor; Giovanni Dosi (Sant'Anna School, Pisa); Sanjeev Goyal (Cambridge University, U.K.).
- Degree Certificate in Statistics and Economics with highest final grade (110/110 'cum laude') at University of Rome "La Sapienza", Faculty of Statistics and Economics.

### Positions

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- From November 2016: Full Professor of Economics at Scuola Superiore Sant'Anna, Istituto di Economia, Pisa, Italy.
- From November 2006 to October 2016: Associate Professor of Economics at Scuola Superiore Sant'Anna, Istituto di Economia, Pisa, Italy.
- October 2005 – December 2005: Visiting Scholar at Bureau d'Economie Theorique et Appliquée (BETA), Strasbourg, France.
- November 2004 – October 2006: Assistant Professor at Department of Economics, University of Verona, Verona, Italy.
- September 2000 – October 2004: Assistant Professor at Scuola Superiore Sant'Anna, Laboratory of Economics and Management, Pisa, Italy.

### Teaching

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Post-Graduate Courses: Most recently taught courses include:

- Microeconomics (MSc in Economics)
- Non-Cooperative and Evolutionary Game Theory (MSc in Economics)
- Agent-based Computational Economics (MSc and PhD)
- Economic Networks: Theory and Applications (MSc in Economics)

Under-Graduate Courses: Most recently taught courses at Scuola Superiore Sant'Anna include:

- The empirics of trade, migration and temporary mobility
- Evolutionary Game Theory
- Agent-based Computational Economics
- Economic Networks: Theory and Applications

Recent lecturing activity:

- I have been teaching courses on "Theory and Applications of Economic Networks" at the European Central Bank (ECB) in Frankfurt (2012-2013) and at the Competitiveness Research Group, ECB, Vienna (2013).

## Recent Grant Support

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- The network of international trade flows: a statistical analysis (Local Unit), Italian Ministry of University (MIUR), 2011-2013
- Correlations in Complex Heterogeneous Networks: Identifying Systemically Important Financial Institutions (Local Unit), INET – Institute for New Economic Thinking, New York <http://ineteconomics.org/>, 2012-2014
- The Evolutionary Paths toward the Financial Abyss and the Endogenous Spread of Financial Shocks into the Real Economy (Local Unit), INET – Institute for New Economic Thinking, New York <http://ineteconomics.org/>, 2011-2013
- Robust Evaluation of Climate Policy Using Agent-based Integrated Assessment Models (Local unit), U.S. National Science Foundation, 2012-2014
- Distributed Global Financial Systems for Society (DOLFINS), FETPROACT 1: Global System Science, European Commission, 2015-present
- Innovation-fuelled, Sustainable, Inclusive Growth (ISIGrowth), H2020-EURO-SOCIETY-2014, 2015-present
- Impacts and risks from higher-end scenarios: strategies for innovative solutions (IMPRESSION), Collaborative Project, FP7, European Union, 2014-present

## Miscellanea

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- Director of the International Doctoral Program in Economics, Scuola Superiore Sant'Anna, Pisa, Italy (2012-20)
- I have been supervising several PhD, MSc and Bachelor students. Recent PhD students supervised (Doctoral Program in Economics, Scuola Superiore Sant'Anna): Matteo Chinazzi, Rossana Mastrandrea, Marco Duenas. Recent MSc Students supervised (MSc in Ecoeconomics, Scuola Superiore Sant'Anna and Università di Pisa: Matteo Pegoraro, Chiara Calastri, Giulia Rossello.
- Associate editor for the Journal of Economic Dynamics and Control (JEDC), Advances in Complex Systems (ACS) and the Journal of Economic Interaction and Coordination (JEIC).
- Member of the Advisory Council of the Society for Computational Economics (2009-2011)
- Member of the Editorial Board Meeting of the Journal of Artificial Societies and Social Simulation (JASSS)
- I have been invited in many conferences and workshops as keynote speaker, including ESHIA 2010, Latsis Symposium 2012, Emaee 2013, Complenet 2014 and others.
- I have been serving in several international conference program committees, including the conference on Computing in Economics and Finance (CEF), the Workshop on the Economic Science with Heterogeneous Interacting Agents (WEHIA), the Workshop on Complex Networks (Complenet), the International Symposium on Agent-Based Modeling and Simulation (ABModSim), the Artificial Economics Conference (AE), the European Conference on Complex Systems (ECCS), the Conference of the European Social Simulation Association (ESSA), the International Workshop on Managing Financial Instability in Capitalist Economies (MAFIN), the International Conference on Signal Image

Technology & Internet Based Systems (SITIS), the World Congress on Social Simulation (WCSS).

- I have been serving as a referee for various international journals (American Economic Review, Industrial and Corporate Change, Structural Change and Economic Dynamics, Journal of Economic Dynamics and Control, Journal of Evolutionary Economics, International Journal of Industrial Organization, Computational Economics, Journal of Economic Behavior and Organization, European Physical Journal B, Physical Review E, Small Business Economics, Journal of Applied Econometrics, Physica A, PLoS One, Journal of Economic Growth, Journal of Economic Development, the ECB Working Paper Series).
- Coordinator of Dimetic Session on Computational and Evolutionary Models (Maastricht, 2006-2011, <http://dimetic.dime-eu.org>)

## Scholarships

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- December 1996 : Bank of Italy, "B. Stringher" Scholarship for Post-Graduate Studies in Economics, Academic Year 1998-1999.
- July 1996 : European Investment Bank, "Campili-Formentini" Scholarship for a Three-Year Program of Post-Graduate Studies in Economics, Academic Years 1996-1998 and 1999-2000.

## Fields of interest

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- Agent-Based Computational Economics: Methodological Issues, Models and Applications
- Game-Theoretic Models of Strategic Network Formation
- Economic Networks: Empirical Evidence
- Industrial Dynamics: Models and Empirical Evidence
- Statistical Properties of Micro and Macro Dynamics

Publications (for a complete list see <http://www.lem.sssup.it/fagiolo>)

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## Journal Articles

1. Fagiolo, G. and Santoni, G. (2015), "Human-Mobility Networks, Country Income, and Labor Productivity", *Network Science*, 3: 377-407.
2. Mastrorillo, M. and Fagiolo, G. (2015), "International Migration and School Enrollment of the Left-Behinds in Albania: A Note", *Eastern European Economics*, 53: 242-254.
3. Ascari, G., Fagiolo, G., Roventini, A. (2015), "A Note on Fat Tail Distributions and Business Cycle Models", *Macroeconomic Dynamics*, 19: 465-476.
4. Dosi, G. Fagiolo, G., Napoletano, M. Roventini, A. and Treibich, T. (2015), "[Fiscal and Monetary Policies in Complex Evolving Economies](#)", *Journal of Economic Dynamics and Control*, 52: 166-189.
5. Alatrliste Contreras, M.G. and Fagiolo, G. (2014), "Propagation of Economic Shocks in Input-Output Networks: A Cross-Country Analysis", *Physical Review E*, 90: 062812. Article covered as: "[Focus: Heavily Interconnected Economies Are Vulnerable to Shocks](#)" by Tamela Maciel, *Physics* 7, 130 (2014).
6. Mastrandrea, R., Squartini, T., Fagiolo, G., Garlaschelli, D. (2014), "Reconstructing the world trade multiplex: The role of intensive and extensive biases", *Physical Review E*, 90, 062804.

7. Duenas, Marco and Fagiolo, Giorgio (2014), "Global Trade Imbalances: A Network Approach", *Advances in Complex Systems*, 17: 1450014 (29 pages).
8. Fagiolo, G. and Mastrorillo, M. (2014) "[Does Human Migration Affect International Trade? A Complex-Network Perspective](#)", *PLoS ONE* 9(5): e97331.
9. Mastrandrea, R., Squartini, T., Fagiolo, G. and Garlaschelli D. (2014), "[Enhanced network reconstruction from irreducible local information](#)", *New Journal of Physics*, 16: 043022.
10. Vitali, S., Napoletano, M. and Fagiolo, G. (2013) "Spatial Localization in Manufacturing: A Cross-Country Analysis", *Regional Studies*, 47:1534-1554.
11. Fagiolo, G. and Mastrorillo, M. (2013), "International migration network: Topology and modeling", *Physical Review E*, 88, 012812.
12. Dosi, G., Fagiolo, G., Napoletano, M. and Roventini, A. (2013), "Income Distribution, Credit and Fiscal Policies in an Agent-Based Keynesian Model", *Journal of Economic Dynamics and Control*, 37: 1598-1625.
13. Chinazzi, M., Fagiolo, G., Reyes, J. and Schiavo, S. (2013), "Post-Mortem Examination of the International Financial Network", *Journal of Economic Dynamics and Control*, 37: 1692-1713.
14. M.D. Gerst, P. Wanga, A. Roventini, G. Fagiolo, G. Dosi, R.B. Howarth, M.E. Borsuk (2013), "Agent-based modeling of climate policy: An introduction to the ENGAGE multi-level model framework", *Environmental Modeling and Software*, 44: 62-75.
15. Duenas, M. and Fagiolo, G. (2013), "Modeling the International-Trade Network: A Gravity Approach", *Journal of Economic Interaction and Coordination*, 8: 155-178.
16. Squartini, T., Fagiolo, G. and Garlaschelli, D. (2013), "Null Models of Economic Networks: The Case of the World Trade Web", *Journal of Economic Interaction and Coordination*, 8: 75-107.
17. Fagiolo, G. and Roventini, A. (2012), "Macroeconomic policy in DSGE and agent-based models", *Revue de l'OFCE*, 124: 67-116. [[Get a PDF version](#)]
18. Napoletano, M., Dosi G., Fagiolo, G. and Roventini, A. (2012), "Wage Formation, Investment Behavior and Growth Regimes: An Agent-Based Analysis", *Revue de l'OFCE*, 124: 235-262. [[Get a PDF version](#)]
19. Fagiolo, G. and Roventini, A. (2012), "On the Scientific Status of Economic Policy: A Tale of Alternative Paradigms", *Knowledge Engineering Review*, 27: 163-185.
20. Barigozzi, M., Alessi, L., Capasso, M. and Fagiolo, G. (2012), "The Distribution of Consumption-Expenditure Budget Shares. Evidence from Italian Households", *Structural Change and Economic Dynamics*, 23: 69–91.
21. Squartini, T., Fagiolo, G. and Garlaschelli, D. (2011), "Randomizing World Trade. Part I: A Binary Network Analysis", *Physical Review E*, 84, 046117.
22. Squartini, T., Fagiolo, G. and Garlaschelli, D. (2011), "Randomizing World Trade. Part II: A Weighted Network Analysis", *Physical Review E*, 84, 046118 .
23. Barigozzi, M., Fagiolo, G. and Mangioni, G. (2011), "Identifying the Community Structure of the International-Trade Multi Network", *Physica A*, 390: 2051-2066.
24. Dosi, G., Fagiolo, G. and Roventini, A. (2010), "Schumpeter Meeting Keynes: A Policy-Friendly Model of Endogenous Growth and Business Cycles", *Journal of Economic Dynamics and Control*, 34: 1748–1767.
25. Fagiolo, G., Reyes, J. and Schiavo, S. (2010), "The Evolution of the World Trade Web", *Journal of Evolutionary Economics*, 20: 479-514.
26. Reyes, J., Schiavo, S. and Fagiolo, G. (2010), "Using Complex Networks Analysis to Assess the Evolution of International Economic Integration: the Cases of East Asia and Latin America", *Journal of International Trade and Economic Development*, 19: 215-239.

27. Barigozzi, M., Fagiolo, G. and Garlaschelli, D. (2010), "The Multi-Network of International Trade: A Commodity-Specific Analysis", *Physical Review E*, 81, 046104.
28. Fagiolo, G. (2010), "The International-Trade Network: Gravity Equations and Topological Properties", *Journal of Economic Interaction and Coordination*, 5:1-25.
29. Schiavo, S., Reyes, J. and Fagiolo, G. (2010), "International Trade and Financial Integration: A Weighted Network Analysis", *Quantitative Finance*, 10: 389–399.
30. Fagiolo, G., Alessi, L., Barigozzi, M. and Capasso, M. (2010), "On the distributional properties of household consumption expenditures. The case of Italy", *Empirical Economics*, 38:717-741.
31. Fagiolo, G., Napoletano, M., Roventini, A. and Piazza, M. (2009), "[Detrending and the Distributional Properties of U.S. Output Time Series](#)", *Economics Bulletin*, 29, 4.
32. Schweitzer, F., Fagiolo, G., Sornette, D., Vega-Redondo, F., Vespignani, A., White, D.R. (2009), "Economic Networks: The New Challenges", *Science*, 24 July 2009, Vol. 325, No. 5939, pp. 422-425.
33. Schweitzer, F., Fagiolo, G., Sornette, D., Vega-Redondo, F., White, D.R. (2009), "Economic Networks: What do we know and what do we need to know?", *Advances in Complex Systems*, 12:407-4022.
34. Fagiolo, G. and Roventini, A. (2009), "On the Scientific Status of Economic Policy: A Tale of Alternative Paradigms", published in Russian as "O nauchnom statuse ekonomicheskoy politiki: povest' ob al'ternativnykh paradigmatkh", *Voprosy Ekonomiki*, 6:24.
35. Capasso, M., Alessi, L., Barigozzi, M. and Fagiolo, G. (2009), "On approximating the distributions of goodness-of-fit test statistics based on the empirical distribution function: The case of unknown parameters", *Advances in Complex Systems*, 12: 157–167.
36. Fagiolo, G., Reyes, J. and Schiavo, S. (2009), "The World-Trade Web: Topological Properties, Dynamics, and Evolution", *Physical Review E*, 79, 036115 (19 pages).
37. Reyes, J., Schiavo, S. and Fagiolo, G. (2008), "Assessing the evolution of international economic integration using random-walk betweenness centrality: The cases of East Asia and Latin America", *Advances in Complex Systems*, 11: 685–702.
38. Fagiolo, G., Napoletano, M. and Roventini, A. (2008), "Are Output Growth-Rate Distributions Fat-Tailed? Some Evidence from OECD Countries", *Journal of Applied Econometrics*, 23: 639-669.
39. Dosi, G., Fagiolo, G. and Roventini, A. (2008), "The Microfoundations of Business Cycles: An Evolutionary, Multi-Agent Model", *Journal of Evolutionary Economics*, 18: 413-432.
40. Bottazzi, G., Dosi, G., Fagiolo, G. and Secchi, A. (2008), "Sectoral and Geographical Specificities in the Spatial Structure of Economic Activities", *Structural Change and Economic Dynamics*, 19: 189-202.
41. Fagiolo, G., Reyes, J. and Schiavo, S. (2008), "On the Topological Properties of the World Trade Web: A Weighted Network Analysis", *Physica A*, 387: 3868–3873.
42. Bottazzi, G., Dosi, G., Fagiolo, G. and Secchi, A. (2007), "Modeling Industrial Evolution in Geographical Space", *Journal of Economic Geography*, 7: 651-672.
43. Fagiolo, G., Valente, M. and Vriend, N. (2007), "Segregation in Networks", *Journal of Economic Behavior and Organization*, 64: 316-336.
44. Dosi, G., Fagiolo, G. and Roventini, A. (2007), "Lumpy investment and endogenous business cycles in an evolutionary multi-agent model", *Cybernetics and Systems*, 38: 631-666.
45. Fagiolo, G., Moneta, A. and Windrum, P. (2007), "A Critical Guide to Empirical Validation of Agent-Based Models in Economics: Methodologies, Procedures, and Open Problems", *Computational Economics*, 30:195-226.

46. Fagiolo, G. (2007), "Clustering in Complex Directed Networks", *Physical Review E*, 76: 026107 (8 pages).
47. Fagiolo, G., Napoletano, M. and Roventini, A. (2007), "How Do Output Growth Rate Distributions Look Like? Some Time-Series Evidence on OECD Countries", *European Physical Journal B*, 57: 205-211.
48. Windrum, P., Fagiolo, G. and Moneta, A. (2007), "Empirical Validation of Agent-Based Models: Alternatives and Prospects", *Journal of Artificial Societies and Social Simulation*, 10, 2, available at: <http://jasss.soc.surrey.ac.uk/10/2/8.html> .
49. Fagiolo, G. (2006) "[Directed or Undirected? A New Index to Check for Directionality of Relations in Socio-Economic Networks](#)", *Economics Bulletin*, 3, 34: 1-12.
50. Fagiolo, G. and Luzzi, A. (2006), "Do Liquidity Constraints Matter in Explaining Firm Size and Growth? Some Preliminary Evidence on the Italian Manufacturing Industry", *Industrial and Corporate Change*, 15, 1: 1-39.
51. Dosi, G., Fagiolo, G. and Roventini, A. (2006), "An Evolutionary Model of Endogenous Business Cycles", *Computational Economics*, 27, 1: 3-34.
52. Fagiolo, G. (2005), "[A Note on Equilibrium Selection in Polya-Urn Coordination Games](#)", *Economics Bulletin*, 3, 45: 1-14.
53. Fagiolo, G. and Valente, M. (2005), "Minority Games, Local Interactions, and Endogenous Networks", *Computational Economics*, 25: 41-57.
54. Fagiolo, G. (2005), "Endogenous Neighborhood Formation in a Local Coordination Model with Negative Network Externalities", *Journal of Economic Dynamics and Control*, 29: 297-319.
55. Fagiolo, G., Marengo, L. and Valente, M. (2004), "Population Learning in a Model with Random Payoff Landscapes and Endogenous Networks", *Computational Economics*, 24: 383-408.
56. Fagiolo, G., Marengo, L. and Valente, M. (2004), "Endogenous Networks in Random Population Games", *Mathematical Population Studies*, 11: 121-147.
57. Fagiolo, G., Dosi, G. and Gabriele, R. (2004), "Matching, Bargaining, and Wage Setting in an Evolutionary Model of Labor Market and Output Dynamics", *Advances in Complex Systems*, 14: 237-273.
58. Fagiolo, G. and Dosi, G. (2003), "Exploitation, Exploration and Innovation in a Model of Endogenous Growth with Locally Interacting Agents", *Structural Change and Economic Dynamics*, 14: 237-273.
59. Aversi, R., Dosi, G., Fagiolo, G., Meacci, M. and Olivetti, C. (1999), "Demand Dynamics with Socially Evolving Preferences", *Industrial and Corporate Change*, 8, 2: 353-408.

### **Special Issues Edited**

1. Dawid, H. and Fagiolo, G. (Eds.), Special Issue on "Agent-Based Models for Economic Policy Design", *Journal of Economic Behavior and Organization*, 2008, Volume 67, Issue 2.
2. Fagiolo, G., Birchenhall, C. and Windrum, P. (Eds.), Special Issue on "Empirical Validation in Agent-Based Models", *Computational Economics*, 2007, Volume 30, Issue 3.

## Book Chapters

1. Fagiolo, G. and Mastrorillo, M., "Migration and Trade: A Complex-Network Approach" IEEE Computer Society, 2013 International Conference on Signal-Image Technology & Internet-Based Systems (SITIS), Kyoto, Japan, 2-5 Dec. 2013, pp. 538 - 545, DOI: 10.1109/SITIS.2013.90.
2. Dosi, G., Fagiolo, G., Napoletano, M. and Roventini, A. (2012), "Economic policies with endogenous innovation and Keynesian demand management", in: Solow, R.M. and Touffut, J.-P. (2012), What's Right with Macroeconomics, Edward Elgar, Cheltenham, U.K.
3. Fagiolo, G., Reyes, J. and Schiavo, S. (2009), "Dynamics and Evolution of the International Trade Network", in: Fortunato, S., Mangioni, G., Mezenes, R. and Nicosia, V. (Eds.), Complex Networks, Studies in Computational Intelligence, Springer-Verlag Berlin Heidelberg, Vol. 207, pp. 1-14.
4. Fagiolo, G., Valente, M. and Vriend, N.J. (2008), "A Dynamic Model of Segregation in Small-World Networks", in: Naimzada, A.K., Stefani, S. and Torriero, A. (Eds.), Networks, Topology, and Dynamics. Theory and Applications to Economic and Social Systems, Lecture Notes in Economics and Mathematical Systems, Springer-Verlag Berlin Heidelberg, Vol. 613, pp. 109-124.
5. Fagiolo, G., Moneta, A. and Windrum, P. (2006), "Confronting Agent-Based Models with Data: Methodological Issues and Open Problems", in Bruun, C. (Ed.), Advances in Artificial Economics. The Economy as a Complex Dynamic System, Lecture Notes in Economics and Mathematical Systems, Springer-Verlag Berlin Heidelberg, Vol. 584, pp. 255-267.
6. Dosi, G., Fagiolo, G., Roventini, A. (2006), "Lumpy Investment and Endogenous Business Cycles" in Trappl, R. (ed.), Cybernetics and Systems 2006, Vienna, Austrian Society for Cybernetic Studies.
7. Bottazzi, G., Dosi, G. and Fagiolo, G. (2006), "On Sectoral Specificities in the Geography of Corporate Location", in Breschi, S. and Malerba, F. (Eds.), Clusters, networks and innovation, Oxford, U.K., Oxford University Press.
8. Pyka, A. and Fagiolo, G. (2005), "Agent-Based Modelling: A Methodology for Neo-Schumpeterian Economics". In: Hanusch, H. and Pyka, A. (Eds.), The Elgar Companion to Neo-Schumpeterian Economics, Edward Elgar, Cheltenham.
9. Dosi, G., Marengo, L. and Fagiolo, G. (2005), "Learning in Evolutionary Environments", in Dopfer, K. (Ed.), Evolutionary Principles of Economics, Cambridge, Cambridge University Press.
10. Fagiolo, G., Dosi, G. and Gabriele, R. (2004), "Matching, Bargaining, and Wage Setting in an Evolutionary Model of Labor Market and Output Dynamics", in: Leombruni, R. and Richiardi, M. (Eds.), Industry and Labor Dynamics: The Agent-based Computational Economics Approach, Singapore, World Scientific Press.
11. Fagiolo, G., Marengo, L. and Valente, M. (2004), "Population Learning in Random Games with Endogenous Network Formation", in Lux, T., Reitz, S. and Samanidou, E. (Eds.), Nonlinear Dynamics and Heterogenous Interacting Agents, Lecture Notes in Economics and Mathematical Systems, Berlin, Springer.
12. Fagiolo, G., Dosi, G. and Gabriele, R. (2004), "Towards an evolutionary interpretation of aggregate labor market regularities", in: Cantner, U., Dinopoulos, E. and Lanzillotti, R.F. (Eds.), Entrepreneurship, the New Economy and Public Policy: Schumpeterian Perspectives, Berlin - Heidelberg, Springer Verlag.
13. Bottazzi, G., Dosi, G. and Fagiolo, G. (2001), "On the Ubiquitous Nature of the Agglomeration Economies and their Diverse Determinants: Some Notes", in Quadrio Curzio, A. and Fortis, M. (Eds.), Complexity and Industrial Clusters: Dynamics and Models in Theory and Practice, Heidelberg, Physica-Verlag, 2002, p.167-191.

14. Dosi, G., Fagiolo, G. and Marengo, L. (2000), "On the dynamics of Cognition and Actions. An Assessment of some Models of Learning and Evolution", in Pagano, U. and Nicita, A. (Eds.), *The Evolution of Economic Diversity, Papers and Proceedings of the 10th International School of Economic Research on Evolution and Economics*, Siena (Italy), June 27 - July 5, Routledge.
15. Dosi, G. and Fagiolo, G.. (1998), "Exploring the unknown. On entrepreneurship, coordination and innovation-driven growth", in Lesourne, J. and Orléan, A. (Eds.), *Advances in Self-Organization and Evolutionary Economics*, Paris, Economica. Also in: Dosi, G. (2000), *Innovation, Organization and Economic Dynamics: Selected Essays*, Cheltenham, Edward Elgar Publishing.
16. Dosi, G., Fagiolo, G., Aversi, R., Meacci, M. and Olivetti, C. (1999), "Cognitive Processes, Social Adaptation and Innovation in Consumption Patterns: from Stylized Facts to Demand Theory", in Dow, S.C and Earl, P.E. (Eds.), *Economic Organizations and Economic Knowledge: Essays in Honour of Brian Loasby*, Cheltenham, Edward Elgar.
17. Fagiolo, G. (1998), "Spatial Interactions in Dynamic Decentralised Economies", in Cohendet, P. , Llerena, P., Stahn, H. and Umbhauer, G. (Eds.), *The Economics of Networks: Interaction and Behaviours*, Berlin - Heidelberg, Springer Verlag.