

Stefano Battiston

CURRICULUM VITAE

Swiss National Science Foundation Professor at the Department of Banking and Finance, University of Zurich

PERSONAL DATA

Name: Stefano Battiston
Date of Birth: July 28, 1972
Place of Birth: Venice, Italy
Citizenship: Italian



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REFERENCES

- Professor Joseph Stiglitz, Columbia University
- Professor Marc Chesney, Director of the Department of Banking and Finance of the University of Zurich
- Professor Steven Ongena, Department of Banking and Finance of the University of Zurich

RESEARCH AND CAREER PROFILE

Stefano Battiston is a leading expert in the areas of economic and financial networks, systemic risk, and sustainable finance, as reflected in several top-journal publications and EU project coordination awards. His scientific background in complex systems, combined with 15 years of research in economics and finance, put him in a unique position to understand policy issues both from a quantitative and holistic perspective. The societal and policy relevance of his research is reflected in durable dialogues with a vast network of contacts with EU policymaking institutions and stakeholders. In the recent years, he has been leading a group of 10+ people among researchers and administrative staff, and he has established the FINEXUS Center for Financial Networks and Sustainability at the University of Zurich. He has also been coordinating several EU and Swiss projects on finance and sustainability for a total funding of 9+ million Euros and has been involved in 10+ research grants, overall. His goal is to expand further his innovative research program on complex financial networks and sustainability and to mainstream it in the scientific community and among policy institutions.

EDUCATION AND POSITIONS

Professorships and Current Positions

- Since 06/2016: Director of FINEXUS Center for Financial Networks and Sustainability, University of Zurich, Department of Banking and Finance
- Since 11/2013: Swiss National Science Foundation (SNSF) Professor of Banking at University of Zurich, Department of Banking and Finance
- Eligible for Italian full professor position in the area 13-A2 (Economic Policy)

Senior researcher and Post-doc positions

- 08/2009-09/2013 senior researcher and (07/2005-07/2009) postdoc at ETH Zurich, Department Management Technologies and Economics in the Chair of Systems Design lead by Prof. Frank Schweitzer,
- 10/2004-07/2005 CNRS post-doc at École des Hautes Études en Sciences Sociales, Paris, Centre d'Analyse et Mathématique Social, with director Prof. Henry Berestycki

Doctoral degree

- 01/2001-03/2004 PhD in Statistical Physics at the École Normale Supérieure, Paris, Laboratoire de Physique Statistique. Thesis: "Dynamics and Evolution of Complex Networks in Socio-Economic Networks", with supervisors Eric Bonabeau (Eurobios and Icosystems) and Gerard Weisbuch (École Normale Supérieure).

Master degrees and research assistant positions

- 04/1999-12/2000: Master of Science in Neuroscience, Brandeis University, MA, USA. 09/1999-12/2000. Research assistant in neuroscience at Brandeis University.
- 03/1998: Laurea degree in Physics from Univ. of Padua, grade 110/110, thesis: "Neuronal Networks: Statistical Methods and Mutual Information Measure", supervisors Prof. Attilio Stella (Univ. of Padua) and Prof. Vincent Torre (SISSA).
- 06/1997-03/1999 Research assistant in neuroscience at SISSA-ISAS Trieste, Italy.
- 06/1992: Bachelor degree in Classical Studies, grades 60/60 Liceo Classico Tito Livio, Padova, Italy.

AWARDS AND FELLOWSHIPS

2013 – 2019	SNSF Professorship Award (Swiss national competition)
2004 – 2005	CNRS Post Doc fellowships (French national competition)
2001 – 2002	CIFRE fellowship, with École Normale Supérieure and Eurobios, Paris, France
1999 – 2000	PhD fellowship in Neuroscience, Brandeis University, MA, USA
1999	Graduate fellowship from Gini foundation

RESEARCH TOPICS AND EXPERTISE FIELDS

- Since 2013, **Sustainable finance and climate-finance**: analysis of financial risk in the context of climate change and climate policies, credit portfolio analysis in green and development banks
- Since 2005, **Systemic risk and financial stability**: quantitative methods to assess systemic risk in presence of financial contagion, corporate debt pricing in presence of counterparty risk
- Since 2001, **Corporate finance**: analysis of equity cross-ownership networks and board of directors interlocks across countries, globally and in economic geography context: empirical studies and modelling
- 2007-2011, **Networks in R&D and innovation**: models of evolving networks under strategic interaction in game-theoretical settings, efficiency and stability of networks
- 2007-2011, **On-line social networks and recommender systems**: empirical analysis and algorithms for trust in recommender systems
- 1998-2001, **Neuroscience**: empirical analysis and models of mutual information and memory in experimental and model neuronal networks.

RESEARCH PROJECTS AND CONSULTANCY ACTIVITY

Research projects, consulting, collaborations with policy institutions

- Member of Group of Economic Advisors (GEA) of the European Securities and Markets Authority (ESMA), from Dec. 2018
- Systemic risk analysis and financial network analysis with several central banks (from 2013)
- Climate-finance risk analysis: several development banks and stakeholders in the domain of sustainability
- Social and corporate network analysis in the domain of business intelligence and foreign direct investments

Responsibilities in National and International Research Grants

- **SNSF Professorship** grant “Systemic Risk and Financial Networks”: duration 2013-2019, 2.1M CHF total budget. Role: **principal investigator**, scientific concept and supervision.
- **DOLFINS**, EU H2020 FET project “Distributed Global Financial Systems for Society”, n. 640772: duration 2015-2018, 14 partner institutions, 4.2M Euro budget. Role: **project coordinator**, scientific concept, supervision. www.dolfinsproject.eu, <https://cordis.europa.eu/project/rcn/193749/factsheet/en>
- **SIMPOL**, EU FP7 FET project “Simulation of Financial Networks for Policy Models”, n.610704 duration 2013-2016, 6 partner institutions, 1.8M euro budget,. Role: **project coordinator**, scientific concept and supervision. www.simpolproject.eu, <https://cordis.europa.eu/project/rcn/110645/factsheet/en>
- Institute for New Economic Thinking (**INET**) research grant Task Force “Macroeconomic efficiency and Stability” (2016-2018) coordinated by J.E. Stiglitz (Columbia University). Role: leader of working group Financial Networks.

- **FINREALNET** (FINancial and REAL Sector NETworks in Europe) Marie Skłodowska-Curie Individual Fellowship Program: duration 2017-2018, grant no. 704936. Topic: Network analysis of systemically important real sectors in the euro area and models of for sector targeting macro-prudential tools. Role: supervision of the post-doctoral researcher fellow.
- **ISIGROWTH**: H2020 grant no. 649186, duration 2015 – 2018. Topics: financial innovation and real economy growth, inequality. Role: Node and task leader.
- **SEIMETRICS**: H2020-FET grant no. 649982, duration 2015 – 2018. Topics: metrics to account for climate impact of portfolio investments. Role: Node and task leader.
- **BigDataFinance** (“Big Data in Financial Research and Risk Management”) Marie Curie Innovative Training Network grant no. 675044. Topic: Doctoral training of 15 researchers at the crossroad of Finance and Big Data. Duration 2016-2019. Role: supervision of two of the 15 fellows.
- **OpenMaker**, H2020 grant no. 687941. Topic: social innovation in real and financial sector. Duration 2016-2019. Role: Node and task leader.
- 2010-2013, EU-FET project **FOC** “Forecasting Financial Crises”, coordinated by Prof. Guido Caldarelli at IMT Lucca. Role: coordination of several working packages and tasks on systemic risk monitoring and IT development.
- 2012-2015, EU-FET Integrated Project **MULTIPLEX**, coordinated by Prof. Guido Caldarelli (IMT Lucca). Role: contribution to project concept, negotiation process and dissemination tasks.
- 2012-2014, Institute for New Economic Thinking (**INET**) - Task Force on Systemic Risk, directed by Joseph E. Stiglitz (Columbia Univ.) Role: coordination of Working Group on Financial Networks.
- Swiss National Science Foundation (**SNSF**) grant “OTC Derivatives and Systemic Risk in Financial Networks” granted to the Chair of Systems Design (2010-2013). Role: scientific concept and supervision.
- Institute for New Economic Thinking (**INET**), research grant “Long-range Correlations in Financial Networks” (2012-2014), coordinated by Imre Kondor at Parmenides Foundation. Role: in charge of supervision of work package on multi-agent simulations of default contagion.
- EU-COST project **COSTP10, Swiss Chapter**. Role: contribution to project concept and supervision.
- EU project **MMCOMNET** “Measuring and Modelling Complex Networks across Domains” (2005-2008), coordinated by Prof. Felix Reeds-Tsochas (Saïd Business School, Oxford). Role: scientific supervision of research task on supply networks.
- EU-FET project **COSIN**, the first EU grant on Complex Networks (2002-2005), coordinated by Guido Caldarelli, CNR, Italy. Role: research and reporting tasks in work-package on Socio-economic networks.

SCIENTIFIC REVIEWER AND EDITOR ACTIVITY

- **Economics and Finance Journals:**
 - Reviewer for J. of Economic Behaviour and Organization, J. of Economic Dynamics and Control, J. of Financial Stability, J. of Banking and Finance, Quantitative Finance, J. of Financial Network Theory.
 - Associate Editor for J. of Financial Stability (from 2019), J. of Financial Network Theory (from 2018). Guest Editor for two special issues of J of Financial Stability (2017, 2018)
- **Interdisciplinary Journals:**
 - Reviewer for Nature, PNAS, Science Advances, Scientific Reports, Physics Review E, Physics Review D, European Physics Journal B, Quantitative Finance, Physica A.
 - Guest editor for EPJB in 2010. Associate editor for EPJDATA (from 2014).

ORGANIZATION OF INTERNATIONAL CONFERENCES (Selected)

- Organizer of the 2nd FINEXUS Conference on Financial Networks and Sustainability, January 17-19 2018, Univ. of Zurich and the Key Panel on hosting Nobel laureate Joseph Stiglitz, Graeme Maxton (Secr. Gen. of Club of Rome) as well as three high-rank representatives of public and private global financial institutions.
- Co-organizer of 2nd conference on "Network models, stress testing, and other tools for financial stability monitoring and macro-prudential policy design and implementation", Mexico City 26-28, September 2017 in collaboration with the Journal of Financial Stability.
- Organizer of the 1st FINEXUS Conference on Financial Networks and Sustainability, January 9-13 2017, Univ. of Zurich and the Round Table on the nexus finance-climate-inequality hosting Nobel laureate Joseph Stiglitz.
- Organizer of the public lecture Nobel laureate Joseph Stiglitz at University of Stiglitz “Financial Complexity and Climate Change”, Zurich, January 18, 2016

- Co-organizer of 1st conference on "Network models, stress testing, and other tools for financial stability monitoring and macroprudential policy design and implementation", Mexico City 9-13, November 2015 in collaboration with the Journal of Financial Stability
- Program Chair at European Conference on Complex Systems (ECCS'14)
- Co-organizer of Conference at International Monetary Fund: Interconnectedness - Building Bridges between Research and Policy, Washington, April 11, 2014

TEACHING

- University of Zurich
 - Spring 2015 and 2016, PhD course on Systemic risk and financial networks
 - Fall 2015, 2016, 2017, 2018: Master course Introduction to Systemic risk and financial networks
- ETH Zurich
 - Spring 2011, 2012, 2013: Course on Economic Networks, ETH Zurich
 - Spring 2010: Course on Complex Adaptive Systems, ETH Zurich
- Lectures in Thematic Schools (selected)
 - May 2018, 4th Como Spring School of Complex Networks: Theory, Methods, and Applications.
 - May 2018, Intensive Course on Sustainable Finance, Warsaw School of Economics, Warsaw, Poland
 - September 2017, Lectures on Financial Networks at Summer School on Complex Socio-Technical Systems, IFISC, Palma de Mallorca.
 - January 2017, Lectures on Systemic risk at BigDataFinance Winter School, UZH, Switzerland
 - July 2016, Lectures on "Financial Networks" at XVI Trento Summer School, Trento, Italy
 - April 2015, Lectures on Complex Financial Networks at Les Houches School in Complex Networks, France
 - September 2014, Lectures on Complex Financial Networks at Summer School of European Conference Complex Systems, Lucca Italy

SUPERVISION OF PHD STUDENTS AND POSTDOCS (selected)

Overall, Stefano Battiston has supervised the work of 10+ PhD students (who all succeeded their defense) including: Tarik Roukny, PhD at Univ. of Brussels in 2011, currently Assistant Professor of Finance at KU Leuven, Faculty of Business and Economics; Michael D. König, PhD at ETH Zurich in 2009, now associate professor at the Department of Spatial Economics at VU Amsterdam.

He supervised directly 8 postdocs who found successful positions in research in academic and policy institutions, including : Marco Bardoscia (postdoc in the SIMPOL project), now Research Economist in the Stress Test Strategy Division of Bank of England; Paolo Barucca (my postdoc in the DOLFINS project), now lecturer at UCL; Marco D'Errico, (postdoc in the SNF project), now Financial Stability expert at the European Systemic Risk Board.

LANGUAGES

- Italian (native), English (proficient), French (proficient), Spanish (proficient), Portuguese and German (basic)

PUBLICATIONS (updated on November 2018)

Summary

- 50+ publications in peer-reviewed journals

Citations and bibliometrics

- Google Scholar profile: <http://scholar.google.com/citations?hl=en&user=3wrVpcYAAAAJ>
 - no. citations 5465, h-index 33, i10 index 62
- Scopus profile: <https://www.scopus.com/authid/detail.uri?authorId=6603263932#>
 - no. citations 1660, h-index 25

Top 5 publications by citation number or impact factor

1. Schuldenzucker, S., Seuken, S. & Battiston, Default ambiguity: Credit default swaps create new systemic risks in financial networks, *Management Science (forthcoming)*, earlier version on ssrn 3043708.

2. Battiston, S., Mandel, A., Monasterolo, I., Schuetze, F., & Visentin, G. (2017). A Climate stress-test of the financial system. *Nature Climate Change*, 7, 283-288.
3. Bardoscia, M., Battiston, S., Caccioli, F., & Caldarelli, G. (2016). Pathways towards instability in financial networks. *Nature Communications*, 8, 14418.
4. Battiston, S., Roukny, T., Stiglitz, J., Caldarelli, G. & May, R. The Price of Complexity in Financial Networks. *PNAS*, 113, 36, 10031-10036 (2016).
5. Battiston, S., Gatti, D. D., Gallegati, M., Greenwald, B. C. N. & Stiglitz, J. E. Liaisons Dangereuses: Increasing Connectivity, Risk Sharing, and Systemic Risk. *J. Econ. Dyn. Control* **36**, 1121–1141 (2012).

Full list of publications in international peer-reviewed journals (53)

1. Schuldenzucker, S., Seuken, S. & Battiston, S. Default ambiguity: Credit default swaps create new systemic risks in financial networks, *Management Science (forthcoming)*, earlier version on ssrn 3043708.
2. Karpf, Andreas, Antoine Mandel, and Stefano Battiston. "Price and network dynamics in the European carbon market." *Journal of Economic Behavior & Organization* 153 (2018): 103-122.
3. Monasterolo, Irene, Jiani I. Zheng, and Stefano Battiston. "Climate-Finance and Climate Transition Risk: An Assessment of China's Overseas Energy Investments Portfolio." *Journal of China and the World Economy* (2018).
4. Stolbova, V., Monasterolo, I., Battiston, S.: A Financial Macro-Network Approach to Climate Policy Evaluation. *Ecol. Econ.* 149, (2018).
5. Roukny, T., Battiston, S., & Stiglitz, J. E. (2018). Interconnectedness as a Source of Uncertainty in Systemic Risk. *Journal of Financial Stability*, 35, 93-106.
6. D'Errico, M., Battiston, S., Tuomas, P., & Scheicher, M. (2018). How does risk flow in the credit default swap market? *Journal of Financial Stability*, 35, 53-74.
7. Monasterolo, I., Battiston, S., Janetos, A.C., Zheng, Z. (2017). Vulnerable yet relevant: the two dimensions of climate-related financial disclosure. *Climatic Change*, 145, 3–4, pp 495–507
8. Battiston, S., Mandel, A., Monasterolo, I., Schuetze, F., & Visentin, G. (2017). A Climate stress-test of the financial system. *Nature Climate Change*, 7, 283-288.
9. Tasca, P., Deghi A., & Battiston, S. (2017). Portfolio Diversification and Financial Stability. *Journal of Economic Dynamics and Control*, 82, 96-124.
10. Bardoscia, M., Battiston, S., Caccioli, F., & Caldarelli, G. (2016). Pathways towards instability in financial networks. *Nature Communications*, 8, 10.1038/ncomms14416.
11. [Battiston eal 2016a] Battiston, S., Roukny, T., Stiglitz, J., Caldarelli, G. & May, R. The Price of Complexity in Financial Networks. *PNAS*, 113, 36, 10031-10036 (2016).
12. Schuldenzucker, S., Seuken, S. & Battiston, S. Clearing Payments in Financial Networks with Credit Default Swaps. *Proceedings of the 17th ACM Conference on Economics and Computation, EC*. Vol. 16. 2016. http://www.ifi.uzh.ch/ce/publications/Clearing_CDSs.pdf
13. [Battiston eal 2016b] Battiston, S., Farmer, J. D., Flache, A., Garlaschelli, D., Haldane, A. G., Heesterbeek, H., Hommes, C., Jaeger, C., May, R., Scheffer, M. (2016). Complexity theory and financial regulation. *Science*, 351(6275), 818–819.
14. Vitali, S., Battiston, S., Gallegati, M. Financial Fragility and Distress Propagation in a Network of Regions. *J. Econ. Dyn. Control* **62**, 56–75 (2016).
15. [Battiston eal 2016c] Battiston, S., Caldarelli, G., D'Errico, M. & Gurciullo, S. Leveraging the network: a stress-test framework based on DebtRank. *Stat. Risk Model.* *ssrn no.2571218* (2016).
16. [Battiston eal 2016d] Battiston, S., D'Errico, M. & Gurciullo, S. DebtRank and the network of leverage. *J. Altern. Investments* (2016).
17. Tasca, P. & Battiston, S. Market Procyclicality and Systemic Risk. *Quantitative Finance. Earlier version MPRA no. 45156* (2016).
18. Zeng, A. & Battiston, S. The Multiplex Network of EU Lobby Organizations. *PLoS-ONE forthcoming., SSRN 2571869* (2016).
19. Bardoscia, M., Battiston, S., Caccioli, F. & Caldarelli, G. DebtRank: A Microscopic Foundation for Shock Propagation. *PLoS One* **10**, e0134888 (2015).
20. Sluban, B., Smailović, J., Battiston, S. & Mozetič, I. Sentiment leaning of influential communities in social networks. *Comput. Soc. Networks* **2**, 1–21 (2015).
21. Puliga, M., Caldarelli, G. & Battiston, S. Credit Default Swaps networks and systemic risk. *Sci. Rep.* **4**, 6822 (2014).
22. Vitali, S. & Battiston, S. The Community Structure of the Global Corporate Network. *PLOS-ONE* **9**, e104655 (2014).

23. Musmeci, N., Battiston, S., Puliga, M. & Gabrielli, A. Bootstrapping topology and systemic risk of complex network using the fitness model. *J. Stat. Phys.* **151**, 720–734 (2013).
24. Roukny, T., Bersini, H., Pirotte, H., Caldarelli, G. & Battiston, S. Default Cascades in Complex Networks: Topology and Systemic Risk. *Sci. Rep.* **3**, 2759 (2013).
25. Kaushik, R. & Battiston, S. Credit default swaps drawup networks: too interconnected to be stable? *PLoS One* **8**, e61815 (2013).
26. Delpini, D. *et al.* Evolution of controllability in interbank networks. *Sci. Rep.* **3**, 1626 (2013).
27. Galbiati, M., Delpini, D. & Battiston, S. The power to control. *Nat. Phys.* **9**, 126–128 (2013).
28. Battiston, S. & Caldarelli, G. Systemic Risk in Financial Networks. *J. Financ. Manag. Mark. Institutions* **2**, 129–154 (2013).
29. Battiston, S., Caldarelli, G., Georg, C.-P., May, R. & Stiglitz, J. Complex derivatives. *Nat. Phys.* **9**, 123–125 (2013).
30. [Battiston eal 2012a] Battiston, S., Gatti, D. D., Gallegati, M., Greenwald, B. C. N. & Stiglitz, J. E. Liaisons Dangereuses: Increasing Connectivity, Risk Sharing, and Systemic Risk. *J. Econ. Dyn. Control* **36**, 1121–1141 (2012).
31. [Battiston eal 2012b] Battiston, S., Delli Gatti, D., Gallegati, M., Greenwald, B. C. N. & Stiglitz, J. E. Credit Default Cascades: When Does Risk Diversification Increase Stability? *J. Financ. Stab.* **8**, 138–149 (2012).
32. [Battiston eal 2012c] Battiston, S., Puliga, M., Kaushik, R., Tasca, P. & Caldarelli, G. DebtRank: Too Central to Fail? Financial Networks, the FED and Systemic Risk. *Sci. Rep.* **2**, 541 (2012).
33. König, M. D., Battiston, S., Napoletano, M. & Schweitzer, F. The efficiency and stability of R&D networks. *Games Econ. Behav.* **75**, 694–713 (2012).
34. Bordino, I. *et al.* Web search queries can predict stock market volumes. *PLOS-ONE* **7**, (2011).
35. Vitali, S., Glattfelder, J. B. & Battiston, S. The network of global corporate control. *PLoS-ONE* **6**, (2011).
36. König, M. D., Battiston, S., Napoletano, M. & Schweitzer, F. Recombinant knowledge and the evolution of innovation networks. *J. Econ. Behav. Organ.* **79**, (2011).
37. Lorenz, J., Battiston, S. & Schweitzer, F. Systemic risk in a unifying framework for cascading processes on networks. *Eur. Phys. J. B* **71**, 441–460 (2009).
38. Walter, F. E., Battiston, S. & Schweitzer, F. Personalised and Dynamic Trust in Social Networks. *Proc. third ACM Conf. Recomm. Syst.* 197–204 (2009).
39. Glattfelder, J. B. & Battiston, S. Backbone of complex networks of corporations: The flow of control. *Phys. Rev. E* **80**, 36104 (2009).
40. Lorenz, J. & Battiston, S. Systemic risk in a network fragility model analyzed with probability density evolution of persistent random walks. *Networks Heterog. Media* **3**, 185 (2008).
41. König, M. D., Battiston, S., Napoletano, M. & Schweitzer, F. On Algebraic Graph Theory and the Dynamics of Innovation Networks. *Networks Heterog. Media* **3**, 201–219 (2008).
42. Walter, F. E., Battiston, S. & Schweitzer, F. A Model of a Trust-based Recommendation System in a Social Network. *JAAMAS* **16**, 57–74 (2008).
43. Weisbuch, G. & Battiston, S. From production networks to geographical economics. *J. Econ. Behav. Organ.* **64**, 448–469 (2007).
44. [Battiston 2007a] Battiston, S., Gatti, D. D., Gallegati, M., Greenwald, B. C. N. & Stiglitz, J. E. Credit Chains and Bankruptcies Avalanches in Production Networks. *J. Econ. Dyn. Control* **31**, 2061–2084 (2007).
45. [Battiston 2007b] Battiston, S., Rodrigues, J. F. & Zeytinoglu, H. The Network of Inter-regional Direct Investment Stocks across Europe. *Adv. Complex Syst.* **10**, 29–51 (2007).
46. Garlaschelli, D., Battiston, S., Castri, M., Servedio, V. D. P. & Caldarelli, G. The scale free nature of market investment networks. *Phys. A Stat. Mech. its Appl.* **350**, 491–499 (2005).
47. Battiston, S. & Catanzaro, M. Statistical properties of corporate board and director networks. *Eur. Phys. J. B - Condens. Matter* **38**, 345–352 (2004).
48. Battiston, S., Inner structure of capital control networks. *Phys. A Stat. Mech. its Appl.* **338**, 107–112 (2004).
49. [Battiston eal. 2003a] Battiston, S., Bonabeu, E. & Weisbuch, G. Decision making dynamics in corporate boards. *Phys. A Stat. Mech. its Appl.* **322**, 567–582 (2003).
50. [Battiston eal. 2003b] Battiston, S., Weisbuch, G. & Bonabeau, E. Spread of decisions in the corporate board network. *Adv. Complex Syst.* **6**, (2003).
51. Mirabella, G., Battiston, S. & Diamond, M. E. Integration of multiple-whisker inputs in rat somatosensory cortex. *Cereb. Cortex* **11**, 164–170 (2001).

52. Pinato, G., Battiston, S. & Torre, V. Statistical independence and neural computation in the leech ganglion. *Biol. Cybern.* **83**, 119–130 (2000).
53. Rousche, P. J., Petersen, R. S., Battiston, S., Giannotta, S. & Diamond, M. E. Examination of the spatial and temporal distribution of sensory cortical activity using a 100-electrode array. *J. Neurosci. Methods* **90**, 57–66 (1999).

Selected Publications in Books and Conference Proceedings (13)

1. Sluban, Borut, et al. "Profiling the EU lobby organizations in Banking and Finance." *Applied Network Science* 3.1 (2018): 44.
2. Olsen, Richard, et al. "Case study of Lykke exchange: architecture and outlook." *The Journal of Risk Finance* 19.1 (2018): 26-38.
3. Battiston S., Pellegrini F., Caldarelli G., Merelli E. Editors, Proceedings of ECCS2014, European Conference on Complex Systems, Springer Proceedings in Complexity 2016.
4. Battiston, S., Caldarelli, G. & D'Errico, M. in *A. Garas (ed.), Interconnected Networks, Underst. Complex Syst.* (2015). doi:DOI 10.1007/978-3-319-23947-7_12
5. Battiston, S. & Caldarelli, G. in *Networks Networks Last Front. Complex.* (D'Agostino, G. & Scala, A.) 311–321 (Springer, 2014).
6. Cimini, G. et al. in *Soc. Informatics* 323–333 (Springer, 2014). at <http://arxiv.org/abs/1410.2121>
7. König, M. D., Battiston, S. & Schweitzer, F. in *Innov. networks new approaches Model. Anal.* (Pyka, A. & Scharnhorst, A.) (Springer Complexity Series, 2009).
8. König, M. D., Battiston, S., König, M. D. & Battiston, S. in *Networks, Topol. Dyn. Theory Appl. to Econ. Soc. Syst.* (Naimzada, A. K., Stefani, S. & Torriero, A.) 23 (Springer, 2009).
9. Walter, F. E., Battiston, S. & Schweitzer, F. Emergence and Evolution of Coalitions. *Comput. Intell.* **56**, 245–258 (2007).
10. Caldarelli, G., Battiston, S., Garlaschelli, D. & Takayasu, H. in *Pract. Fruits Econophysics* (Takayasu, H.) 297–301 (Springer-Verlag, 2006). doi:10.1007/4-431-28915-1
11. Battiston, S., Walter, F. E. & Schweitzer, F. Impact of Trust on the Performance of a Recommendation System in a Social Network. in *Proc. Work. Trust Fifth Int. Jt. Conf. Auton. Agents Multi-Agent Syst.* (2006).
12. Caldarelli, G., Battiston, S. & Garlaschelli, D. in *Pract. Fruits Econophysics Proc. Third Nikkei Econophysics Symp.* 297–301 (2006).
13. Caldarelli, G., Battiston, S., Garlaschelli, D. & Catanzaro, M. in *Lect. NOTES Phys.* **650**, 399–424 (Springer, 2004).

Working Papers and Papers under Review (7)

All working papers are available either online or upon request.

1. Battiston, S., & Monasterolo, I. (2019). A carbon risk assessment of central banks' portfolios under 2°C aligned climate scenarios. Working Paper OeNB, forthcoming.
2. Battiston, S. and Stiglitz, J.E., Unstable by Design: Systemic risk in endogenous financial networks, in preparation, 2019.
3. Luu D.T., Napolitano M., Barucca P., Battiston S., Collateral Unchained: Rehypotheication networks, concentration and systemic effects, under review on Journal of Financial Stability.
4. Barucca, P., Bardoscia, Caccioli, F., D'Errico, M., Visentin, G., Caldarelli, G., Battiston, S., Network Valuation in Financial Systems. (2016), ssrn 2795583, under review on Mathematical Finance.
5. Schuldenzucker, S., Seuken, S. & Battiston, S. Finding Clearing Payments in Financial Networks with Credit Default Swaps is PPAD-complete. Working Paper. December 2016, http://www.ifi.uzh.ch/ce/publications/Clearing_PPAD.pdf
6. Visentin, G., D'Errico, Battiston, S., M., Rethinking Financial Contagion. (2016). Ssrn 2831143
7. Glattfelder, J. B. & Battiston, S. Analyzing the Global Ownership Network (2018), in prep.
8. Di Iasio, G., Battiston, S., Infante, L. & Pierobon, F. Capital and Contagion in Financial Networks. *MPRA Pap. No. 52141* (2013).
9. Roukny, T., George, C.-P. & Battiston, S. A Network Analysis of the Evolution of the German Interbank Market. *Dtsch. Bundesbank Discuss. Pap. 22/2014* (2014).

INVITED TALKS (Selected)

Date and Place	Event
January 8-9, 2019, Brussels, Belgium	European Commission Joint Research Center COPFIR and TEG Sust. Fin. Conference on Promoting Sustainable Finance invited talk "Climate stress-tests of the EU financial system"
December, 10 th , 2018, Paris, France	Centre d'Economie de la Sorbonne, Research Days 2018. Keynote speaker: "Financial Networks" More
November 20 th , 2018, Brussels, Belgium	European Commission Joint Research Center COPFIR Conference (Community of Practice in Finance) 1st annual conference on The resilience of the financial system -, invited talk "Climate stress-tests of the EU financial system"
October 19 th , 2018, Amsterdam, Netherland	Univ. of Amsterdam, Keynote speech at 20th anniversary workshop of Dept. CENDEF.
October 17 th , 2018, Paris, France	European Securities and Markets Authority. Invited Seminar "Climate stress-tests of the EU financial system"
September 5 th , Nice, France	EAEPE conference, keynote speaker in panel on climate risk and finance. More .
June 26 th , Brussels, Belgium	European Commission, DG-FISMA seminar. Invited speaker: "Climate risk metrics for EU financial institutions"
June 10-14 th , Paris, France	NetSci 2018 Conference, Keynote Speech: Financial networks: from systemic risk to sustainable finance
May 4 th 2018, Vienna, Austria	Keynote Speech at Green Finance Conference of Austrian National Bank / SUERF / Vienna Univ. of Economics and Business.
May 1 st 2018, Venice	Invited lecture at Univ. of Ca Foscari Venice: Financial networks: from systemic risk to sustainable finance https://www.unive.it/data/agenda/9/20564
April, 4 th , 2018, Amsterdam	Annual conference of Dutch Platform of Complexity Science NPCS, Keynote Speaker: The price of complexity in financial networks. More
March, 15-16, 2018, Paris, France	Innovative Training Network 'Expectations and Social Influence Dynamics in Economics' (ExSIDE). Université Paris 1 - Pantheon Sorbonne: Doctoral Training Network. Invited Lecturer: Lectures on Financial Network. More
March, 15-16, 2018, Paris, France	Innovative Training Network 'Expectations and Social Influence Dynamics in Economics' (ExSIDE). Université Paris 1 - Pantheon Sorbonne: Doctoral Training Network. Invited Lecturer: Lectures on Financial Network. More
February, 23-24, 2018, New York, United States	INET Conference at Columbia Business School: Conference on Financial Networks, Big Risks, Macroeconomic Externalities, and Policy Commitment Devices. Invited Speaker: Systemic Risk and Endogenous Financial Networks. More
January, 17-19, 2018, Zurich, CH	Second FINEXUS Conference on Financial Networks and Sustainability, at the University of Zurich. Keynote Speaker, organiser and moderator. More
November, 15, 2017, Bonn, Germany	COP23 Side Event: Embedding new climate risk and impact metrics throughout the project pipeline of development financial institutions. Co-Organiser and Speaker. More
November, 13, 2017, Bonn, Germany	COP23 Side Event: How new climate risk and impact metrics can empower development finance institutions. Co-Organiser and Speaker. More
October, 19-21, 2017, Budapest, Hungary.	29th Annual European Association for Evolutionary Political Economy (EAEPE) Conference 2017. Co-organiser of Special Session "The role of the state in the climate-finance nexus".
October, 2, 2017, Warsaw, Poland	Warsaw School of Economics. Invited lecturer of the Course in Financial Networks and Systemic Risk. More
September 27-28, 2017, Mexico City, Mexico:	CEMLA Conference 2017. Banco de México, CEMLA, the University of Zurich and the Journal of Financial Stability jointly organizing a conference on "Network models, stress testing, and other tools for financial stability monitoring and macroprudential policy design and implementation" More

September, 17-22, 2017, Cancun, Mexico	Conference on Complex Systems 2017. Invited speaker: Price of Complexity in Financial Networks. More
September, 4-8, 2017, Palma de Mallorca, ES	Summer School on Complex Socio-Technical Systems. Course Instructor: Financial Networks. More
June 26-27, 2017, Mexico City, Mexico	Inter-American Development Bank: National Development Banks & Green Banks. Invited speaker "The CLIMAFIN Toolbox". More
June, 19-23, 2017, Mexico City, Mexico	International Economic Association 18th World Congress. Invited speaker: Price of Complexity in Financial Networks. More
June 14, 2017, Paris, F	Banque de France. Invited speaker: Climate Stress Test. More
January, 19-20, 2017, Zurich, CH	ETH Risk Center, Workshop on Cascade Processes. Invited speaker: Rethinking Financial Contagion. More
January, 11-13, 2017, Zurich, CH	First FINEXUS Conference on Financial Networks and Sustainability, with honorary guest Prof. Stiglitz (Columbia University). Organizer. More
January, 9-13, 2017, Zurich, CH	Big Data Finance Winter School. Co-organizer. More
December, 13, 2016, Padua, Italy:	University of Padua. Invited speaker. Title of speech: "The Price of Complexity in Financial Networks"
December, 12, 2016, Venice, Italy:	Ca' Foscari University of Venice. Invited speaker. Title of speech: "The Price of Complexity in Financial Networks"
November, 10, 2016, Marrakesh, Morocco	COP22 Side Event: "Disentangling the climate-finance nexus". Co-organizer and speaker. More
3-5 Nov 2016	Keynote speaker at Session "Understanding complexity and uncertainty in coupled human-natural systems: new approaches to sustainability analysis", the 28th Annual European Association for Evolutionary Political Economy (EAEPE) Conference: Industrialisation, Socio-Economic Transformation and Institutions. Title of speech: speech "Climate finance and complexity". Manchester, UK.
4-9 Sep 2016	Invited technical assistance at Central Bank of Colombia: Workshop at Central Bank of Colombia, Program "Systemic Risk in Financial Networks". Bogota, Colombia.
27 Jun 2016	Fields Institute for Research in Mathematical Science, Conference on the Stability of Financial Systems: Modelling, Regulation and Stress Testing, Toronto, Canada.
20 Jun - 1 Jul 2016	Invited lecturer for a course on Systemic Risk in Financial Network, 17th Trento Summer School, Intensive course on Macroeconomic Coordination and Externalities. Trento, Italy
11 Nov 2015	Keynote speaker: at the conference on "Network models, stress testing, and other tools for financial stability monitoring and macroprudential policy design and implementation", co-organized by CEMLA, Banco de México, the University of Zurich and the Journal of Financial Stability, Mexico City.
12-13 Oct 2015	Invited speaker at Global Economic Symposium (GES) 2015: Financial Regulatory Frameworks – Current Reforms and Future Challenges. Kiel, Germany.
23 Sep 2015	Keynote speaker & program committee at 2015 RiskLab/BoF/ESR Conference on Systemic Risk Analytics, Bank of Finland, Helsinki, Finland
9 Sep 2015	Keynote speaker at JNTF and the Center for Risk Studies second conference on "Network Theory and Financial Risk", Cambridge
30 Jul 2015	"The price of complexity", Bank of England seminar, London.
25 Jul 2015	"Leveraging the network: a stress test framework based on DebtRank", Second International Conference of the Society for Economic Measurement (SEM) OECD Conference Center.
11 May 2015	ECB-ESRB Expert Group on Interconnectedness, Frankfurt: "Leveraging the network: a stress test framework based on DebtRank".
14-18 Apr 2015	"The Price of Complexity in financial networks" at INET Seminar Series at Columbia University.
8-11 Apr 2015	"Liberté, Egalité, Fragilité" INET Annual Conference. Topic: Financial Networks, Financial Innovation & Inequality. Paris, France.

26 Mar 2015	“Leveraging the network: a stress test framework based on DebtRank”, UCLA, IPAM conference on Systemic risk, Los Angeles .
23-25 Mar 2015	Keynote speaker: "Leveraging the network: a stress-test framework based on DebtRank". Lorentz Center Workshop Socio-Economic Complexity. Leiden, Netherlands.
21 Mar 2015	Keynote speaker: Price of complexity in financial networks, WEHIA Conference. Nice, France.
11 Dec 2014	“DebtRank and Systemically Important Financial Institutions”, Austrian Central Bank seminar, Stability Division, Vienna.
25 Aug 2014	“Diversification and Financial Stability”, Isaac Newton Institute Semester Program on Systemic Risk, Cambridge.

Statement about the top 10 publications.

In the list below, the Impact Factor (IF) is taken whenever available as the 5-years estimate provided by the journal itself. The number of citations is the one provided by Google Scholar on November 14, 2018.

- Schuldenzucker, S., Seuken, S., & Battiston, S. (2019). Default Ambiguity: Credit Default Swaps Create New Systemic Risks in Financial Networks. *Management Science*, Forthcoming. Earlier version <https://ssrn.com/abstract=3043708>

The question of how do we find out who owes what to whom in an intricate network of obligations was resolved in a positive way by Eisenberg and Noe in 2001. IN their seminal paper, they showed that the solution to this problem exists unique under mild conditions and they provided an algorithm the yield the solution in polynomial time. It turns out the existence and the uniqueness are not guaranteed any longer when actors engage in non-linear contract such as Credit Default Swaps. We provide analytical sufficient conditions to restore the desirable properties of the market clearing. This new fundamental result is the subject of the paper (Schuldenzucker ea. 2018) currently with the status of conditional acceptance under the prestigious journal Management Science.
- Battiston, S., Mandel, A., Monasterolo, I., Schuetze, F., & Visentin, G. (2017). A Climate stress-test of the financial system. *Nature Climate Change*, 7, 283-288.
citations 68, IF = 21.1

The paper develops a new methodology that allows individual financial institutions to include into traditional risk measures (e.g. Value-at-Risk) sources of risk previously not accounted for such as climate physical risk as well as climate policy risk (Battiston ea. 2017). This work is gaining traction in both the academic and the policy community of sustainable finance, in particular among key global players such as the World Bank and the European Investment Bank, whose mission includes attracting private capital into projects aligned with the UN Sustainable Development Goals (SDGs) and the Paris Agreement 2 degrees target. As an academic, I find very important that my research can contribute to shaping the way global institutions think about a prominent societal issue such as sustainability, and more precisely how they measure climate risk and contributions to climate action.
- D’Errico, M., Battiston, S., Tuomas, P., & Scheicher, M. (2018). How does risk flow in the credit default swap market? *Journal of Financial Stability*, 35, 53-74.
citations 21, IF = 2.6

This paper represents the first multi-layer network analysis of the global Credit Default Swap (CDS) market in collaboration with the European Systemic Risk Board based on confidential supervisory data. It shows how risk flows in the market across networks that have very similar structures across most CDS’ reference entities. It also shows that the empirical structure is more fragile than alternative structures under many conditions.
- Bardoscia, M., Battiston, S., Caccioli, F., & Caldarelli, G. (2016). Pathways towards instability in financial networks. *Nature Communications*, 8, 10.1038/ncomms14416.
citations 46, IF = 13.1

The paper demonstrates the mathematical mechanisms behind the fact that microprudential policies recommending to limit banks’ largest single exposure to their counterparties (thus encouraging risk diversification and market integration) can have unintended consequences in terms of financial instability, under empirically relevant conditions. The theorem is very general and unreported previously, i.e. the existence of pathways in the space of financial networks along which the banking system becomes increasingly less stable despite the fact that the leverage of each bank remains unchanged.

5. [Battiston et al 2016a] Battiston, S., Roukny, T., Stiglitz, J., Caldarelli, G. & May, R. The Price of Complexity in Financial Networks. *PNAS*, 113, 36, 10031-10036 (2016).
citations 59, IF = 10.4
The paper addresses and resolves the long standing issue of determining the default probability of n banks connected in a network of liabilities and exposed to exogenous shocks. It also shows how that the more complex the network architecture is, the less precisely regulators can estimate the systemic loss from a shock on a given bank, leading to the problem of collective moral hazard and excessive risk taking by the banking sector as a whole.
6. [Battiston et al 2012a] Battiston, S., Gatti, D. D., Gallegati, M., Greenwald, B. C. N. & Stiglitz, J. E. Liaisons Dangereuses: Increasing Connectivity, Risk Sharing, and Systemic Risk. *J. Econ. Dyn. Control* **36**, 1121–1141 (2012).
citations 564, IF = 1.2
The paper investigates the tension between risk diversification and systemic risk in a continuous time model and shows how risk diversification can be detrimental to systemic financial stability when creditors impose to borrowers credit costs that increase with the financial fragility of the borrower. The existence of interior optimal level of diversification is shown analytically.
7. [Battiston et al 2012b] Battiston, S., Delli Gatti, D., Gallegati, M., Greenwald, B. C. N. & Stiglitz, J. E. Credit Default Cascades: When Does Risk Diversification Increase Stability? *J. Financ. Stab.* **8**, 138–149 (2012).
citations 192, IF = 1.5
The paper investigates the tension between risk diversification and systemic risk in discrete time. It shows how risk diversification can be detrimental to systemic financial stability in the presence of illiquidity on the market for the assets liquidated in case of banks' default.
8. [Battiston et al 2012c] Battiston, S., Puliga, M., Kaushik, R., Tasca, P. & Caldarelli, G. DebtRank: Too Central to Fail? Financial Networks, the FED and Systemic Risk. *Sci. Rep.* **2**, 541 (2012).
citations 411, IF = 2.9
The paper introduces a methodology to assess the systemic impact of shocks on the balance sheet of financial institutions connected in a network of liabilities. The methodology is widely used now in the community working on financial networks and it has been included among the indicators for monitoring systemic risk at various central banks. In comparison with more basic network indicators, its contribution is to provide a monetary value of the impact of shocks in the presence of uncertainty on the future default of the banks. The paper has spurred a long series of developments.
9. König, M. D., Battiston, S., Napoletano, M. & Schweitzer, F. The efficiency and stability of R&D networks. *Games and Economic Behaviour*. **75**, 694—713 (2012).
citations 76, IF = 1.3
This paper investigates a model of decentralized formation of R&D collaborations among firms, and shows that multiple equilibrium networks may exist for the same level of collaboration cost and the decentralized equilibrium is not efficient in general.
10. Vitali, S., Glattfelder, J. B. & Battiston, S. The network of global corporate control. *PLoS-ONE* **6**, (2011).
citations 782, IF = 5.4
This paper has been widely covered in the popular press during the fall of 2011 and still frequently mentioned today as it represents the first (and still unique) comprehensive empirical study of the global network of corporate ownership. While standard economic theory has not much to say about the network of ownership relations and its consequences, this paper shows that the global economy has a very specific structure that reflects the level of ownership concentration.