

*Ministero dell'Istruzione dell'Università e della Ricerca*

Dipartimento per la formazione superiore e per la Ricerca  
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PRIN: PROGETTI DI RICERCA DI RILEVANTE INTERESSE NAZIONALE – Bando 2017  
Prot. 2017HBTK5P

**PART A**

*1. Action line*

South line/Linea Sud

*2. Research project title*

From high school to job placement: micro-data life course analysis of university student mobility and its impact on the Italian North-South divide.

*3. Duration (months)*

36 months

*4. Main ERC field*

SH - Social Sciences and Humanities

*5. Possible other ERC field*

PE - Physical Sciences and Engineering

*6. ERC subfields*

1. SH3\_10 Social aspects of learning, curriculum studies, educational policies
2. PE1\_14 Statistics
3. SH1\_10 Management; marketing; organisational behaviour; operations management

## 7. Key Words

| n° | Testo inglese                   |
|----|---------------------------------|
| 1. | educational systems             |
| 2. | social networks                 |
| 3. | statistical models              |
| 4. | services management             |
| 5. | demography                      |
| 6. | Student Inter-Regional Mobility |

## 8. Principal Investigator

|  |   |
|--|---|
| <b>ATTANASIO</b><br>(Surname)                            | <b>MASSIMO</b><br>(Name)                                  |
| <b>Professore Ordinario</b><br>(Category)                |   |
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## 9. List of the Research Units

| n° | Associated Investigator | Category | University/ Research Institution | Registered office (address) | Does operating office coincide with | Operating office (address) | Contract of availability of operating office | Declaration of availability of the | e-mail address |
|----|-------------------------|----------|----------------------------------|-----------------------------|-------------------------------------|----------------------------|--|------------------------------------|----------------|
|----|-------------------------|----------|----------------------------------|-----------------------------|-------------------------------------|----------------------------|--|------------------------------------|----------------|

|    |                    |                                  |  |  | <b>registered office?</b> |   | <b>operating office and copy of contract</b> |                            |
|----|--------------------|----------------------------------|--|--|---------------------------|---|--|----------------------------|
| 1. | ATTANASIO Massimo  | Professore Ordinario             | Università degli Studi di PALERMO            | P.zza della Marina, 61 Pal. Steri - PALERMO (PA) | no                        | City: Palermo (PA)<br>Address: viale delle Scienze, Edificio 13 | property                                     | massimo.attanasio@unipa.it |
| 2. | RAGOZINI Giancarlo | Professore Associato confermato  | Università degli Studi di Napoli Federico II | C.so Umberto I, 40 - NAPOLI (NA)                 | no                        | City: Napoli (NA)<br>Address: via Leopoldo Rodinò 22            | free availability                            | giragoz@unina.it           |
| 3. | PORCU Mariano      | Professore Ordinario (L. 240/10) | Università degli Studi di CAGLIARI           | Via Università', 40 - CAGLIARI (CA)              | no                        | City: Cagliari (CA)<br>Address: viale s. Ignazio 78             | property                                     | mrporcu@unica.it           |
| 4. | DELPINI Danilo     | Ricercatore confermato           | Università degli Studi di SASSARI            | P.zza dell'Università', 21 - SASSARI (SS)        | no                        | City: Sassari (SS)<br>Address: via Muroni 25                    | free availability                            | ddelpini@uniss.it          |

### 10. Brief description of the research proposal

The main objective of this project is the analysis of student mobility from the southern parts of Italy to the central-northern regions. These flows are interrelated to the historical economic North-South divide, which has increased since the 1990s. The project is based on the recent access that the Ministry of Education has granted to the national micro-level longitudinal data on university student careers from 2008 to 2017. The objectives are two-fold: to trace student trajectories from high school to job placement (we will link the university student careers database with the Almalaurea job placement database) and to study the relationship between student university flows and government funding mechanisms, such as the quasi-market allocation system introduced in the 1990s. The main expected results are: the construction of probability mobility profiles of graduates in terms of, for example, degree completion, fields of study, and performance; the description of push and pull factors that lie beyond mobility, a network representation of Universities in terms of their attractiveness, and the identification of the driving factors of university performance and attractiveness with respect to student mobility.

### 11. Total cost of the research project, per single item

| Associated Investigator | item A.1       | item A.2.1     | item B         | item C        | item D       | item E        | sub-total      | item F          | Total            |
|-------------------------|----------------|----------------|----------------|---------------|--------------|---------------|----------------|-----------------|------------------|
| ATTANASIO Massimo       | 84.044         | 71.615         | 93.395         | 3.900         | 2.400        | 11.800        | 267.154        | 24.599,4        | <b>291.753,4</b> |
| RAGOZINI Giancarlo      | 51.235         | 47.573         | 59.285         | 2.600         | 2.400        | 6.900         | 169.993        |                 | <b>169.993</b>   |
| PORCU Mariano           | 20.662         | 89.594         | 66.154         | 6.000         | 0            | 7.500         | 189.910        |                 | <b>189.910</b>   |
| DELPINI Danilo          | 58.783         | 48.000         | 64.070         | 6.070         | 4.000        | 12.000        | 192.923        |                 | <b>192.923</b>   |
| <b>Total</b>            | <b>214.724</b> | <b>256.782</b> | <b>282.904</b> | <b>18.570</b> | <b>8.800</b> | <b>38.200</b> | <b>819.980</b> | <b>24.599,4</b> | <b>844.579,4</b> |

- item A.1: Enhancement of months/person of permanent employees
- item A.2.1: Cost of contracts of non-employees, specifically to recruit
- item B: Overheads (flat rate equal to 60% of the total cost of staff, A.1 + A.2.1, for each research unit)
- item C: Cost of equipment, instruments and software
- item D: Cost of consulting services and similar
- item E: Other operating costs
- item F: Prize (automatically calculated as 3% of total cost of the project)

## PART B

### B.1

#### 1. Abstract

In the last twenty years, the Italian university system has experienced significant changes that involve two main players: the student and the university. The last decade saw students' enrolment decrease following the economic crisis of 2008, especially in southern regions of the country. Although there has been an increase in enrolments in the northern and central regions since 2012, increased enrolment in the southern regions has occurred only recently. At the same time, student migration from the southern to the central and northern regions of the country has increased steadily in the last ten years. This phenomenon has created further inequalities within the country as well as a cultural and socio-economic losses for the South that does not appear to be slowing down.

The other important change has been the modification of the universities' governance rules: in the nineties the central government introduced financial autonomy and then, around the 2010, in line with the international trends, funding mechanisms in the Italian Higher Education system were reformed according to quasi-market and performance-based budgeting theories.

This project is founded on the "Agreement between the Italian Ministry of Education and Research (MIUR) and the Universities of Palermo, Cagliari, Siena and Turin", first implemented in 2016 and later amended with the inclusion of universities of Florence, Naples, and Sassari in 2017. The agreement's aim is to study Italian students migration and universities student careers in terms of the students' profiles. The research group has already created a national, longitudinal, micro-level database using MIUR student archives, covering all the freshmen cohorts between 2008-09 and 2016-17. It allows for the first time in Italy to follow all students - including transfers from one institution to another - from enrolment year to graduation.

The main objective is to analyse student migrations from the South to the central and northern regions of the country, while observing other mobility flows within the country and to other countries. Moreover, in order to follow the student from enrolment to their access to the labour market, we plan to use the AlmaLaurea database, which provides information about graduates job placements. Our main objective is to address questions (using specific questionnaires), such as "Who are the students that migrate and who are the students that stay?", "Is it true that a degree obtained in the central and northern regions of the country has greater value than a degree obtained in the South?", "Why is it that the central and northern regions offer better labour market perspectives than the South?", "Is mobility a consequence of personal and/or family dynamics?", "What is the influence of the educational background and of the high school attended on student migration choices and performance?", "Is there any high school effect?", "How do students that migrate from the South perform (time to graduation, grades, etc.) compared to students that stay?", "Who finds a better job and when?", "Where do students settle after graduation?", "How do the students that migrate outside the country make out?"

The second objective is the assessment of unintended consequences of the performance budgeting on equality and on equity at the individual university level and as a whole on the national university system. We aim to study the connection between mobility patterns and the mechanisms of incentives due to performance-based allocation that have been recently implemented in Italy. In particular, a major goal is testing for possible distortions induced by competitive mechanisms that might have favoured highly ranked institutions to the detriment of disadvantaged universities, by a sort of "rich gets richer" effect. If a university's attractiveness is mostly influenced by exogenous factors (e.g. quality of life in the town of destination, family wealth, employment opportunities etc.), that are not controlled by universities, it can be assumed that the university's strategy can produce a limited effect in driving student choice and it will lead to increased inequality and unfairness within the country. In turn, since the capacity of attracting students will influence the amount of public subsidies, this may undermine also the recruitment of new academic personnel. The link between the two objectives is student mobility from the southern regions to the central-northern regions. Therefore, one of the main research thrust is to try to measure the disadvantages – also in terms of funds - affecting southern universities as a consequence of student mobility.

## 2. Detailed description of the project: targets that the project aims to achieve and their significance in terms of advancement of knowledge, state of the art and proposed methodology

### 1. Premise

Definition of movers and stayers. Mover/stayer: individual who enrolls at a university outside/inside his/her area of origin.

Definition of "area of origin" depends on the specific research questions (based on ad hoc distance measures, regions, macro-areas). Attractiveness is based on the number of movers and it can be graded according to the "distance" between macro-region/region/province of origin and the macro-region/region/province of destination.

Definition of hub/authorities. Student mobility establishes a set of networks, e.g., among areas of origin and areas of destination, among areas of origin and universities of destination, among universities of origin and destination. Hubs and authorities are central nodes of the networks. Hubs are areas/universities which point to many areas/universities considered central or important.

### 2. Issues at stake

Human and cultural capital, including education and qualifications, can be considered a relevant resource to create innovation and development. Despite the significant increase in university graduates from the 1950s to the 2000s, Italy is among the poorest performing countries within EU. Although university enrolment has been increasing in northern and central universities in the last three years, this is due, in part, from increased student migration from southern regions. These tendencies, which have remained unabated, operate in the context of educational inequalities, among individuals of different socio-economic backgrounds and among geographical areas. Territorial inequalities in Italy are strictly related to the well-known North-South divide. Student mobility trajectories seem to reinforce this divide [1]. Mobility is usually an opportunity, but in Italy it is one-directional, that is, from the South to the Centre and North. This strong imbalance between outward and inward flows might therefore have negative consequences on the territories from which students move. The mobility flows show that there exists a university North-South divide too and movers seem to be more favoured in terms of economic and cultural resources than stayers (e.g. there are larger shares of movers among students from lyceums than from technical schools). This process seems to clash with the art.34 of the Italian Constitution, as "Capable and deserving pupils, including those without adequate finances, have the right to attain the highest levels of education", as some southern students cannot afford living outside the family home. Moreover, this selective process could represent an obstacle to the development of high quality institutions in the areas from which the share of movers is larger. Finally, a crucial issue is the place where students invest their acquired human capital once they graduate. According to survey data, a large proportion of southern graduates, who obtained their degree in the Centre-North, settle in the Centre-North: this points to a substantial "brain-drain" in the South. This effect is compounded by reforms to higher education governance, starting with the university autonomy and, later, with the evaluation system and the introduction of financial additional resources (quota premiale), have been changing the national university "geography" since the last decade, in which the universities mirror the historical Italian North-Centre South divide.

### 3. The data

The data regard three entities or, in a broader sense, statistical units: the student, the high school, and the university.

#### i) The Student.

The MIUR has been collecting administrative data – called Anagrafe Nazionale Studenti (ANS) – at student-level from all higher education institutions for more than a decade. These do not allow for deep-understanding of student flows, because they have all the limitations of aggregate data. However, our research group has access to the national student level micro-data archives, from 2008 to the latest available cohorts, thanks to a special agreement between the MIUR and all the universities of our group. This agreement was first signed in 2016 (by the Universities of Palermo, Cagliari, Siena, and Turin) and amended in 2017 (to include the Universities of Florence, Naples Federico II, and Sassari). The databases provide a great opportunity in terms of the advancement of knowledge and it is the basis for the creation of this research group. The database also includes the student's high school identification code as well as several information on his/her high school career. The original ANS archives have already been cleaned up by our research group and longitudinal individual datasets for each cohort are already available (L-ANS). These datasets allow, for the first time, to learn about the transition from BA graduation (1st level) to MA (2nd level) enrolment: this transition is very interesting because it encapsulates the second student migration flows.

These datasets will be linked to data surveys on the university graduates profile (ALM1) and labour market outcomes (ALM2) collected by the AlmaLaurea Consortium (ALM) at graduation and after 1, 3, and 5 years from degree attainment. These data allow us to identify post-graduate movers and stayers within a coarse geographical partition. A periodic retrospective survey will be used to produce a longitudinal database, which will allow us to relate the labour market outcomes and residential choices 1, 3 and 5 years after the end of studies to university careers, on a fine-grained typology of fields of study and degree-types, creating a unified (L-ANS-ALM) data archive. Because of the current restrictions in data release, we will later explore how to extend the linkage to all institutions, while at first the linkage will be limited to universities covered in the current project.

#### ii) The high school.

The high school's identification code reported in the (L-ANS) will be linked to data collected by the National Institute for the Evaluation of the School System (INVALSI). This dataset will allow linking the high school characteristics (region, province, type of high school, gender percentage, foreign students percentage, student attrition, teaching staff, student achievement in reading and mathematics, etc.) to the university outcomes (e.g. student attrition, mobility rates, number of credits accumulated, type of university courses, etc.). Compositional variables will be computed at the school level using data from three databases: the INVALSI student questionnaire (INVALSI-S), the INVALSI tests on the two skill areas (INVALSI-T) and the INVALSI school form (INVALSI-SCH). We will link each school in a new database (INVALSI-S-T-SC) to define Italian high school characteristics in terms of the socioeconomic and immigrant status of their students, their level of competencies and the school organisational practices. The link of (INVALSI-S-T-SC) with the ANS micro-data will allow us to investigate students' university choices and performance in light of their previous educational experiences.

#### iii) The university.

The (L-ANS) datasets can provide detailed information on student indicators related to the FFO. Moreover, we will need other time series 2008-2018 regarding: the reduction of the allocation funding due to student reduction (in the South), additional funding due to new faculty positions, the geography of total university faculty, and university faculty mobility in Italy. This information will be used to create an Italian university map with several layers: total budget and its items, faculty members, and students (movers/stayers).

### 4. General and specific research questions:

- Is it possible to determine a school's influence on student migration choices? What is more important, the perceived quality of the university more important than exogenous factors (e.g. the quality of life in the town of destination) not under the control of university's management? Or is it the student socioeconomic and educational background?
- What is the spatial-temporal size of the phenomenon and its characteristics at 1st (BA) and 2nd (MA) level degrees? How do hubs and authorities play a role? What is the geography of movers/attrition rates

in terms of gender, location of the high school, type of school, big town/small town, social background, hard and soft sciences?

- What underlies postgraduate mobility? Who returns to their territories of origin and who moves after degree completion?
- What is the profile of the “weak” student, is there a southern “weakness”? How is this related to gender, type of school, social background? Is there a migration chain in the student flows? Are there new universities/new territories more attractive than others?
- Universities are interconnected in a web of relationships of various nature: students move from one university to another; so do researchers and university professors; institutions can be more or less similar by dimension, attractiveness, diversification of degree courses, research/teaching performance, strategy of their governance, or with respect to exogenous factors that characterise geographical position. All these issues will allow to construct a “map” of the Italian university network. These maps will be carried out to answer specific questions: What is the relationship between the network centrality of a university and its attractiveness and performance? Do similar institutions perform similarly? What attributes are better predictors of an institution’s performance? Is there some clear relationship between students’ mobility and a university’s performance in terms of quality and development strategy? Or do exogenous factors play the major role?
- The newly introduced funding mechanisms and the logic of performance budgeting may well have played a role in shaping the university network. Student mobility is an indirect outcome of such mechanisms, since students can freely choose which the university to enrol in, by selecting the best one since their choices are driven by quality and performance. In this sense students “vote with their feet” and reward universities with an additional share of funds (i.e. the “costo standard”). How much is that amount? How has it changed over time?
- As the MIUR transfers money to the universities just for “regular” students and in-time degree attainments, how much is the financial loss borne by southern universities due to the mobility of the best “performing” students? What is the role of university autonomy and how have universities changed their strategy and business model in response to quasi-market and performance-budgeting mechanisms? Ultimately, has the quasi-market system determined distortions due to “rich gets richer” effects, possibly amplifying a pre-existing divide among institutions (e.g. southern vs northern universities)? We aim at measuring all these effects.

#### 5. Expected results

- Geographical high school mobility maps at 1st and 2nd level.
- Geographical thematic (according to the variables above mentioned) mobility maps at BA and MA level, and at placement.
- Chain migration maps; profile of the “weak” and “strong” student.
- Probability mobility profiles of graduates (and indicators) in terms of degree completion, field of study, performance etc.
- A description of push and pull factors that lie beyond mobility and a deeper understanding of individual motivations.
- Network representation of Universities in terms of attractiveness, quality of services, socio-economic indicators and mobility.
- Definition of a comprehensive notion of “centrality” for universities, moving probabilities conditioning on network centrality, identification of clusters of similar institutions.
- Identification of the driving factors of university performance and attractiveness and assessment of the relation between Higher Education reform, budgeting and student mobility.

#### 6. State of the art

Empirical studies on international student mobility [2] focus primarily on the macro-level determinants of mobility choices, and they underline the influence of socio-economic and cultural conditions of the areas of origin and destination. The cost of moving abroad and quality of universities play a major role too. In contrast, studies on internal student mobility in European countries are fewer ([3] on UK, [4] on Netherlands), except for Italy, where domestic student mobility flows are almost entirely unidirectional – from South to North – mirroring internal economic migration. Internal student mobility has been mainly investigated with aggregate administrative data released by the MIUR. Some studies have focused on the determinants of student performance mobility at a local level [5, 6] and examined aggregate migration flows of students across Italian provinces. Regression or gravity models have shown that universities can be a source of a selective migration process. On the whole, these studies show that student mobility depends not only on the local university systems (and in particular on quality indicators), but also on the local labour market conditions in areas of origin and destination [7, 8]. Individual determinants of internal mobility have been studied mainly by exploiting survey data on upper secondary graduates and university graduates, focusing on the role played by individual factors such as family background and schooling career [9, 10]. Some recent papers have studied individual determinants of internal student mobility with MIUR administrative data at the micro level [11, 12]. Preliminary results have already shown the great potential of studying the phenomenon at multiple levels including territory, institution, field of study, gender, type of school. A crucial issue is what happens to students once they graduate from university. Where do they employ the human capital they have acquired? A few studies investigate the factors influencing post-graduate residential outcomes [13] and labour market outcomes of movers and stayers [14]. This body of research shows that graduates in the North show more favourable early labour market performances than graduates in the South and that a substantial share of Southern students moving northbound to attend university does not return to their areas of origin after degree attainment. Information is available at a much larger scale from the Almalaurea consortium, while information on international mobility of Italian students is very limited. The Almalaurea survey on Italian graduates is useful to analyze mobility intentions at the 2nd level degree and postgraduate mobility [15].

Although some studies have been devoted to the analysis of macro-determinants of student mobility in Italy, to the best of our knowledge there is no systematic survey trying to investigate the determinants of mobility choices at the individual level. In literature, there are only some example of surveys on international mobility of students, especially in Europe dealing with non Erasmus mobility [16]. These papers try to identify the attractive factors of a country, in the “market” for university students, associated to their recruitment strategies [17, 18].

Moreover, it will be interesting to explore in Italy the international debate on the relation between student mobility flows and the university system [19]. During the last decade, the Italian higher education system has been transformed in accordance with quasi-market [20] and performance-budgeting literature [21] in order to increase competition and to push universities to change their strategies to increase performance by changing their product. This clearly emerges by looking to the funding mechanism which allocates the FFO in relation to the number of students enrolled and by using a formula-based mechanism [22].

Nevertheless, given that the quasi-market system links resource allocation to student’ choice, and that the latter are bounded rational agents [23] and their decisions could be influenced by factors not directly linked to university quality, quasi-market and performance budgeting systems can lead to inequalities and unfairness (for instance, the above mentioned “rich get richer” effect).

Finally, student mobility can be analyzed using network analysis. Such network analysis has been previously applied to the Erasmus Programs [24] or the international student mobility ambit [25]. The network approach has also been used to study the different roles of the Italian regions, in terms of hubs and authorities, for university mobility using the ANS aggregated data [26].

#### 7. Methods

The methods can be briefly summarised in three groups:

##### a) Survival (life course) methods.

The (L-ANS) and the (L-ANS-ALM) databases will be suitable to apply statistical models for retrospective cohort settings, such as multilevel models, and multistate models in the presence of competing risks. In order to gain more insight into student history, we will explore the possibility of applying extended Cox Models and eventually methods with unobservable variables. Another approach will take into consideration the possible effect in the long run of early-life conditions and events. This approach has its classical application in the study of health and mortality [27]. It seems innovative in educational studies and it is grounded on the idea that the possible determinants of the choices toward university mobility might be traced in early-life conditions of the student career.

## b) Survey data.

Data collection on students will be conducted via a mixed-mode survey, considering CAPI, CATI and CAWI mode to manage the questionnaires. Recently, these kinds of surveys have been used more frequently, both by international private research institutes and the Italian Statistical Institute. This kind of approach allows one to save time and substantially reduce the cost of the survey. Of course, in the case of mixed mode data collection special attention will be paid on questionnaire construction, data comparability among the modes, error sources and sizes [28].

## c) Social Network Analysis (SNA) of student Flows.

The micro-data (L-ANS) allow to infer the network of student mobility from high school to university and between Italian universities. SNA will be used to analyse the roles played by each province or university in attracting undergraduate/graduate students through network indexes and the global structure of the network through clustering and blockmodeling techniques for one-mode and two mode network data.

## d) Systemic Level Network Analysis.

We intend to investigate Italian University in a systemic perspective as a time-varying multidimensional network of institutions interconnected at various levels. The first level is given by student flows, another one is the university faculty mobility, plus, of course, geographical or transportation proximity. This picture will be enriched by including vertex attributes that measure intrinsic factors and context variables. We will measure the vertex centrality of institutions, both in absolute and relative terms, and the degree of similarity between them. As well, similarity (as another kind of proximity) will provide a different "geography" of University taking into account degree courses, governance, performance, and context. Community detection algorithms will be used to identify groups of similar, or similarly performing institutions. The network's time evolution and standard qualitative and quantitative methods will allow to measure the effects of quasi-market dynamics in reformed University subject to performance budgeting, on the universities' strategies, for increasing performance and attractiveness, and on the divide between institutions.

### 3. Project development, with identification of the role of each research unit with regards to expected targets, and related modalities of integration and collaboration

The following table outlines the Work Package (WP) activities, the Research Units (RU) involved and their workloads. LP=Lead Participant, P=Participant

| Work package | WP title  |        | UNIPA (PI) | UNICA | UNINA | UNISS | Total months per WP |
|--------------|---|--------|------------|-------|-------|-------|---------------------|
| WP1          | Refinement and sharing of the data warehouse        | LP / P | LP         | P     |       | P     | 10                  |
|              |   | Months | 6          | 2     |       | 2     |                     |
| WP2          | The high schools and the mobility of their students | LP / P | P          | LP    | P     |       | 8                   |
|              |   | Months | 2          | 4     | 2     |       |                     |
| WP3          | Student mobility at enrolment                       | LP / P | LP         | P     | P     | P     | 10,5                |
|              |   | Months | 5          | 2     | 1,5   | 2     |                     |
| WP4          | Graduates placement                                 | LP / P | LP         | P     |       | P     | 8                   |
|              |   | Months | 5          | 2     |       | 1     |                     |
| WP5          | Ad-hoc surveys and enquires                         | LP / P | P          | P     | LP    |       | 9                   |
|              |   | Months | 3          | 3     | 3     |       |                     |
| WP6          | Student' mobility and university funding            | LP / P | P          | P     | P     | LP    | 11                  |
|              |   | Months | 1          | 0     | 2     | 8     |                     |

## WP1: Refinement and sharing of the data warehouse

- The database (L-ANS) is already available for all the RUs, as all the participants signed the agreement with the MIUR. A prototypical longitudinal archive of the careers of university students (L-ANS) has been constructed for three cohorts, structured as a person/year record file, including the relevant information on the students' academic history and all transfers across Italian higher education institutions. Information on the careers will be updated every six months.

- The longitudinal Archive of University Graduates (L-ANS-ALM) will be obtained combining (L-ANS) with the database (ALM), just including the universities taking part in this project. Some northern and central universities will be included. The construction of this database will be based on the structure already determined for (L-ANS). A significant process of re-engineering is needed to achieve this aim.

- The database (L-HS) will be constructed linking the database (INVALSI-S-T-SC) with the (L-ANS). Each high school will contain the school+university careers for the students who graduated from that school.

- The database (L-UN) will be constructed linking (L-ANS) with the FFO and with the personnel database of each university, including university faculty hiring process and transfers in Italy.

## WP2: The high school and the transition to university

In this WP the focus will be determined at the HS level. High Schools need to understand – as it is required by their RAV (Rapporto di Autovalutazione) – the "destiny" of their graduates in terms of mobility,

gender, type of high school, drop-outs, regularity, time to degree etc. Special focus groups can be created in order to understand what teachers, parents and students say in the last years of the high school with respect to the students' university career.

WP3: Student mobility: mobility flows and maps of university enrolment

(L-ANS) will allow us to investigate the performance of a cohort of students since their enrolment. In this way, we will obtain deeper insight into all the trajectories, focusing on migrants and non-migrants and their movements. We will stress the differences between movers' profiles at the 1st and 2nd levels, focusing on the trajectories from South to Centre and North. Further, other minor trajectories will be included in order to construct a national student mobility map. Special focus will be done to several variables, which look to be determinant in the enrolment process (who decides not to continue with the university? Who, instead, is going to enrol at university and where? Who is going to be a stayer or a mover?).

WP4: Graduates placement

The main purpose of WP4 is to consider the occurrence of mobility after graduation, based on (L-ANS-ALM). As before, the student's career histories can give further insights in understanding how inter-regional and inter-individual differences may have an effect on job seeking and on job quality.

WP5: Ad-hoc surveys and enquires

WP5.1.1 Sample survey on movers decisions at enrolment (2nd level degree)

In order to achieve an in-depth understanding of movers' trajectories, a sample survey will be conducted. It will be obtained drawing a sample of 1st level graduate students, not enrolled in a MA of the same university, from the databases of the universities involved in the project plus other southern universities. Two different questionnaires will be created: one for students not enrolled at all, and another one for movers and stayers. In this regard, it will be very useful to step up research into the motives that induce students to change universities, in order to understand among several motives, such as anticipate job mobility, attraction for the study programs, attraction for the university's prestige, and attraction for student welfare policies. Also, the effect of the university context and the role of migration chain will be investigated. This survey will be conducted via mixed mode administration, i.e. using both CATI and CAWI methodologies. The University of Naples Federico II shall bear the expenses for the software and the call center.

WP5.1.2 Sample survey on movers at enrolment (1st level degree)

A second survey will be conducted on a sample of students who moved to enroll at a BA level course. Due to privacy restriction, (L-ANS) contains just the list of the movers from the South to the North, without any identification. This is why we will conduct two surveys: a CAWI and a CATI survey. (L-ANS) will identify the Northern Universities, in the migration network that, attract the largest numbers of southern students. The online survey will be launched using Facebook pages and groups, the Twitter profiles of these Universities, as well as on-line communities of southern students in the northern Universities. A snowball sampling strategy will be also implemented. A second survey will focus only on some large northern universities: ad hoc agreements with these universities will be signed in order to obtain the list and the names of southern students attending those universities. To do this, a CATI survey will be conducted. Sample sizes of the two surveys will most likely be the same.

WP5.2. Sample surveys on job movers

An online CAWI survey on a graduate sample at the 1st and 2nd levels will be conducted to explore how the respondents search for a job and use their networks to get information on jobs opportunities. We will explore whether, and to what extent, (i) job opportunities depend on the type and strength of the graduate's networks; (ii) graduate' networks influence, educational mismatching and/or (iii) mismatching can be related to the mover/stayer condition.

WP5.3 Surveys Help Desk

Considering the lack of some pertinent data on students and graduates (as socio-economic background, social network and territorial relationships, study or work activity abroad) we will provide a structured platform for online CAWI surveys, aimed at designing experimental studies on some target populations.

WP6: Students' mobility and university funding

The WP6 is intended to identify and assess the effects induced by the adoption of performance budgeting in the Italian higher education system at university and national level and to understand whether the funding mechanism has led to inequality and unfairness

WP6.1 University level

The analysis will be focused on how universities tackled the incentives posed by quasi-market and performance budgeting. In particular the analysis will try to understand how universities changed their strategies in order to "change their product" with the aim to improve their quality. Furthermore, the relationship between changes in strategy and university's attractiveness will be investigated. Moreover, the relationship between student mobility and endogenous (e.g. quality of education, quality of research) or exogenous factors will be analysed. In this regard, a twofold notion of relevance of a university base will be explored: an extrinsic "centrality", depending essentially on the values of exogenous context variables, and the intrinsic quality of the institution in terms of teaching and research activity and social impact as well (TERZA MISSIONE). Intrinsic quality will be eventually conditioned to available resources and funding received. The disentanglement of the contributions of these aspects to a university's attractiveness is a major goal. Finally, changes in strategies and business models will be tracked, in order to identify some homogeneous patterns within the Italian higher education system.

WP6.2 National level. The analysis will be aimed to identify factors that influence university attractiveness, which will be qualified in terms of student enrolments and incoming/outgoing flows of both students and university faculty. Metrics will be introduced to measure the degree of similarity of the strategies implemented by universities, in order to test for an effective correlation between strategy and attractiveness. A major working hypothesis here is that if exogenous factors (i.e. those not under the control of university management) strongly influence student choices, a performance-based funding system will lead to unfairness and inequality. Moreover, a contribution to this level of analysis will be provided by the network approach. By using network indices we will identify the universities and the territories that play a different role in the mobility network and determine their characteristics. On the other hand, by using clustering methods for network data we will identify important subnetworks. In addition, via block-modelling methods we will identify the core and peripheral universities in terms of attractiveness.

RUs' Project coordination

The RUs will share an on-line repository of the database and will interact through monthly video chat and calls. Each year, in a one-day workshop, they will discuss the results and advances.

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#### 4. *Possibile application potentialities and scientific and/or technological and/or social and/or economic impact of the project*



The databases and the expected deliverables of this application will be an invaluable resource for informing government policies. Furthermore, the project will have technological, scientific, social, and economic impact. For the first time in Italy, it will be possible to produce national longitudinal maps (in terms of student mobility) from high school to job placement. A follow-up project, which will require a computer science team, could create a national data warehouse that could be made publicly available. This database could include several layers, such as time, space, student profiles, MIUR funding, and university profiles.

The project will provide several databases/datasets and papers and reports with social, economic, and scientific benefits. The main beneficiaries will be educational institutions, public institutions as well as students, households, other stakeholders, and policy makers.

The (L-ANS) database is the first longitudinal micro-level, career-focused database to provide significant statistical analysis to both educational and non-educational institutions. The (L-ANS-ALM) database will supplant currently fragmented data and build more uniform student/graduate/worker biographies, based on a longitudinal approach. In general, these two databases will provide the basis to calculate statistics/indicators/measurements for universities, for local, national, and European politicians, and for labour market stakeholders. For the first time in Italy, information on transitions from BA to MA levels will become available with a longitudinal approach. The main benefits are that universities will be able to evaluate the efficacy of the higher education system in real time, while politicians will be able to plan investments into disadvantaged areas to improve academic quality and expand work opportunities to stop intellectual migration. At the same time, the connection drawn between high school, university and the job market will provide insights into the shortfalls of the educational system; especially one in which territorial divides seemed to have increased. Most importantly, the southern part of the country could take advantage of having better information that can be used to reduce the migration of intellectual capital toward the North. Moreover, these databases could be utilized to construct predictive models of student mobility, using different middleware and software tools.

University and national policy makers will be able to utilise a new geographical and historical "visualisation" of student mobility, universities hiring policies, and differences between northern and southern territories. Moreover, universities and policy makers will be able to manage and assess the limits and the benefits of the current competitive quasi-market system. At the same time local stakeholders will be informed about educational migration flows, which in turn can support/enhance territorial excellence in order to face local weaknesses. In summary, this project will provide the necessary information for the local, regional, and national political decision makers to create policies that can reform higher education, so that institutions in charge of creating policies can be more innovative and able to improve the university system based on current information.

## 5. Costs and fundings, for each research unit (automatically calculated)

| n° | Associated or principal investigator | Total cost (euro) | Co-funding (item A.1) (euro) | MIUR funding (other items) (euro) |
|----|--------------------------------------|-------------------|------------------------------|-----------------------------------|
| 1. | ATTANASIO Massimo                    | 291.753,4         | 84.044                       | 207.709,4                         |
| 2. | RAGOZINI Giancarlo                   | 169.993           | 51.235                       | 118.758                           |
| 3. | PORCU Mariano                        | 189.910           | 20.662                       | 169.248                           |
| 4. | DELPINI Danilo                       | 192.923           | 58.783                       | 134.140                           |
|    | <b>Total</b>                         | <b>844.579,4</b>  | <b>214.724</b>               | <b>629.855,4</b>                  |

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- [3] Faggian A., McCann P., Sheppard S. 2007. Some evidence that women are more mobile than men: gender differences in UK graduate migration behavior. J Regional Sci, 47(3), 517-539.
- [4] Sà C., Florax R.J.G.M., Rietveld P. 2006. Does Accessibility to Higher Education Matter? Choice Behaviour of High School Graduates in the Netherlands. Spatial Econ Anal, 1(2), 155-174.
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## B.2

### 1. PI's Curriculum Vitae

Personal : born 12 Feb 1959, Milan

#### Education:

University of Palermo, Laurea in Statistical Sciences, 1982

University of Padua, Ph.D. in Applied Statistics, 1991

Doctoral Dissertation: Modelling graduates and drop-outs in Italian Universities in three cohorts of freshmen

University of California Los Angeles, Post-Doc, 1992.

#### Professional Career:

University of Palermo, Ricercatore (Assistant Professor of Statistics) 1992-nov 1998

Visiting Scientist at Ontario Veterinary College, Guelph, Canada , Aug-Dec 1994

University of Palermo, Associate Professor of Social Statistics nov 1998-dec 2002

University of Palermo, Full Professor of Social Statistics dec 2002- present

#### Scientific interest:

Surveys. Survival analysis. Metanalysis. Construction of indicators;

Logistic regression; Educational Systems assessment focusing on University performance indicators; Assessment of health care systems

#### Research Activities:

-Member of the PhD Programs in Statistics University of Palermo, 2001-present ;

-Coordinator of the PhD Program in "Applied Statistics" University of Palermo, 2005-2006;

-Associate Editor of the Italian Journal of Statistics;

-Coordinator of several local Research Program at University of Palermo since 1996, on statistical issues concerning biostatistics and indicator construction;

-Member of the National Research Program 2005 'Indicators Construction for Public Decision-Making Processes between Measurement Issues and Knowledge Opportunities', coordinator by Vincenza Capursi;

-Coordinator of the Ph,D in Applied Statistics, university of Palermo, 2006-2007

-Referee of the Journal "Journal of Applied Statistics"

## Other activities:

- July 2010 - Visiting Professor Ludwig Maximilian University Munich, in coordination Prof. Gerhard Tutz
- Nov 2010 - Seminars Ph.Course in Statistics University of Lubjiana
- Coordinator of the Course study in Statistics and informatics, University of Palermo, 2007-2016
- 2005 - Responsible for European Credit Transfers System for the University of Palermo

*1.a National and international grants (as Principal Investigator)*

- PI and responsible for funds of the national "Scientific Degree Program, Statistics" 2014-2020. Euro 120.000 per year.
- PI and responsible for funds of the research " Assessment of the perceived quality of the services provided and the satisfaction of the users of hospitalization and treatment services in the hospital, of the Day Hospital and Day Surgery Services and of the diagnostic and outpatient services in Sicily", 2015-2020. Euro 130.000
- PI and responsible for funds of the research " Evaluation of the services provided by the First Aid Departments in the Sicilian hospitals" 2016-2020. Euro 110.000

*1.b National and international acknowledgments*

- 1992, University of California Los Angeles , one-year scholarship Exchange program between University of Padua- University of California
- Vice-Coordinator of the National Research Program 2005 and 2008 (PRIN) 'Indicators Construction for Public Decision-Making Processes between Measurement Issues and Knowledge Opportunities', coordinator by Vincenza Capursi;
- 2013-now Member of the Regional "Evaluation Committee for Clinical Trial Experiments", Palermo, Italy
- PI of the research project on the "Study of the university student mobility" (Studio della Mobilità Studentesca Universitaria) among "Italian Ministry of University and Research" (Ufficio di Statistica e Studi del MIUR) and the Universities of Palermo, Cagliari, Siena, and Turin.2016
- PI of the research project on the "Study of the university student mobility" (Studio della Mobilità Studentesca Universitaria) among "Italian Ministry of University and Research" (Ufficio di Statistica e Studi del MIUR) and the Universities of Palermo, Florence, Naples "Federico II", and Sassari. 2017

*2. Principal scientific publications of PI*

1. TINE', Fabio, ATTANASIO, Massimo, MUGGEO, Vito Michele Rosario, Crainiceanu, C. (2017). Evidence of bias in randomized clinical trials of hepatitis C interferon therapies. CLINICAL TRIALS, vol. 14, p. 483-488, ISSN: 1740-7745, doi: 10.1177/1740774517715447 - **Articolo in rivista**
2. ATTANASIO, Massimo, CAPURSI, Vincenza (2016). Statistics in Education. JOURNAL OF APPLIED STATISTICS, vol. 43(1), ISSN: 0266-4763, doi: 10.1080/02664763.2015.1104890. - **Articolo in rivista**
3. ATTANASIO, Massimo, ENEA, Marco (2014). An association model for bivariate data with application to the analysis of university students' success.. JOURNAL OF APPLIED STATISTICS, vol. 41, ISSN: 0266-4763, doi: 10.1080/02664763.2014.998407 - **Articolo in rivista**
4. Aiello F, Attanasio M, Tinè F (2011). Assessing covariate imbalance in meta-analysis studies. STATISTICS IN MEDICINE, vol. 30, p. 2671-2682, ISSN: 0277-6715, doi: 10.1002/sim.4311 - **Articolo in rivista**
5. Muggeo VMR, Attanasio M (2011). Segmented relationships to model erosion of regression effect in Cox regression. STATISTICAL METHODS IN MEDICAL RESEARCH, vol. 20, p. 401-414, ISSN: 0962-2802, doi: 10.1177/0962280209358643 - **Articolo in rivista**
6. Rizzo L, Calvaruso V, Cacopardo B, Alessi N, Attanasio M, Petta S, Fatuzzo F, Montineri A, Mazzola A, L'abbate L, Nunnari G, Bronte F, Di Marco V, Craxì A, Cammà C. (2011). Comparison of transient elastography and acoustic radiation force impulse for non-invasive staging of liver fibrosis in patients with chronic hepatitis C.. AMERICAN JOURNAL OF GASTROENTEROLOGY, vol. 106, ISSN: 0002-9270, doi: 10.1038/ajg.2011.341 - **Articolo in rivista**
7. CABIBBO, Giuseppe, ENEA, Marco, ATTANASIO, Massimo, Bruix, J, CRAXI, Antonio, CAMMA', Calogero (2010). A meta-analysis of survival rates of untreated patients in randomized clinical trials of hepatocellular carcinoma.. HEPATOLOGY, vol. 2010, ISSN: 0270-9139, doi: DOI 10.1002/hep.23485 - **Articolo in rivista**

8. CAMMA', Calogero, CABIBBO, Giuseppe, BRONTE, Fabrizio, ENEA, Marco, LICATA, Anna, ATTANASIO, Massimo, Andriulli, A, CRAXI, Antonio (2009). Retreatment with pegylated interferon plus ribavirin of chronic hepatitis C non-responders to interferon plus ribavirin: A meta-analysis.. JOURNAL OF HEPATOLOGY, vol. 2009-07, ISSN: 0168-8278 - **Articolo in rivista**

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9. MUGGEO, Vito Michele Rosario, ATTANASIO, Massimo, Porcu, M. (2009). A segmented regression model for event history data: an application to the fertility patterns in Italy. JOURNAL OF APPLIED STATISTICS, vol. 2009, p. 973-988, ISSN: 0266-4763, doi: 10.1080/02664760802552994 - **Articolo in rivista**

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10. Enea M, Attanasio M (2012). Bivariate logistic models for the analysis of the students' University "success". In: Proceedings of the 46th Scientific Meeting of the Italian Statistical Society. Cleup, ISBN: 9788861298828, Rome, June, 20-22, 2012 - **Contributo in Atti di convegno**

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11. Attanasio M, Boscaino G, Capursi V, Plaia A (2011). Indicators and measures for the assessment of university students' careers. In: [Atti della VIII Riunione Scientifica del gruppo CLADAG-SIS]. p. 01-04, ISBN: 978-88-96764-22-0, Pavia, Italia, 7-9 settembre 2011 - **Contributo in Atti di convegno**

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12. Attanasio M, Boscaino G, Capursi V (2015). Studenti in calo e in fuga: quale è il destino degli atenei siciliani?. In: (a cura di): Campostrini S; Ghellini G; Tuzzi A, Con senso di misura. Riflessi statistici da alcuni allievi di Lorenzo Bernardi. p. 99-113, PADOVA:CLEUP, ISBN: 9788867873937 - **Contributo in volume (Capitolo o Saggio)**

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13. Attanasio M, Boscaino G, Capursi V, Plaia A (2013). Can the students' career performance be helpful in predicting an increase in universities income?. In: (a cura di): Giudici P; Ingrassia S; Vichi M, Statistical Models for Data Analysis. STUDIES IN CLASSIFICATION, DATA ANALYSIS, AND KNOWLEDGE ORGANIZATION, Springer, ISBN: 978-3-319-00031-2, ISSN: 1431-8814, doi: 10.1007/978-3-319-00032-9-2 - **Contributo in volume (Capitolo o Saggio)**

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14. AIELLO F, ATTANASIO M (2008). Alcune considerazioni sulla costruzione di indicatori composti. In: CAPURSI V., GHELLINI G.. Dottor Divago: Discernere valutare e governare la nuova Università. Collana Valutazione - AIV - Teoria, metodologia e ricerca. p. 123-138, MILANO:FrancoAngeli, ISBN: 978-88-464-9634-8 - **Contributo in volume (Capitolo o Saggio)**

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15. Attanasio M, Capursi V (a cura di) (2011). Statistical methods for the evaluation of university systems. CONTRIBUTIONS TO STATISTICS, Heidelberg:Physica-Verlag, ISBN: 978-3-7908-2374-5, ISSN: 1431-1968 - **Curatela**

### 3. Hindex of PI (only for the scientific fields in which the use of the H-index is usually adopted)

| H-Index | Source |
|---------|--------|
| 8       | Scopus |

### 4. Associated investigators' Curriculum Vitae

#### 1. RAGOZINI Giancarlo

##### Position

Associated Professor in Statistics (since 2005)- Department of Political Science- University of Naples Federico II.  
National Qualification to Full Professor in Social Statistics since 2017.

##### Previous positions

- 2000-2005 Researcher in Statistics - Department of Sociology- University of Naples Federico II.
- 1999. Research Assistant - Center for Computational Statistics, Department of Applied and Engineering Statistics della George Mason University, Fairfax VA U.S.A., Research manager I Prof. Edward J. Wegman
- 1998 Visiting Student Department of Probabilità and Mathematical Statistics- Charles University of Prague- Research manager Jaromir Antoch.

#### Education

- 2000 P.Hd in Computational Statistics and Applications- DEPARTMENT OF MATHEMATICS AND STATISTICS Federico II University of Naples. P.hd Dissertation on "Computational Geometry: a tool for the Multidimensional Data Exploratory Analysis"
- 1996 Laurea Degree in Economics in Economia e Commercio, Federico II University of Naples, Dissertation on "Graphical Methods for Multidimensional Data"

#### Research interests

Statistical methods for Social Network Analysis. Structural Equation Models in Social Science and Psychology. Youth policies and University policies. Performance analysis. Multivariate methods for survey data and panel data analysis. Statistical methods for multiple multivariate outlier detection. Computational Geometry for Computational Statistics. Nonparametric methods for multivariate control quality. Data depth and multivariate Ordering.

#### Editorial Activities

Associate Editor SOCIAL NETWORK ANALYSIS AND MINING (Springer)  
Guest Editor of the Springer Book: Analysis and Modeling of Complex Data in Behavioral and Social Sciences. Studies in Classification, Data Analysis, and Knowledge Organization. Vicari, D., Okada, A., Ragozini, G., Weihs, C. (Eds.) 2014  
Guest Editor of Springer Book: "ADVANCES IN LARGE NETWORK ANALYSIS: METHODS, ALGORITHMS AND APPLICATIONS" LECTURE NOTES IN SOCIAL NETWORKS. G.Giordano, P.Panzarasa, G. Ragozini (Eds) (forthcoming)  
Guest Editor of Special Issue of SOCIAL NETWORK ANALYSIS AND MINING (SNAM) "LARGE NETWORKS AND BIG DATA: NEW CHALLENGES" P.Doreian, L.Waltman, G. Ragozini (Eds) (forthcoming)

#### Administrative Duties

Head of the Master Program in Statistical Science for Decision Making and of the Graduate Program Statistics for Business and Society- University of Naples Federico II.

#### Grants as Principal Investigator.

- Research Project "Multivariate Outlier detection based on a Computational Geometry Approach", Young Researcher Program 2001, Principal Investigator
- Research Project "Permanent regional observatory on youth condition" (D.D. n. 163 del 23/12/2009, Action E of DGR. n. 777/2008) granted by the Youth Policy Bureau of Campania Region. Principal Investigator
- "Regional Observatory on Campania University System", (P.O. FESR 2007-2013 O.O.2.1. "Action for relevant strategic scientific areas". Principal Investigator for University of Naples Federico II

#### Professional Societies

Italian Statistical Society, Classification and Data Analysis Group of the Italian Statistical Society, the International Federation of Classification Societies, International Network for Social Network Analysis, Italian Society for Quality Culture diffusion (AICQ) (in the past)

#### Other offices

Principal Investigator for University of Naples Federico II in the Agreement on the Analysis of Student Mobility with University of Palermo, University of Florence, University of Sassari and Italian Ministry of Education and Research (MIUR), since 2017.

Member of the National Observatory on the Right to Tertiary Education and welfare measure for students appointed by On. V. Fedeli, Italian Minister of Education and Research (2018-2020).

Member of Regional Group for the Youth Policy Planning of Campania Region.

## **2. PORCU Mariano**

Mariano Porcu is full professor in Social Statistics since 2014 at the University of Cagliari. There, from 2006 to 2014, was associate professor, and, from 2002 to 2006, assistant professor. Between 2000 and 2002 he worked as a researcher at the Italian National Institute of Statistics in Rome. In 2000 he gained his PhD in Applied Statistics at the University of Palermo and in 1997 the Postgraduate Diploma in Statistics & Operational research at the Department of Mathematics of the University of Essex (UK).

He teaches "Social Statistics" and "Models and Methods for the Evaluation" at the faculty of Economics, Law and Political Sciences. He also teaches Applied Statistics in University of Cagliari Master programs. In the past he taught Statistics and Economics Statistics.

From 2007 to 2015 he was member of the evaluation committee of the University of Cagliari where he focused his activity for the surveys on students' evaluation of teaching.

In 2013 he has been Visiting Researcher at the University of Kentucky (USA) where he developed a still on going fruitful scientific collaboration with the fellows of the College of Education.

He has been referee for the following journals: Statistical Methods & Applications; Quality & Quantity; Procedia Economics and Finance; Journal of Applied Statistics; Journal of the Royal Statistics Society.

Since 2017 he is in the Editorial Board of the Journal Statistical Methods & Applications.

His research activity is mainly addressed towards studies on the evaluation of the educational systems. Specifically, the main area of his interest is focused on the methods for building up adjusted composite indicators for the evaluations of educational institutions. The main publications in this framework apply and show the potential of latent variable modelling approaches (Latent Class Analysis and Item Response Models) and quantile regression for addressing specific research questions in educational field. In the framework of the surveys addressed to the measurement of teaching quality according to students' perception he worked on methods for missing data treatment based on Multiple Imputation Analysis. Furthermore, the determinants of graduates rates of employability has been analysed by adopting boolean regression models; on this framework other researches have been addressed to the study the determinants of graduates entrance time to the labour market and students' mobility. In the framework of composite indicators, he worked on researches related to the adjusted measures of GDP and of family well-being. He has collaborated in researches concerning the study of factors which affect the duration of marriages in Italy (investigated using quantile regression model for censored data) and the duration of the time interval between subsequent live births (investigated using Segmented Regression Models for discrete data). During the time he was engaged as a researcher at the Department of Economic Statistics of the Italian National Institute of Statistics he has worked on probabilistic models for determining the activity status of enterprises. In the past, some research activities have been also addressed in the health field and led, in collaboration with teams of medical researchers, to the publication of two works applied to urological problems.

Since 2001 he is member of the Italian Statistical Society. He is also in the research staff of CIRDE (Center for Interdisciplinary Research in Education, University of Cagliari). Since 1999 he had numerous talks in conferences and workshops of international and national relevance.

### **3. DELPINI Danilo**

#### **RESEARCH ACTIVITY AND INTERESTS**

Danilo Delpini is Ph.D. in Theoretical Physics and currently an Assistant Professor in Statistics at the Department of Economics and Business in Sassari. Previously, he worked at the Department of Physics in Pavia and at the Institute for Complex Systems (National Research Council) in Rome.

Nowadays, the study of socio-economic phenomena involves the application of models and methodologies developed in different fields. The economy and society are indeed "complex systems" and methods from disciplines like statistical physics, graph theory and network science find broad application as tools to tackle such complexity.

In this spirit, his research activity has been interdisciplinary, and characterized by the application of statistical methodologies and mathematical frameworks to the study of financial and socio-economic systems.

For several years, he's been working on the empirical analysis of financial data, the modelling of price evolution by means of continuous-time stochastic processes and stochastic differential equations, with practical applications in market risk evaluation (for both single assets and portfolios) and pricing of financial derivatives.

In particular, he contributed to the formulation of some classes of stochastic volatility models and to the estimation of their parameters from price time series, exploiting Monte Carlo techniques and Maximum Likelihood/GMM approaches.

In the last few years, his activity has focused on the statistical analysis of real-world complex networks in finance and economics, the study of their evolution with time and the problem of defining effective indicators of systemic risk and "centrality".

The quest for reliable indicators has been strongly called for after the Global Financial Crisis of 2007–2008.

He focused on interbank networks and payment systems and exploited the recent theoretical framework of network controllability to identify institutions that could be more relevant in changing the network state by means of external actions.

Currently he studies bipartite holding networks, especially networks of portfolio holdings, to measure the influence of network topology in the propagation of systemic shocks and the effects of correlation between agents' or institutions' investment strategies and systemic fragility.

Many of the tools currently used in network science are general enough to be applied to the study of other types of networks, such as those emerging from the mobility of people or from flows of material and immaterial resources.

More recently he got interested in the analysis of human mortality and he is currently working on efficient non parametric estimation of mortality hazard functions and detection of secular changes in its shape.

His research activity usually implies dealing with structured datasets and data processing/analysis pipelines.  
He has devoted effort in developing the computational and programming skills that are usually required and beneficial in such kind of workflow.

His research interests cover: Complex Networks, Complex Systems, Statistical Physics, Graph Theory, Econophysics, Socio-Economic Dynamics, Agent Based Models, Computational and Statistical Methods, Numerical Simulations, Distributed Computing, Big Data Analysis, Machine Learning.

## ACADEMIC EXPERIENCE

Department of Economics and Business, Università di Sassari, Italy:

- November 2012 -> today

Professor of Statistical Methods for Economic Decisions

(for the master degree in Economic Sciences) 2012–2015

Professor of Computer Science

(for the degree in Economics and Business Management), since 2013

- Teaching contract: A.Y. 2011/2012

Professor on contract of Statistical Methods for Economic Decisions

the master degree in Economic Sciences)

- Doctorate

Member of the teaching body of the doctoral degree "Dottorato in Scienze Economiche ed Aziendali" of the University of Cagliari in agreement with the Department of Economics and Business of the University of Sassari.

Istituto dei Sistemi Complessi (CNR), Rome, Italy:

- Postdoctoral fellow (November 2011 to November 2012)

Fellowship at ISC Rome Unit at University "La Sapienza"

Topic: forecasting of financial crises from topological analysis of economic networks and their modeling by means of complex networks

Department of Economics and Business, Università di Pavia, Italy:

- Research fellow (November 2010 to November 2011)

Topic: mathematical methods in economics, finance and actuarial sciences

- Teaching assistant (A.Y. 2010/2011)

Teaching seminars of Quantitative Finance (for the master degree in Finance)

- Teaching assistant (A.Y. 2009/2010)

Tutorship of Financial Mathematics (for the degree in Economics)

Teaching seminars and tutorship of Quantitative Finance (for the master degree in Finance)

Department of Physics, Università di Pavia, Italy:

- Teaching assistant (A.Y. 2010/2011)

Teaching seminars of Econophysics (for the master degree in Physics)

IMT Institute for Advanced Studies, Lucca, Italy:

- Visiting Scholar (01/2013–12/2013, 12/2014–11/2016, 12/2016–12/2017, 12/2017–12/2019)

Research Unit: NETWORKS - Unit for the Study of Natural Networks

- Visiting Scholar (22/03/2012 - 31/12/2012)

Research Unit: AXES - Laboratory for the Analysis of Complex Economic Systems

Istituto Universitario di Studi Superiori IUSS, Center for Risk and Security Studies, Pavia, Italy:

- Research Fellow (November 2010 to January 2011)

Topic: multiplicative noise processes, applications to Physics and Finance

## PARTICIPATION IN RESEARCH PROJECTS

- Team Member: METHODOLOGIES AND DATA MINING TECHNIQUES FOR THE ANALYSIS OF BIG DATA BASED ON LONGITUDINAL POPULATION AND EPIDEMIOLOGICAL REGISTERS - LONGPOP (Horizon2020 – MSC – ITN –ETN 2015)
- Postdoctoral research fellowship: FORECASTING FINANCIAL CRISES – FOC (FET OPEN grant n. 255987)

## PROFESSIONAL EXPERIENCE

Banca Leonardo S.p.A., Milan, Italy

- Stage (May 2010 to June 2010)

Study and implementation of models with stochastic volatility for interest rate products at the Financial Engineering desk

## EDUCATION

Università di Pavia "Alma Mater Studiorum", Pavia, Italia

- Ph.D. in Physics, February 3, 2011

Curriculum in Theoretical Physics (with Ph.D. grant)

Thesis topic: Modeling and Analysis of Financial Time Series beyond Geometric Brownian Motion

Supervisor: Professor O. Nicosini

Area of study: econophysics, stochastic processes, time series analysis, statistical and computational methods, risk management, derivative pricing

- M.Sc. in Physics, summa cum laude, April 27, 2007

Curriculum in Theoretical Physics (emphasis on Quantum Field Theory and Statistical Mechanics)

Thesis topic: The Research of the Higgs Boson at Future Colliders

Adviser: Professor O. Nicosini

Area of Study: high energy phenomenology and quantum field theory

- B.Sc. in Physics, summa cum laude, December 17, 2004

Thesis topic: Lorentz and Poincaré Symmetries

Adviser: Professor A. Marzuoli

Area of Study: group theory and space-time symmetries

## REFEREE FOR INTERNATIONAL JOURNALS

Fluctuation and Noise Letters, Journal of Statistical Mechanics: Theory and Experiment,

Journal of Complex Networks, Scientific Reports,

The European Physical Journal B, Applied Network Science, Europhysics Letters

## AWARDS



National Academic Qualification as Associate Professor (Abilitazione Scientifica Nazionale Professore II Fascia) 2015.

Disciplinary sector: Mathematical Methods for Economics and Financial and Actuarial Sciences (SECS-S/06)

Research activity award "Premialità Ricerca vQr-DiSea 2013" from the Department of Economics and Business, University of Sassari.

#### CONFERENCE AND SEMINAR TALKS

Evolution of Controllability in Interbank Networks, contributed talk at NetONets 2103: Systemic Risk and Infrastructural Interdependencies, Copenhagen - June 3-4, 2013

Evolution of Controllability in Interbank Networks, seminar talk at DEIR, University of Sassari, May 30, 2013.

"From Physics to Finance", seminar talk at the Department of Economics and Business, University of Sassari, February 13, 2013.

Controllability in the Italian interbank market, contributed talk at NetSci 2012 - International Conference on Network Science, Evanston - USA, June 18-22, 2012

Controllability of credit networks: a case study. ECB Eurotower, Kaiserstrasse 29, Frankfurt am Main, Hesse (Germany), February 23, 2012.

Minimal model of financial stylized facts, contributed talk at Sigma-Phi 2011, International Conference on Statistical Physics, Larnaca - Cyprus, July 11-15, 2011

Multiplicative noise processes in financial markets, contributed talk at XII Workshop on Quantitative Finance, Padova, January 27-28, 2011

Multiplicative noise processes in financial markets, seminar talk at Ecole Centrale, Laboratory of Applied Mathematics, Paris, December 3, 2010

Multiplicative diffusion processes: from Physics to Finance, seminar talk at the Department of Economics and Quantitative Methods, University of Pavia, April 28, 2010

Ornstein-Uhlenbeck stochastic volatility models and option pricing, contributed talk at Econophysics Colloquium 2009, Erice - Sicily, October 25-31, 2009

Estimating Value-at-Risk with Product Partition Models, contributed talk at S.Co. 2009 - Complex Data Modeling and Computationally Intensive Statistical Methods for Estimation and Prediction, Milan

Option Pricing under Ornstein-Uhlenbeck Stochastic Volatility Models, talk at Bayesian Analysis and Econophysics for Financial Markets, workshop at Athens University of Economics and Business, June 2-4, 2009

## TECHNICAL SKILLS

Programming: Julia, Python, C/C++, Fortran, Perl (basics), Bash scripting

Applications: LaTeX/BibTeX, MS Office, LibreOffice

Operating systems: FreeBSD, Linux, MS Windows, MacOS

## LANGUAGE SKILLS

Fluent written and spoken English

## 5. Principal scientific publications of associated investigators

### 1. RAGOZINI Giancarlo

1. RAGOZINI, GIANCARLO, PALUMBO, FRANCESCO, D'Esposito M. R. (2017). Archetypal analysis for data-driven prototype identification. STATISTICAL ANALYSIS AND DATA MINING, ISSN: 1932-1864, doi: 10.1002/sam.11325 - **Articolo in rivista**
2. SERINO, MARCO, D'AMBROSIO, DANIELA, RAGOZINI, GIANCARLO (2017). Bridging social network analysis and field theory through multidimensional data analysis: The case of the theatrical field. POETICS, vol. 62, p. 66-80, ISSN: 0304-422X, doi: 10.1016/j.poetic.2016.12.002 - **Articolo in rivista**
3. SICA, LUIGIA SIMONA, Luyckx, Koen, Goossens, Luc, RAGOZINI, GIANCARLO, SESTITO, LAURA (2017). Identity Statuses and Event-Focused Narratives at University Starting Point in Italy. JOURNAL OF ADULT DEVELOPMENT, p. 1-20, ISSN: 1068-0667, doi: 10.1007/s10804-016-9249-2 - **Articolo in rivista**
4. Sica, Luigia S., Ragozini, Giancarlo, Di Palma, Tiziana, Aleni Sestito, Laura (2017). Creativity as Identity Skill? Late Adolescents' Management of Identity, Complexity and Risk-Taking. THE JOURNAL OF CREATIVE BEHAVIOR, ISSN: 0022-0175, doi: 10.1002/jocb.221 - **Articolo in rivista**
5. LUMINO, ROSARIA, RAGOZINI, GIANCARLO, van Duijn, M., Vitale, M. P. (2016). A mixed-methods approach for analysing social support and social anchorage of single mothers' personal networks. QUALITY & QUANTITY, ISSN: 0033-5177, doi: 10.1007/s11135-016-0439-6 - **Articolo in rivista**
6. Kirschstein T., Liebscher S., Porzio G. C., RAGOZINI, GIANCARLO (2015). Minimum volume peeling: A robust nonparametric estimator of the multivariate mode. COMPUTATIONAL STATISTICS & DATA ANALYSIS, vol. 93, p. 456-468, ISSN: 0167-9473, doi: 10.1016/j.csda.2015.04.012 - **Articolo in rivista**
7. RAGOZINI, GIANCARLO, De Stefano D., D'Esposito M. R. (2015). Multiple factor analysis for time-varying two-mode networks. NETWORK SCIENCE, vol. 3, p. 18-36, ISSN: 2050-1242, doi: 10.1017/nws.2015.5 - **Articolo in rivista**
8. SESTITO, LAURA, SICA, LUIGIA SIMONA, RAGOZINI, GIANCARLO, Porfeli E., Weisblat G., DI PALMA, TIZIANA (2015). Vocational and overall identity: A person-centered approach in Italian university students. JOURNAL OF VOCATIONAL BEHAVIOR, vol. 91, p. 157-169, ISSN: 0001-8791, doi: 10.1016/j.jvb.2015.10.001 - **Articolo in rivista**
9. SICA, LUIGIA SIMONA, Crocetti E., RAGOZINI, GIANCARLO, SESTITO, LAURA, Serafini T. (2015). Future-oriented or present-focused? The role of social support and identity styles on 'futuring' in Italian late adolescents and emerging adults. JOURNAL OF YOUTH STUDIES, p. 1-21, ISSN: 1367-6261, doi: 10.1080/13676261.2015.1059925 - **Articolo in rivista**
10. D'Esposito M. R., De Stefano D., RAGOZINI, GIANCARLO (2014). On the use of Multiple Correspondence Analysis to visually explore affiliation networks. SOCIAL NETWORKS, vol. 38, p. 28-40, ISSN: 0378-8733, doi: 10.1016/j.socnet.2014.01.003 - **Articolo in rivista**
11. SICA, LUIGIA SIMONA, SESTITO, LAURA, RAGOZINI, GIANCARLO (2014). Identity Coping in the First Years of University: Identity Diffusion, Adjustment and Identity Distress. JOURNAL OF ADULT DEVELOPMENT, vol. 21, p. 159-172, ISSN: 1068-0667, doi: 10.1007/s10804-014-9188-8 - **Articolo in rivista**
12. D'Esposito M. R., PALUMBO, FRANCESCO, RAGOZINI, GIANCARLO (2012). Interval Archetypes: a new tool for interval data analysis. STATISTICAL ANALYSIS AND DATA MINING, p. 322-335, ISSN: 1932-1864, doi: 10.1002/sam.11140 - **Articolo in rivista**
13. Sestito L., Sica L.S., Ragozini G. (2011). I primi anni dell'Università: Processi di definizione dell'identità tra confusione e consolidamento. ETA' EVOLUTIVA, vol. 99, p. 20-33, ISSN: 0392-0658 - **Articolo in rivista**
14. Porzio G. C., RAGOZINI, GIANCARLO, Vistocco D. (2008). On the use of archetypes as benchmarks. APPLIED STOCHASTIC MODELS IN BUSINESS AND INDUSTRY, vol. 24, p.

- 419-437, ISSN: 1524-1904, doi: 10.1002/asmb.727 - **Articolo in rivista**
15. Giuseppe, Giordano, RAGOZINI, GIANCARLO, VITALE, MARIA PROSPERINA (2017). On the use of DISTATIS to handle multiplex networks. In: (a cura di): A. Petrucci R. Verde, SIS 2017 Statistics and Data Science: new challenges, new generations. p. 499-504, FIRENZE:Firenze University Press, ISBN: 978-88-6453-521-0 - **Contributo in volume (Capitolo o Saggio)**
  16. Felaco C., Ragozini G. (2016). La forza delle lauree deboli: una riflessione sull'occupabilità per genere e territorio. In: (a cura di): G. Ragozini, Laurearsi vale. Le prospettive occupazionali dei laureati campani. p. 102-114, Milano:Franco Angeli, ISBN: 9788891742308 - **Contributo in volume (Capitolo o Saggio)**
  17. Madonia E., Ragozini G. (2016). La transizione degli studenti scuola/università e il quadro degli iscritti. In: (a cura di): G. Ragozini, Regolari o dispersi, migranti o internazionali. I percorsi di carriera degli studenti universitari campani. p. 11-24, Milano:Franco Angeli, ISBN: 9788891742292 - **Contributo in volume (Capitolo o Saggio)**
  18. Ragozini G., Sclorato C., Santelli F. (2016). Le determinanti della mobilità degli studenti universitari campani. In: (a cura di): Buono P. Gallo M. Ragozini G. Reverchon E. Rostirolla P., Il sistema universitario campano tra miti e realtà. Aspetti metodologici, analisi e risultati. p. 230-241, Milano:Franco Angeli, ISBN: 9788891742308 - **Contributo in volume (Capitolo o Saggio)**
  19. Breznik K., RAGOZINI, GIANCARLO (2015). Exploring the Italian Erasmus Agreements by a Network Analysis Perspective. In: ASONAM '15 Proceedings of the 2015 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining 2015. p. 837-838, ACM Digital Library, ISBN: 9781450338547, doi: 10.1145/2808797.2808864 - **Contributo in volume (Capitolo o Saggio)**
  20. Lumino R., Bisceglia A., Ragozini G. (2014). Il nuovo corso delle politiche giovanili in Campania. L'esperienza dei Piani Territoriali Giovanili. Milano:Editore Franco Angeli, ISBN: 9788820420413 - **Monografia o trattato scientifico**

## 2. PORCU Mariano

1. Francesca Giambona, Mariano Porcu (2018). School size and students' achievement. Empirical evidences from PISA survey data. SOCIO-ECONOMIC PLANNING SCIENCES, vol. 64, ISSN: 0038-0121, doi: 10.1016/j.seps.2017.12.007 - **Articolo in rivista**
2. SULIS, ISABELLA, PORCU, MARIANO (2017). Handling missing data in item response theory. Assessing the accuracy of a multiple imputation procedure based on latent class analysis. JOURNAL OF CLASSIFICATION, vol. 34, p. 327-359, ISSN: 0176-4268, doi: 10.1007/s00357-017-9220-3 - **Articolo in rivista**
3. Toland M D, Sulis I, Giambona F, Porcu M, Campbell J. M. Michael (2017). Introduction to bifactor polytomous item response theory analysis. JOURNAL OF SCHOOL PSYCHOLOGY, vol. 60, p. 41-63, ISSN: 0022-4405, doi: 10.1016/j.jsp.2016.11.001 - **Articolo in rivista**
4. Giambona F, Pitzalis M, Porcu M, Sulis I (2016). Measuring Digital Teaching Innovation Using Item Response Theory Models. ITALIAN JOURNAL OF SOCIOLOGY OF EDUCATION, vol. 8, p. 68-109, ISSN: 2035-4983, doi: 10.14658/pupj-ijse-2016-2-5 - **Articolo in rivista**
5. Giambona F, Porcu M, Sulis I. (2016). Students mobility: assessing the determinants of attractiveness across competing territorial areas.. SOCIAL INDICATORS RESEARCH, ISSN: 0303-8300, doi: 10.1007/s11205-016-1407-1 - **Articolo in rivista**
6. PIZALIS, M, PORCU, M. (2016). Cultural Capital and educational strategies. Shaping boundaries between groups of students with homologous cultural behaviours. BRITISH JOURNAL OF SOCIOLOGY OF EDUCATION, vol. 38, p. 956-974, ISSN: 1465-3346, doi: 10.1080/01425692.2016.1205968 - **Articolo in rivista**
7. Porcu Mariano, Giambona Francesca (2016). Introduction to Latent Class Analysis With Applications. THE JOURNAL OF EARLY ADOLESCENCE, p. 129-158, ISSN: 0272-4316, doi: 10.1177/0272431616648452 - **Articolo in rivista**
8. Giambona F., Porcu M. (2015). Student background determinants of reading achievement in Italy. A quantile regression analysis. INTERNATIONAL JOURNAL OF EDUCATIONAL DEVELOPMENT, vol. 44, p. 95-107, ISSN: 0738-0593, doi: 10.1016/j.ijedudev.2015.07.005 - **Articolo in rivista**
9. Pitzalis M, Porcu M (2015). Passaggio a Nord. Come si ristruttura il campo universitario italiano?. SCUOLA DEMOCRATICA, p. 711-722, ISSN: 1129-731X, doi: 10.12828/82088 - **Articolo in rivista**
10. Sulis I, Porcu M (2015). Assessing divergences in mathematics and reading achievement in Italian Primary Schools: a proposal of adjusted indicators of School effectiveness. SOCIAL INDICATORS RESEARCH, vol. 122, p. 607-634, ISSN: 0303-8300, doi: 10.1007/s11205-014-0701-z - **Articolo in rivista**
11. GIAMBONA F, PORCU M, SULIS I (2014). Does Education affect individual well-being? Some Italian Empirical evidences. OPEN JOURNAL OF STATISTICS, p. 319-329, ISSN: 2161-718X, doi: 10.4236/ojs.2014.45032 - **Articolo in rivista**
12. Sulis I., Porcu M. (2012). Comparing degree programs from students' assessments: A LCRA-based adjusted composite indicator. STATISTICAL METHODS & APPLICATIONS, vol. 21, p. 193-209, ISSN: 1618-2510, doi: 10.1007/s10260-011-0185-9 - **Articolo in rivista**
13. PORCU M, MUGGEO V.R.M, ATTANASIO M (2009). A segmented regression model for event history data: an application to the fertility patterns in Italy. JOURNAL OF APPLIED STATISTICS, vol. 36, p. 973-988, ISSN: 0266-4763, doi: 10.1080/02664760802552994 - **Articolo in rivista**
14. PORCU, MARIANO, SULIS, ISABELLA (2013). The credit accumulation process to assess the performances of degree programs: An adjusted indicator based on the result of entrance tests. In: Paolo Giudici Salvatore Ingrassia Maurizio Vichi. (a cura di): Paolo Giudici Salvatore Ingrassia Maurizio Vichi, Statistical Models for Data Analysis. p. 279-287, Cham:Springer International Publishing, ISBN: 9783319000312, doi: 10.1007/978-3-319-00032-9 - **Contributo in volume (Capitolo o Saggio)**
15. SULIS I, PORCU M (2011). Assessing the Quality of the Management of Degree Programs by Latent Class Analysis. In: SULIS I;PORCU M. (a cura di): ATTANASIO M;CAPURSI V, Statistical Methods for the Evaluation of University Systems. p. 161-172, BERLIN HEIDELBERG:Springer-Verlag, ISBN: 9783790823745, doi: 10.1007/978-3-7908-2375-2\_11 - **Contributo in volume (Capitolo o Saggio)**
16. SULIS, ISABELLA, PORCU, MARIANO, PIZALIS, MARCO (2011). Scaling the Latent Variable Cultural Capital Via Item Response Models and Latent Class Analysis. In: Fichet Bernard et al. (a cura di): Fichet Bernard et al., Classification and Multivariate Analysis for Complex Data Structures. p. 271-279, HEIDELBERG:SPRINGER, ISBN: 978-3-642-13311-4, doi: 10.1007/978-3-642-13312-1\_28 - **Contributo in volume (Capitolo o Saggio)**
17. Sulis I, Porcu M, Tedesco N (2011). Evaluating lecturer's capability over time. Some evidence from surveys on university course quality. In: INGRASSIA S. ROCCI R. VICHI M.. (a cura di): INGRASSIA S. ROCCI R. VICHI M., New Perspectives in Statistical Modeling and Data Analysis. vol. XXII, p. 13-20, BERLIN HEIDELBERG:Springer-Verlag, ISBN: 9783642113628, doi: 10.1007/978-3-642-11363-5\_2 - **Contributo in volume (Capitolo o Saggio)**
18. Pitzalis M, Porcu M, De Feo A, Giambona F (2016). Innovare a scuola. Insegnanti, studenti e tecnologie digitali. p. 7-194, BOLOGNA:Il Mulino, ISBN: 978-88-15-26412-1 - **Monografia o**

## trattato scientifico

## 3. DELPINI Danilo

1. Delpini D, Bormetti G (2015). Stochastic volatility with heterogeneous time scales. QUANTITATIVE FINANCE, vol. 15, p. 1597-1608, ISSN: 1469-7688, doi: 10.1080/14697688.2015.1024159 - **Articolo in rivista**
2. Delpini D, Battiston S, Riccaboni M, Gabbi G, Pammolli F, Caldarelli G (2013). Evolution of Controllability in Interbank Networks. SCIENTIFIC REPORTS, vol. 3, 1626, ISSN: 2045-2322, doi: 10.1038/srep01626 - **Articolo in rivista**
3. Galbiati M, Delpini D, Battiston S (2013). The power to control. NATURE PHYSICS, vol. 9, p. 126-128, ISSN: 1745-2473, doi: 10.1038/nphys2581 - **Articolo in rivista**
4. BORMETTI GIACOMO, DE GIULI MARIA ELENA, DELPINI D, TARANTOLA CLAUDIA (2012). Bayesian Value-at-Risk with product partition models. QUANTITATIVE FINANCE, vol. 12, p. 769-780, ISSN: 1469-7688, doi: 10.1080/14697680903512786 - **Articolo in rivista**
5. DELPINI D, BORMETTI GIACOMO (2011). Minimal model of financial stylized facts. PHYSICAL REVIEW E, STATISTICAL, NONLINEAR, AND SOFT MATTER PHYSICS, vol. 83, p. 041111-1-041111-9, ISSN: 1539-3755, doi: 10.1103/PhysRevE.83.041111 - **Articolo in rivista**
6. BORMETTI GIACOMO, CAZZOLA VALENTINA, DELPINI D, MONTAGNA GUIDO, NICROSINI ORESTE (2010). The low volatility fluctuations regime of the exponential Ornstein-Uhlenbeck model. JOURNAL OF PHYSICS. CONFERENCE SERIES, vol. 221, p. 012014-1-012014-10, ISSN: 1742-6588, doi: 10.1088/1742-6596/221/1/012014 - **Articolo in rivista**
7. Bormetti G, Cazzola V, Delpini D (2010). Option pricing under Ornstein-Uhlenbeck stochastic volatility: a linear model. INTERNATIONAL JOURNAL OF THEORETICAL AND APPLIED FINANCE, vol. 13, p. 1047-1063, ISSN: 0219-0249, doi: 10.1142/S0219024910006108 - **Articolo in rivista**
8. Bormetti G, Cazzola V, Delpini D, Livan G (2010). Accounting for risk of non linear portfolios: a novel Fourier approach. THE EUROPEAN PHYSICAL JOURNAL. B, CONDENSED MATTER PHYSICS, vol. 76, p. 157-165, ISSN: 1434-6028, doi: 10.1140/epjb/e2010-00199-9 - **Articolo in rivista**
9. Bormetti G, Delpini D (2010). Exact moment scaling from multiplicative noise. PHYSICAL REVIEW E, STATISTICAL, NONLINEAR, AND SOFT MATTER PHYSICS, vol. 81, p. 032102-1-032102-4, ISSN: 1539-3755, doi: 10.1103/PhysRevE.81.032102 - **Articolo in rivista**
10. Delpini D (2010). Modeling and analysis of financial time series beyond geometric Brownian motion. SCIENTIFICA ACTA, vol. 4, p. 15-22, ISSN: 1973-5219 - **Articolo in rivista**
11. Delpini D, Bormetti G, De Giuli M E, Tarantola C (2009). Bayesian Analysis of Value-at-Risk with Product Partition Models. In: Proceedings of S.Co. 2009 - Complex Data Modeling and Computationally Intensive Statistical Methods for Estimation and Prediction. p. 151-156, Sentarcangelo di Romagna:Maggioli Editore, ISBN: 9788838743856, Politecnico di Milano, Milano, 14-16 Settembre 2009 - **Contributo in Atti di convegno**
12. Delpini D (2010). Modeling and Analysis of Financial Time Series beyond Geometric Brownian Motion. PAVIA:Università di Pavia, ISBN: 978-88-95767-40-6 - **Monografia o trattato scientifico**

## 6. Hindex of associated investigators (only for the scientific fields in which the use of the H-index is usually adopted)

| n° | Surname Name       | H-Index | Source         |
|----|--------------------|---------|----------------|
| 1. | RAGOZINI Giancarlo | 5       | Scopus         |
| 2. | DELPINI Danilo     | 4       | Scopus         |
| 3. | PORCU Mariano      | 8       | Google Scholar |

## 7. Main staff involved (max 10 professors/researchers for each research unit, in addition to the PI or associated investigator), highlighting the time commitment expected

## List of the Research Units

## Unit 1 - ATTANASIO Massimo

## Personnel of the research unit

| n° | Surname Name                | Category  | University/ Research Institution  | e-mail address             | Months/person expected |
|----|-----------------------------|---|-----------------------------------|----------------------------|------------------------|
| 1. | ATTANASIO Massimo           | Professore Ordinario                                    | Università degli Studi di PALERMO | massimo.attanasio@unipa.it | 6,0                    |
| 2. | BOSCAINO Giovanni           | Ricercatore confermato                                  | Università degli Studi di PALERMO | giovanni.boscaino@unipa.it | 1,0                    |
| 3. | PLAIA Antonella             | Professore Associato confermato                         | Università degli Studi di PALERMO | antonella.plaia@unipa.it   | 1,0                    |
| 4. | ENEA Marco                  | Ricercatore a t.d. - t.defin. (art. 24 c.3-a L. 240/10) | Università degli Studi di PALERMO | emarco76@libero.it         | 10,0                   |
| 5. | GIAMBALVO Ornella           | Professore Ordinario (L. 240/10)                        | Università degli Studi di PALERMO | ornella.giambalvo@unipa.it | 1,0                    |
| 6. | MUGGEO Vito Michele Rosario | Professore Associato (L. 240/10)                        | Università degli Studi di PALERMO | vito.muggeo@unipa.it       | 1,0                    |

## Unit 2 - RAGOZINI Giancarlo

## Personnel of the research unit

| n° | Surname Name            | Category                         | University/ Research Institution             | e-mail address                 | Months/person expected |
|----|-------------------------|----------------------------------|--|--------------------------------|------------------------|
| 1. | RAGOZINI Giancarlo      | Professore Associato confermato  | Università degli Studi di Napoli Federico II | giragoz@unina.it               | 4,0                    |
| 2. | STROFFOLINI Francesca   | Professore Ordinario             | Università degli Studi di Napoli Federico II | francesca.stroffolini@unina.it | 2,0                    |
| 3. | AIELLO Fabio            | Professore Associato (L. 240/10) | UKE - Università Kore di ENNA                | fabio.aiello@unikore.it        | 0,5                    |
| 4. | VITALE Maria Prosperina | Professore Associato (L. 240/10) | Università degli Studi di SALERNO            | mvitale@unisa.it               | 0,5                    |
| 5. | GIORDANO Giuseppe       | Professore Associato confermato  | Università degli Studi di SALERNO            | ggiordan@unisa.it              | 0,5                    |

## Unit 3 - PORCU Mariano

## Personnel of the research unit

| n° | Surname Name   | Category                                     | University/ Research Institution   | e-mail address          | Months/person expected |
|----|----------------|--|------------------------------------|-------------------------|------------------------|
| 1. | PORCU Mariano  | Professore Ordinario (L. 240/10)             | Università degli Studi di CAGLIARI | mrporcu@unica.it        | 2,0                    |
| 2. | SULIS Isabella | Ricercatore confermato                       | Università degli Studi di CAGLIARI | isulis@unica.it         | 1,0                    |
| 3. | SALARIS Luisa  | Ricercatore a t.d. (art. 24 c.3-b L. 240/10) | Università degli Studi di CAGLIARI | salaris.luisa@gmail.com | 6,0                    |

#### Unit 4 - DELPINI Danilo

##### Personnel of the research unit

| n° | Surname Name     | Category               | University/ Research Institution  | e-mail address    | Months/person expected |
|----|------------------|------------------------|-----------------------------------|-------------------|------------------------|
| 1. | DELPINI Danilo   | Ricercatore confermato | Università degli Studi di SASSARI | ddelpini@uniss.it | 4,0                    |
| 2. | BRESCHI Marco    | Professore Ordinario   | Università degli Studi di SASSARI | breschi@uniss.it  | 2,0                    |
| 3. | MARINO' Ludovico | Professore Ordinario   | Università degli Studi di SASSARI | lmarino@uniss.it  | 2,0                    |
| 4. | ROTONDO Federico | Ricercatore confermato | Università degli Studi di SASSARI | frotondo@uniss.it | 2,0                    |
| 5. | GIOVANELLI Lucia | Professore Ordinario   | Università degli Studi di SASSARI | giovanel@uniss.it | 3,0                    |

#### 8. Major new contracts for staff specifically to recruit

| n° | Associated or principal investigator | Number of contracts RTD expected | Number of research grants expected | Number of PhD expected | Predictable overall time commitment (months) |
|----|--------------------------------------|----------------------------------|------------------------------------|------------------------|--|
| 1. | ATTANASIO Massimo                    | 1                                | 0                                  | 0                      | 20   |
| 2. | RAGOZINI Giancarlo                   | 0                                | 2                                  | 0                      | 20   |
| 3. | PORCU Mariano                        | 1                                | 0                                  | 0                      | 26   |
| 4. | DELPINI Danilo                       | 0                                | 1                                  | 0                      | 20   |
|    | <b>Total</b>                         | <b>2</b>                         | <b>3</b>                           | <b>0</b>               | <b>86</b>                                    |

## 9. Statement by the Principal Investigator

Con la sottomissione della presente proposta, consapevole della responsabilità civile e penale, attesto l'assenza di duplicazione degli obiettivi e dei contributi richiesti con altri progetti in corso o già conclusi

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"I dati contenuti nella domanda di finanziamento sono trattati esclusivamente per lo svolgimento delle funzioni istituzionali del MIUR. Incaricato del trattamento è il CINECA - Business Unit MIUR. La consultazione è altresì riservata agli atenei e agli enti di ricerca (ciascuno per le parti di propria competenza), al MIUR - D.G. per il Coordinamento e lo Sviluppo della Ricerca - Ufficio V, al CNR e ai CdS. Il MIUR potrà anche procedere alla diffusione dei principali dati economici e scientifici relativi ai progetti finanziati".

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Date 29/03/2018 ore 11:28

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