Department of Economics, Management and Statistics (DEMS)

PhD in Economics and Statistics (ECOSTAT)

A Summary

January 2021

PhD in Economics and Statistics (ECOSTAT)

The Present

(a.y. 2018-19, 2019-20, 2020-21)

PhD ECOSTAT - In a nutshell

- Affiliation: DEMS
- Reference project: «Dipartimento di Eccellenza (DE)»
- Origin: merge of the PhD in Economics and the PhD in Statistics of the University of Milano-Bicocca (BIC)
- Length: 4 years (first cycle XXXIV, a.y. 2018-19)
- 2 curricula: Economics and Statistics

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PhD ECOSTAT - In a nutshell

- Financial resourses (cycle XXXVI, a.y. 2020-21):

- 7 scholarships funded by BIC
- 1 scholarship co-funded by BIC-DE
- 1 scholarship funded by DE
- 1 «executive» position with IntesaSanPaolo – Data Science & AI
- 1 «executive» position with Sas Italy – Analytics Software & Solutions

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PhD ECOSTAT – Project

- *Curriculum in Economics*

- strong emphasis on quantitative and computational economics

- *Curriculum in Statistics*

- accent on statistical methods, statistical learning and applications (data science)

- *«Hybrid» tracks*

- macroeconomics/forecasting
- big data/data analytics/data science

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PhD ECOSTAT – First year (courses)

- *Curriculum in Economics*

Mathematics, Computational Statistics I, Microeconomics, Econometrics, Macroeconomics, Research Methods, Finance (optional)

Note: in collaboration with UCM

- *Curriculum in Statistics*

Mathematical Analysis, Numerical Optimization, Probability, Stochastic Processes, Statistical Inference, Bayesian Statistics, Computational Statistics II (*), Time Series (*), Statistical Modelling, Statistical Learning, R for Data Science, Data Management

(*) in common with the curriculum in Economics

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PhD ECOSTAT – First year (data room)

- *Curriculum in Economics*
- Number of hours (lectures/tutorials) = 340
- Number of instructors = 24

- *Curriculum in Statistics*
- Number of hours (lectures/tutorials) = 320
- Number of instructors = 22

PhD ECOSTAT – Second year (activities)

- *Presentation of research groups*
- *Reading groups (RG)*

- Research-oriented
- Specific/advanced topics
- Direct involvement of students
- Each RG is formed by 15 hours (teaching/presentations)

- *Curriculum in Economics*

- Menu of 15 RG, students have to select 6-8

- *Curriculum in Statistics*

- Menu of 7 RG, students have to select 4-5

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PhD ECOSTAT – After (the first part of) the second year

- *Research projects presentations*

- Second year, november
- Addressed to the faculty, in presence of supervisors

- *Thesis presentations*

- Third and fourth year
- Addressed to the faculty, in presence of supervisors

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PhD ECOSTAT – After (the first part of) the second year

- *Summer/winter schools*
- Financed by the DE budget
- *Interdisciplinary courses*
- Organized by the Bicocca PhD School
- *DEMS seminar series*
- ReLunch, Series in Economics, Series in Statistics
- *PhD students' seminars*
- *Job market training*
- Aimed at encouraging the participation of final-year PhD students to the international job market

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PhD ECOSTAT – Selection of candidates

- *Procedure (main steps)*

1) Call for Interest (informal, january/february)

2) Call for Applications (formal, regulated by the Bicocca PhD School, may/june)

3) Selection Committee (6 members, second half of july)

4) Publication of results/ranking (beginning of september)

PhD ECOSTAT – Selection of candidates (data room)

- *XXXIV cycle (a.y. 2018-19)*
- N. of applicants = 56 (50% Italians, 50% foreigners)
- N. of applicants curriculum Economics = 33 (48.5% Italians, 51.5% foreigners)
- N. of applicants curriculum Statistics = 23 (56.5% Italians, 43.5% foreigners)
- Available scholarships = 9

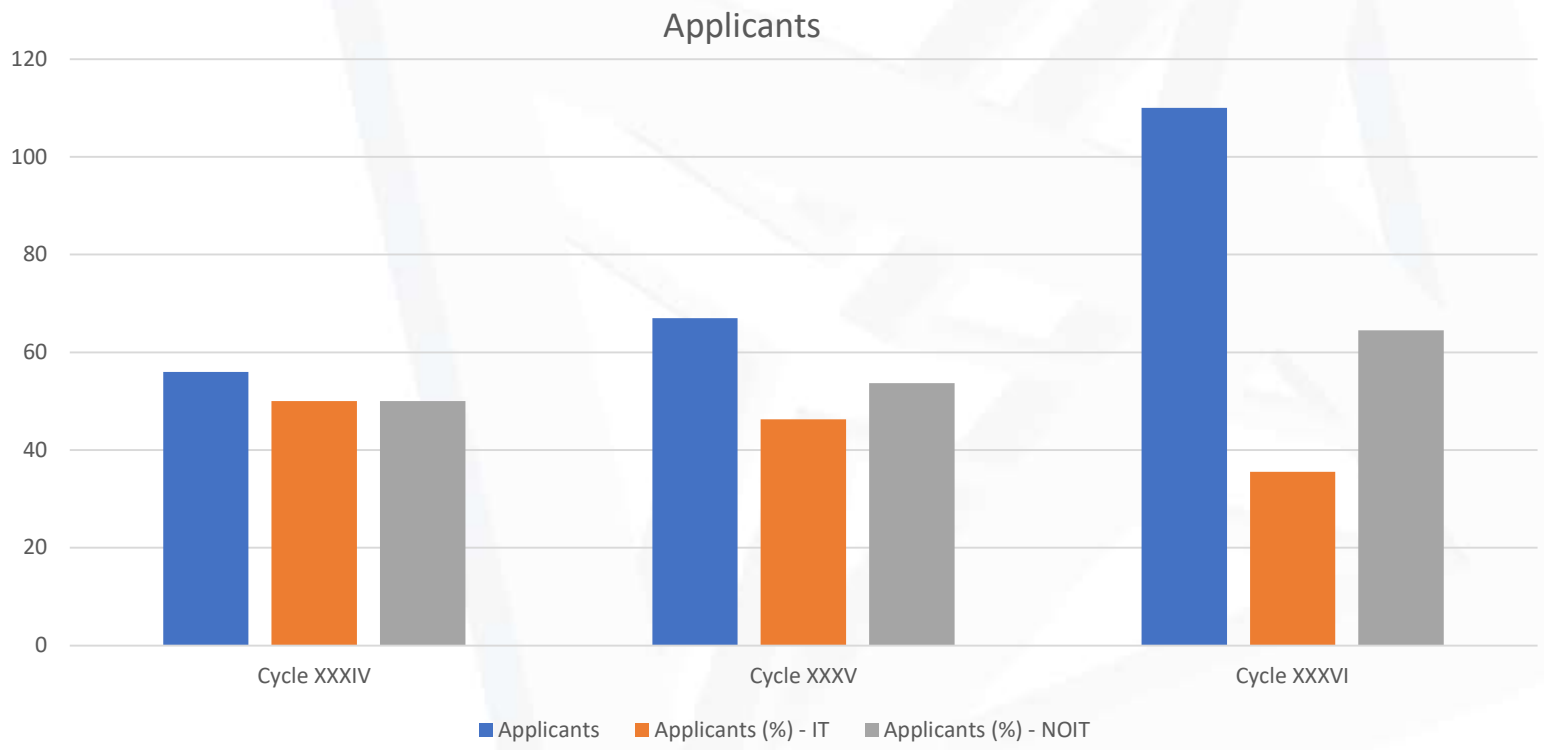
PhD ECOSTAT – Selection of candidates (data room)

- *XXXV cycle (a.y. 2019-20)*
- N. of applicants = 67 (46.3% Italians, 53.7% foreigners)
- N. of applicants curriculum Economics = 44 (32% Italians, 68% foreigners)
- N. of applicants curriculum Statistics = 23 (74% Italians, 26% foreigners)
- Available scholarships = 9

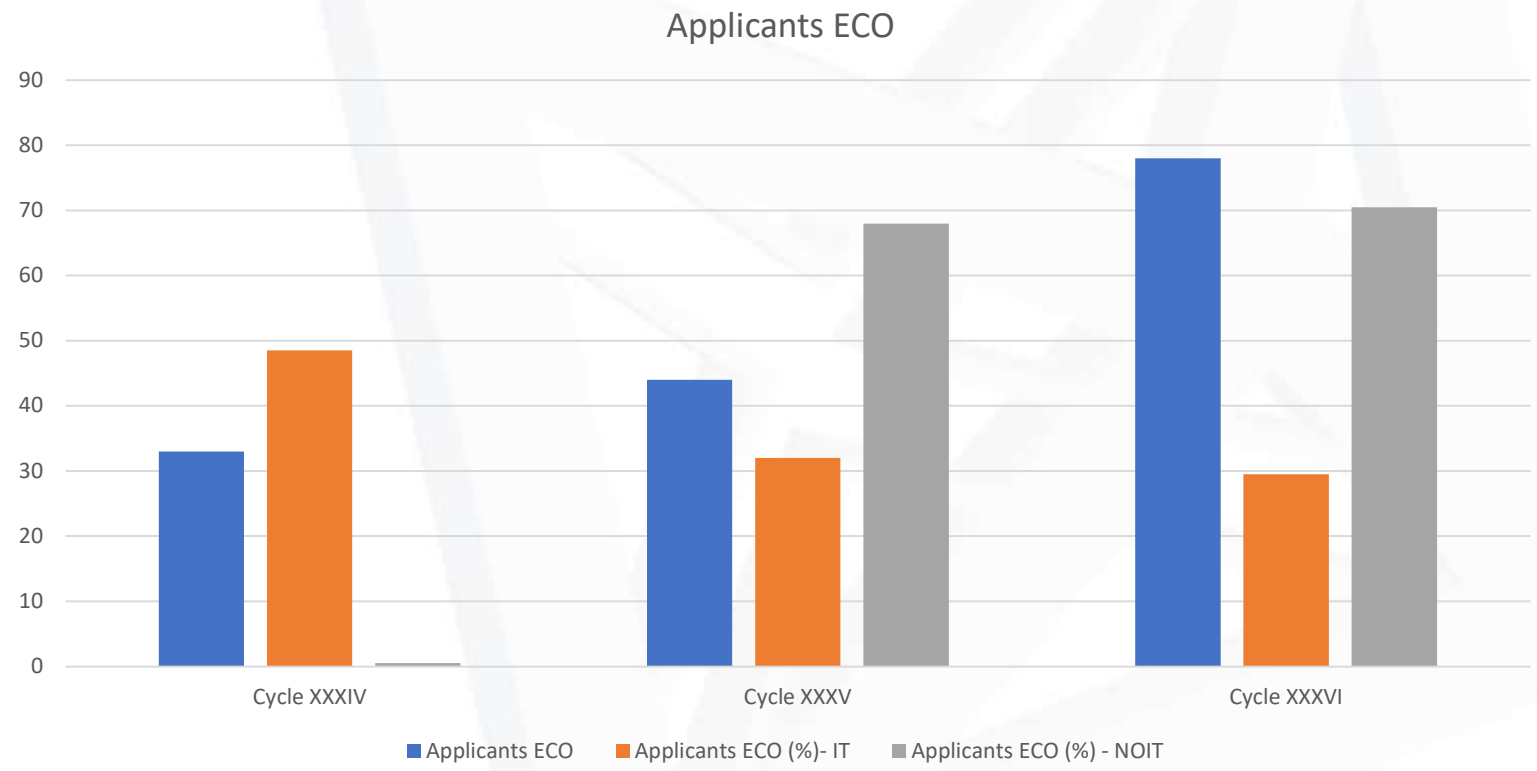
PhD ECOSTAT – Selection of candidates (data room)

- *XXXVI cycle (a.y. 2020-21)*
- N. of applicants = 110 (35.5% Italians, 64.5% foreigners)
- N. of applicants curriculum Economics = 78 (29.5% Italians, 70.5% foreigners)
- N. of applicants curriculum Statistics = 32 (50% Italians, 50% foreigners)
- Available scholarships = 9

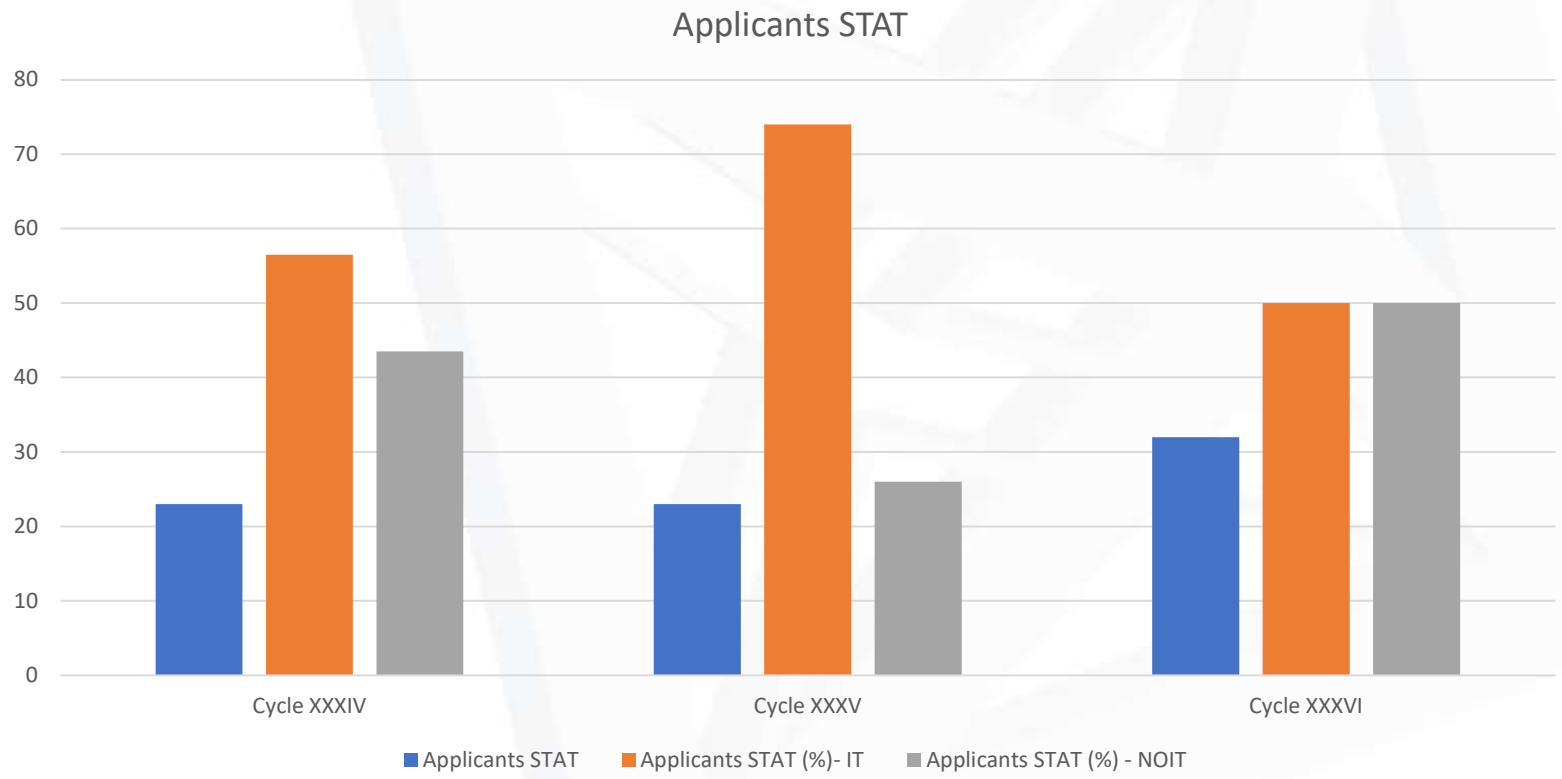
PhD ECOSTAT – Selection of candidates (data room)



PhD ECOSTAT – Selection of candidates (data room)



PhD ECOSTAT – Selection of candidates (data room)



PhD ECOSTAT – Selection of candidates

- *Applicants' main countries of origin*

Albania, Azerbaigian, Bangladesh, **China**, **Ethiopia**, Gana, Germany, Greece, India, **Iran**, Nigeria, Pakistan

PhD ECOSTAT – The three "I's"

- *«I»ndustrialization*

- XXXIV cycle (a.y. 2018-19)

1 «executive» position, Symphonia SGR (Statistics)

2 «high apprenticeship» positions, Siemens (Economics and Statistics)

- XXXV cycle (a.y. 2019-20)

4 «executive» positions, UniCredit, Ramdac Srl, Data Reply Srl, Cgnal Srl (Statistics)

- XXXVI cycle (a.y. 2019-20)

2 «executive positions», IntesaSanPaolo, Sas (Statistics)

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PhD ECOSTAT – The three "I's"

- *«I»nterdisciplinarity*

- *Current situation*

Economics, Statistics

- *Future situation*

Economics, Management, Statistics, Informatics, Computer Engineering, Computer Sciences

PhD ECOSTAT – The three "I's"

- *«I»nternationalization*

- *International Programme Committee*

50 members, 28% with permanent positions in foreign universities

- *Co-tutelles with foreign universities*

Dauphine University, Paris

- *Joint degrees with foreign universities*

To be explored

PhD ECOSTAT – Initiatives funded by DE

- Course on Statistical Learning and Big Data, cycle XXXIV, held by Prof. Saharon Rosset, Tel Aviv University, october 2019
- Course on Statistical Learning, cycle XXXV, held by Prof. Rajen Shah, University of Cambridge, october 2020
- Summer school on Energy Econometrics, Lake Como School of Advanced Studies, september 2021
- Summer/winter schools for PhD students
- Keynote seminars/lectures

e.g. Robert Engle, NYU, june 2018; Peter Robinson, LSE, february 2019

PhD ECOSTAT – Initiatives funded by DE

- Co-sponsored conferences

e.g. 1st CefES International Conference on European Studies, june 2019; International Conference on Econometric Models for Climate Change, august 2019; International Conference on The Mathematics of Subjective Probability, september 2018; International Conference on the Economics and Financial Implications of Climate Change, june 2018.

- Collaborations with foreign universities (joint supervisions)

e.g. Dauphine University, Paris; King's College London; Hebrew University of Jerusalem; University College Dublin; University of Luxembourg; University of Queensland, Australia; University of California, Irvine.

PhD in Economics and Statistics (ECOSTAT)

The Future

(a.y. 2021-2022 onwards)

The new curriculum in **Big Data and Analytics for Business**

Motivations

- Big Data and Analytics: methods/techniques aimed at transforming *large volumes of data, heterogenous and complex,* into information useful to support the *decision processes*

- Big Data and Analitics for Business is *multidisciplinary*, since its is grounded on the following skills:

- *Computer science and engineering*
- *Statistics*
- *Economics, business, management*

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The new curriculum in **Big Data and Analytics for Business**

Motivations

- Specifically:

- *Computer science and engineering*, to *process* large volumes of unstructured data

- *Statistics*, to *model* behaviours of and relations among economic variables

- *Economics, business, management*, to *interpret* relations among economic variables and support the firm's strategic decisions

The new curriculum in **Big Data and Analytics for Business**

Objectives

- *Formation* of researchers able to carry on their research activities at universities, public and private research centers, regulation authorities, technologically innovative *companies*, financial companies

- *Interaction* with economists and statisticians, among both faculty members and PhD students from the two curricula

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The new curriculum in **Big Data and Analytics for Business**

Teaching plan

First year (terms I and II)

- Background courses in *economics/econometrics/management*

- Strategy and organization
- Technology and innovation management
- Economics and organization
- Industrial economics
- Time series analysis

Note: the background courses in economics/econometrics/management are mainly offered by DEMS. Collaborations with DISEADE-BIC are under scrutiny.

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The new curriculum in **Big Data and Analytics for Business**

Teaching plan

First year (terms I and II)

- Background courses in *statistics*

- Computational statistics
- Probability
- Statistical inference (classical and Bayesian)
- Statistical modelling

Note: the background courses in statistics are mainly offered by DEMS and DISMEQ-BIC.

The new curriculum in **Big Data and Analytics for Business**

Teaching plan

First year (terms II and III)

- *Curricular* courses (block 1: tools)

- Databases for structured and unstructured data – SQL
- Programming in Python
- Data quality and cleaning for Big data
- Architecture for Big data processing

Note: the curricular course are mainly offered by DISMEQ-BIC. Collaborations with DISCO-BIC and other departments are under scrutiny.

The new curriculum in **Big Data and Analytics for Business**

Teaching plan

First year (terms II and III)

- C*urricular* courses (block 2: tools and applications)

- Machine learning
- Big data processing lab (hadoop/spark)
- Cloud & distributed algorithm
- Data mining
- Natural language processing
- Human-centered AI

Note: Curricular courses are mainly offered by DISMEQ-BIC. Collaborations with DISCO-BIC and other departments are under scrutiny.

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The new curriculum in **Big Data and Analytics for Business**

Teaching plan

First year (terms III and IV)

- *Curricular* courses (block 3: applications)

- Social media analytics
- Natural language understanding
- Semantic web
- eXplainable AI for business value
- Deep learning and computer vision for business
- Data visualization & visual analytics

Note: Curricular course are mainly offered by DISMEQ-BIC. Collaborations with DISCO-BIC and other departments are under scrutiny.

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The new curriculum in Big Data and Analytics for Business

Collaborations and new PhD denomination

- Collaborations (established) wih other departments: DEMS-Data Science Lab; DISMEQ-BIC; DIECO-CUM; DISTAT-CUM
- Collaborations (under study) with other departments: DISEADE-BIC; DISCO-BIC; DIGIUR-BIC
- Collaborations (under study) with companies:

- IntesaSanPaolo-Data Science & AI
- Sas Italy – Analytics Software & Solutions

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The new curriculum in Big Data and Analytics for Business

Collaborations and new PhD denomination

- Denomination of the new PhD programme:

PhD in Economics, Statistics and Data Science