Abstract

This study presents a comparative analysis of telematic universities and traditional universities in Italy, with a particular focus on structural differences in terms of faculty composition, academic mobility, and scientific productivity. The research is motivated by the rapid proliferation of telematic universities within a higher education system characterized by strong institutional regulation and the formal equivalence of academic degrees.

The empirical analysis is based on the integration of various data sources, including administrative data from the MUR's CercaUniversità portal, aggregate statistics from the USTAT system, and bibliometric indicators extracted from Scopus. A longitudinal dataset covering the period 2000–2024 was constructed, allowing for an examination of the evolution of faculty characteristics and mobility flows over time.

The results highlight significant differences between the two institutional models. Telematic universities are characterized by a more flexible organizational structure, based on a smaller core of tenured faculty, higher student-to-faculty ratios, and greater reliance on contract staff. Academic mobility between telematic and traditional universities exists but is limited, indicating partial permeability between the two systems. Regarding scientific productivity, faculty members affiliated with traditional universities show, on average, higher levels of output, though with the necessary caveats regarding disciplinary differences and career paths.

Overall, the results suggest that telematic universities and traditional universities operate according to different organizational logics, reflecting distinct approaches to balancing accessibility, flexibility, and academic structure within the Italian university system.

List of acronyms

ANVUR – National Agency for the Evaluation of the University System and Research

CINECA – Interuniversity Consortium for Automatic Computing

CRUI – Conference of Italian University Rectors

MIUR – Ministry of Education, University and Research

MUR – Ministry of University and Research

SJR – SCImago Journal Rank

STEM – Science, Technology, Engineering and Mathematics

USTAT – Higher Education Data Portal of the Ministry of University and Research

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Comparative analysis of faculty and scientific productivity between telematic universities and traditional universities in Italy

In recent decades, higher education systems have undergone profound transformations driven by technological, economic, and institutional factors. Among these, the development of digital technologies has had a particularly significant impact, contributing to the spread of new methods of delivering educational programs and the gradual emergence of alternative university models alongside the traditional one. In this context, telematic universities represent a significant and growing phenomenon, as institutions capable of offering entirely distance-learning programs characterized by a high degree of organizational flexibility.

Internationally, a growing body of literature has examined the implications of distance and online higher education for the organization and functioning of universities. Several studies have suggested that the expansion of these forms of education has been associated with the development of alternative approaches to teaching and institutional organization, often characterized by greater flexibility compared to traditional models (Tait, 2018 [23]; Means et al., 2014 [24]). These contributions emphasize that the spread of online education represents not merely a technological innovation, but a broader transformation of higher education systems.

More generally, the literature has highlighted how universities may differ in terms of student composition, organizational structure, and strategic orientation, suggesting that different institutional models can coexist within higher education systems. At the same time, it has been emphasized that the impact and role of these models may vary significantly depending on the national context, in relation to regulatory frameworks, labour market characteristics, and the institutional value attributed to academic degrees (Agasisti & Johnes, 2009 [25]). In this sense, a comparative analysis of traditional and telematic universities cannot ignore the institutional specificities of the context in which these models develop. However, existing studies rarely provide a joint analysis of faculty composition, academic mobility, and scientific productivity within a single national system, particularly in a context such as Italy.

In this regard, the Italian case presents particularly significant characteristics that warrant a dedicated analysis. Telematic universities were introduced relatively recently and operate within a highly regulated and centralized system, in which the degrees awarded have uniform legal standing regardless of the type of institution. This element constitutes a key distinction from other international contexts, where telematic institutions may be subject to varying levels of recognition and legitimacy. Furthermore, the coexistence of

different organizational models within the same regulatory framework makes the Italian university system a particularly interesting context for the comparative study of institutional dynamics.

In light of these considerations, this study aims to systematically analyse the differences between telematic universities and traditional universities in Italy, adopting a comparative approach based on empirical evidence. In particular, the objective is to examine three fundamental dimensions: the composition of the faculty, academic mobility flows, and scientific productivity. Taken together, these dimensions provide a comprehensive understanding of the structural characteristics and evolutionary dynamics of the two university models.

The first area of analysis concerns the structure of the faculty, with particular attention to its distribution by role, age, and type of contract. This dimension is crucial for understanding recruitment patterns and institutional consolidation processes, as well as for identifying any differences in the organizational structures adopted. The second area concerns academic mobility, analysed by reconstructing the patterns of faculty transitions between telematic and traditional universities over time. This analysis allows for the observation of the permeability between the two systems and for assessing whether dynamics of attraction or selection exist between the different types of universities. Finally, the third area concerns scientific productivity, examined using bibliometric indicators, with the aim of comparing the capacity for research production and dissemination across the two institutional models.

From a methodological standpoint, this study is based on the integration of various data sources. Data on academic staff and their evolution over time were obtained from the CercaUniversità portal [20] of the Ministry of University and Research (MUR) [8], which allows for a longitudinal analysis of faculty presence across different universities. This information was supplemented with aggregated data from the ANVUR portal [5], used to analyse the demographic distribution of staff. Finally, with regard to scientific productivity, data were drawn from the Scopus database [21], which allows for the association of internationally standardized bibliometric indicators with each faculty member.

The integration of these sources required a process of constructing and harmonizing the dataset, aimed at ensuring internal consistency and cross-source comparability. In particular, a longitudinal approach was adopted, allowing for the observation of the evolution of the Italian university system between 2000 and 2024, thereby capturing both long-term dynamics and more recent transformations. This temporal perspective is particularly relevant in the case of telematic universities, whose proliferation has intensified since the mid-2000s.

This study thus lies at the intersection of descriptive and comparative analysis, with the aim of providing empirical evidence to support the understanding of the characteristics and role of telematic universities within the Italian higher education system. Without advancing value judgments about the different types of

institutions, this study aims to offer interpretive tools for analysing how different organizational models may affect the composition of the faculty, mobility dynamics, and scholarly output.

In this sense, the analysis aims to contribute to the debate on the future of higher education, highlighting how the emergence of new university models represents not merely a quantitative expansion, but a qualitative transformation in the ways in which knowledge is produced, transmitted, and institutionalized.

1. Evolution and transformations of the Italian university system: the emerging role of telematic universities

Telematic universities, also known as online universities, are higher education institutions that offer academic courses and programmes at a distance, using digital technologies. In Italy, they are recognised by the Ministry of Universities and Research (MUR) and award academic degrees with legal value meaning that

the degrees awarded by these universities are officially recognised by the state, just like those of traditional universities.

1.1 Normative analysis

The development of online universities in Italy began in the early 2000s, following the regulatory framework introduced by the Ministerial Decree of 17 April 2003, which defined the criteria and procedures for the accreditation of distance-learning universities, establishing the criteria for recognising these institutions and setting the parameters for the quality of teaching and infrastructure. Thus, the first officially recognised telematic universities were born, reaching a total of 11 institutions by 2006 *[Table1.1]*.

Table 1.1- list of telematic universities

UNIVERSITY	LOCATION	FOUNDATION YEAR
PEGASO	Napoli	2006
E-CAMPUS	Como	2006
LEONARDO DA VINCI	Torre Vecchia	2004
GIUSTINO FORTUNATO	Benevento	2006
GUGLIELMO MARCONI	Bologna	2004
SAN RAFFAELE	Roma	2006
UNI-NETTUNO	Roma	2005
IUL	Firenze	2005
NICCOLÒ CUSANO	Roma	2006
MERCATORUM	Roma	2006
UNITELMA SAPIENZA	Roma	2004

This number, however, remained unchanged until now, due to the freeze on the accreditation of new telematic universities introduced during the second Prodi government in 2006**.**

The freeze upon telematic universities in Italy during the second Prodi government (2006-2008) suspended the authorisation of new telematic universities through a series of measures. Fabio Mussi headed the Ministry of Universities and Research during 2007 and during that period a moratorium was introduced that put a freeze on authorisations for new telematic universities. The aim was higher quality standards and also to prevent uncontrolled proliferation. Certain telematic universities were offering courses with no adequate didactic requirements as it was feared in effect and that the phenomenon was degenerating to become a “market for degrees”.

These concerns mainly related to the quality of the courses offered, the adequacy of teaching support, tutoring activities, and examination procedures.

The freeze remained in place until sometime after 2008. Successive governments then introduced more stringent rules for evaluating telematic universities, largely through ANVUR's accreditation process. Thus, stricter criteria concerning teaching organisation, technological facilities, as well as course quality requirements, were established.

The Ministerial Decree of 17 April 2003 introduced the criteria and requirements for telematic universities. Among the main provisions, we find the introduction of a service charter in which each telematic university makes explicit the teaching methods, curricula and services offered. Among these directives, we also find the method of recruiting teaching and research staff, which must follow the procedures laid down in Law No. 210 of 3 July 1998[2].

While these institutions offered greater flexibility and inclusiveness, allowing remote workers and students to access university education, they were also criticised for having less teacher-student interaction and for the way in which learning was tested.

It was not until the 2010 Gelmini reform, therefore, that ANVUR assumed a central role in monitoring the quality of telematic universities. In 2013, however, despite the reform, ANVUR and the CRUI (Conference of Italian University Rectors) expressed concerns about the quality of the teaching provided and the need for greater control, prompting MUR to strengthen the checks [13].

A new accreditation system established by the MUR, in cooperation with ANVUR, was introduced in 2016 (Directive No 170 of 21 March 2016[3]). This system made it compulsory to meet specific structural, technological and quality requirements in the field of teaching, applicable to all university institutions, including telematic ones. A central aspect of this reform was the introduction of the distinction between initial accreditation and periodic accreditation, with the latter being subject to regular audits to ensure that quality standards are maintained.

A further regulatory development took place in 2019 with the designation of strategic objectives for the Italian university system, outlining criteria and indicators for the periodic assessment of results, in order to guide universities' funding and development policies. The ministerial decree n.989/2019[4] issued in that year emphasised the role of interactive teaching and the use of advanced technologies in improving the educational experience of students. In addition, greater emphasis was placed on the quality of the teaching staff and their participation in academic research activities, aspects that have traditionally been critical for telematic institutions compared to traditional universities.

Ministerial Decree No. 1835 of 6 December 2024, signed by Anna Maria Bernini, Minister of the Ministry of Universities and Research (MUR), introduced changes to strengthen the teaching offer and guarantee the quality of education. It established the obligation to conduct at least 20 per cent of lessons in synchronous mode [7], to ensure greater interaction between teachers and students. In addition, it reinforced the need to conduct examinations and profit tests in presence, with exceptions for emergency situations or for students with disabilities. The decree also established a division of courses based on the percentage of telematic teaching. The types of courses mentioned in the context are defined as follows:

a) Conventional study courses: these are courses conducted almost entirely in the classroom, with a limited use of the telematic mode, which does not exceed ten per cent of the total activities, excluding practical and laboratory activities.

b) Study courses with a mixed modality: these are study courses with a larger telematic component, but still less than two-thirds of the course.

c) Predominantly distance learning courses: these are courses characterised by the use of e-learning for more than two-thirds of the training activities.

d) Fully distance learning courses: in these courses all the educational activities take place entirely online, with the exception of final examinations and the discussion of the final exam, which must take place in person.

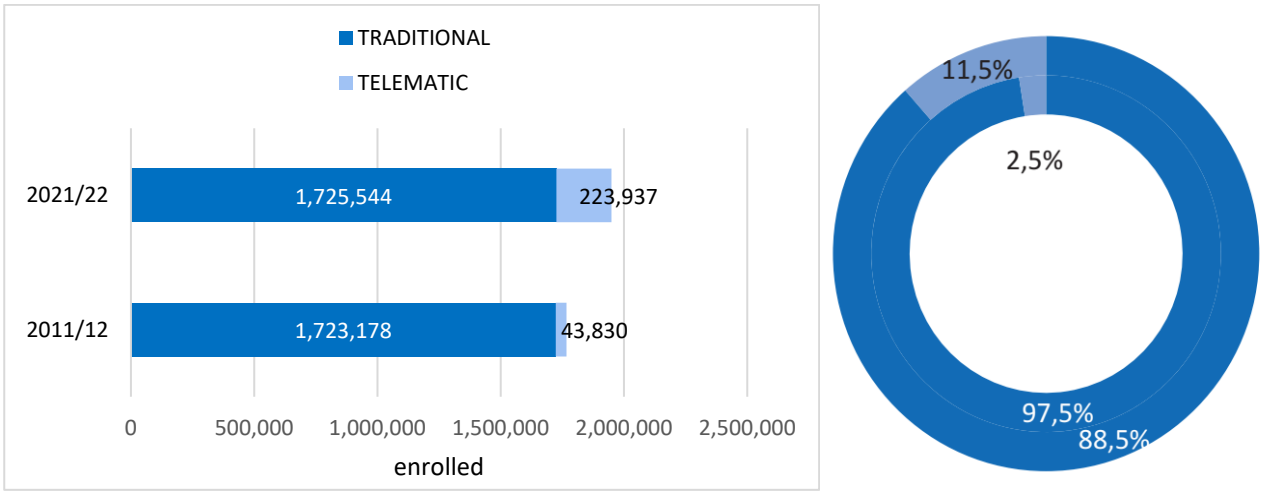
Telematic universities may only activate the last two types of courses, subject to initial approval. The measure provides for a revision of the ratio between students and teachers in courses delivered mainly or entirely at a distance, both in telematic and traditional universities. This measure aims to ensure high quality standards in distance teaching, while fully implementing the already planned recruitment plan.

1.2 Analysis of university enrolments

During the introduction of these regulations, their number remained unchanged, and it was only in 2011 that the number of degree courses offered began to increase, rising from around 50 to over 70, representing 1.5 per cent of the total number of courses.

The real turning point came in 2019 when telematic universities began to attract more and more students, thanks to the perceived greater acceptance of degrees in the world of work (telematic universities invested heavily in marketing) and the growing need for flexible education, surpassing 100,000 registered students. With the outbreak of the COVID-19 pandemic comes the need for distance learning and interest in telematic universities explodes, reaching 220 thousand enrolled in 2021/22 *[Fig.1.1].*

Figure 1.1- Enrolments at telematic and traditional universities (a.y. 2021/22 vs a.y. 2011/12)

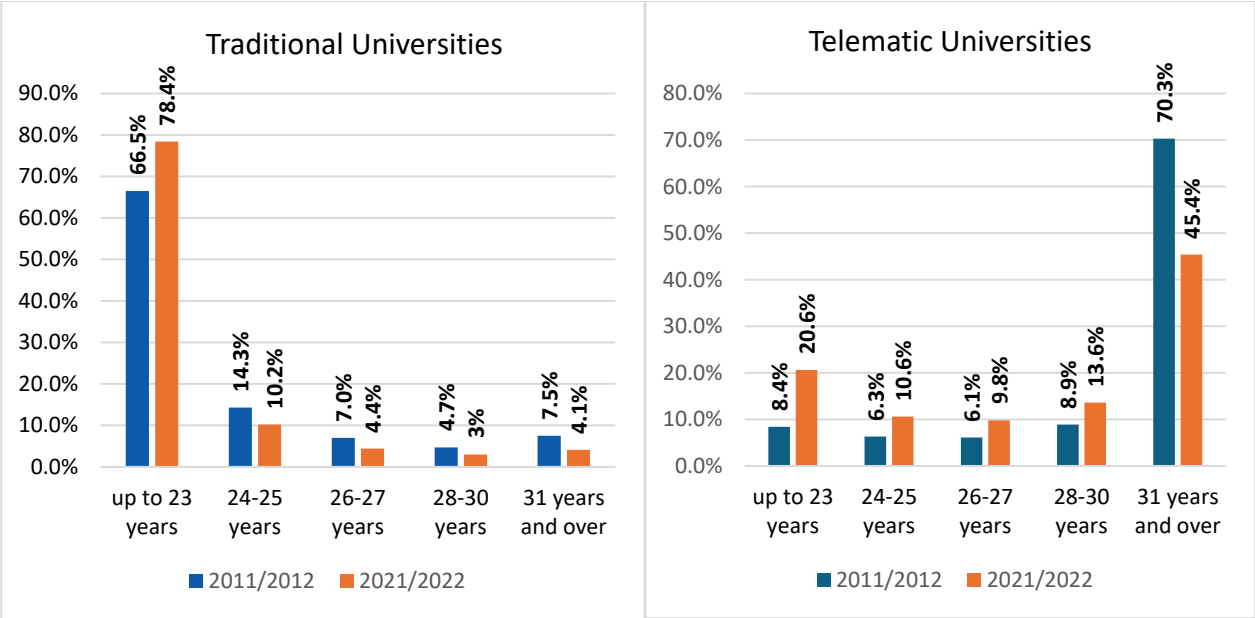


Source: elaboration based on data from the National Student Registry (ANVUR) [5]

Relative to this data, the number of bachelor's degrees awarded by telematic universities also increased compared to the academic year 2011/12, from 5,220 (1.7%) to 34,223 (9.9%) in the academic year 2020/21. These figures indicate that in 2020/21, nine out of ten bachelor's degrees were awarded by traditional universities and one by telematic universities.

As traditional and telematic universities take in students with very different age profiles, the characteristics of graduates also vary significantly. Looking at three-year degrees, it emerges that almost 80% of the degrees awarded by traditional universities in the academic year 2020/21 concern graduates in the age bracket of up to 23, up from 66.5% in 2011/12. In telematic universities, on the other hand, this percentage is much lower, standing at 20.6% (compared to 8.4% in 2011/12), while almost 60% of degrees are awarded to students aged 28 and over.

Figure 1.2- Bachelor's degrees: age groups of graduates (a.y. 2020/21 and a.y. 2011/12)

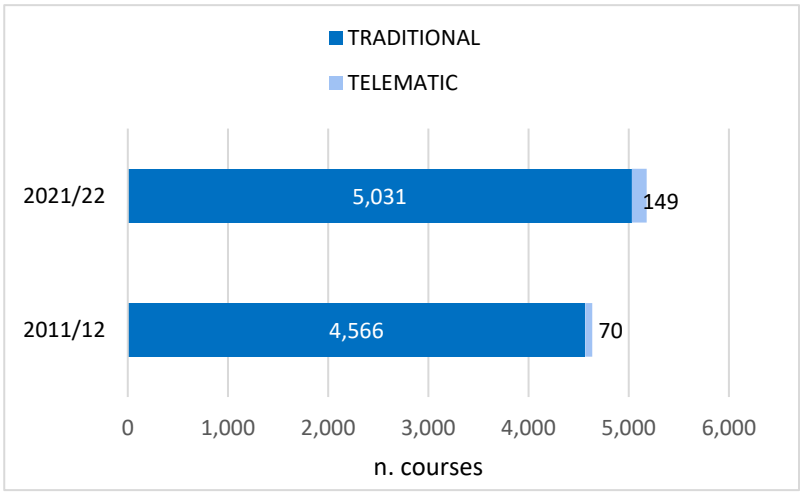


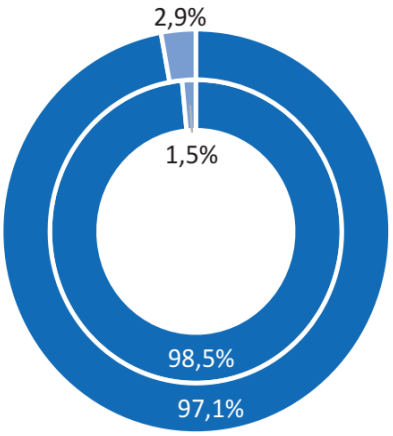
Source: elaboration based on data from the National Student Registry (ANVUR) [5]

These data show major improvements in our country over the last ten years in terms of the increase in the population in the 18-23 age group holding a bachelor's degree. Analysing only the data from telematic universities, it emerges that in the past the majority of those enrolled (70.3%) belonged to the over-30 age group. Nowadays, however, a more balanced distribution between the different age groups is observed. While on the one hand there is a greater presence of graduates in younger age groups, on the other hand it may also emerge that telematic universities are not only chosen for their flexibility with the world of work, but also for economic or practical reasons.

There was also a significant increase in the range of courses on offer. During the academic year 2021/22, telematic universities offered a total of 149 study courses, an increase of 79 courses compared to 2011/12, or a growth of 113% [Fig. 1.3]. The prevailing subject area for courses delivered at a distance is economics, law and social sciences, with 68 courses (45.6% of the total). This is followed by the STEM area (Science, Technology, Engineering and Mathematics) with 38 courses (25.5%), the artistic, literary and educational area with 33 courses (22.1%) and, finally, the health and agro-veterinary area with 10 courses (6.7%), all related to the disciplines of Sport and Motor Sciences.

Figure 1.3 - Number of study courses at traditional and telematic universities (a.y. 2021/22 vs a.y. 2011/12)





Source: MUR-Banca dati dell'offerta formativa [9]

It is particularly relevant to analyse the data regarding changes in recent years in relation to the regularity with which students complete three-year degrees. Looking at the most recent cohorts of enrolled students, a greater constancy in achieving the degree on time emerges. Even looking at the data beyond the third year, significant improvements can be seen. However, six years after enrolment, just over 63% of students in the 2014/15 cohort have graduated. This highlights that the number of students who complete their degree late or interrupt their studies is still high.

The analysis of the cohorts of matriculated students, distinguishing between telematic and traditional universities and also considering their geographical distribution, highlights significant differences compared to the national average in the achievement of a bachelor's degree on time. Telematic universities show a percentage of graduates on time of 44.8%, while in traditional universities the value stands at 37.8%, a difference of seven percentage points [Tab.1.2]. This gap is significantly influenced by geographical variations within the traditional universities.

Table 1.2 - Graduates within 3 years in first-level courses by cohort of enrolled students

University type	***2010/11***	***2011/12***	***2012/13***	***2013/14***	***2014/15***	***2015/16***	***2016/17***	***2017/18***
Telematic	**21,1%**	**16,6%**	**22,4%**	**19,8%**	**27,2%**	**37,6%**	**40,9%**	**44,8%**
Traditional	**26,3%**	**27,5%**	**29,1%**	**30,8%**	**33,5%**	**35,4%**	**36,4%**	**37,8%**

Source: elaboration based on data from the National Student Registry (ANVUR) [5]

1.3 Analysis of quality

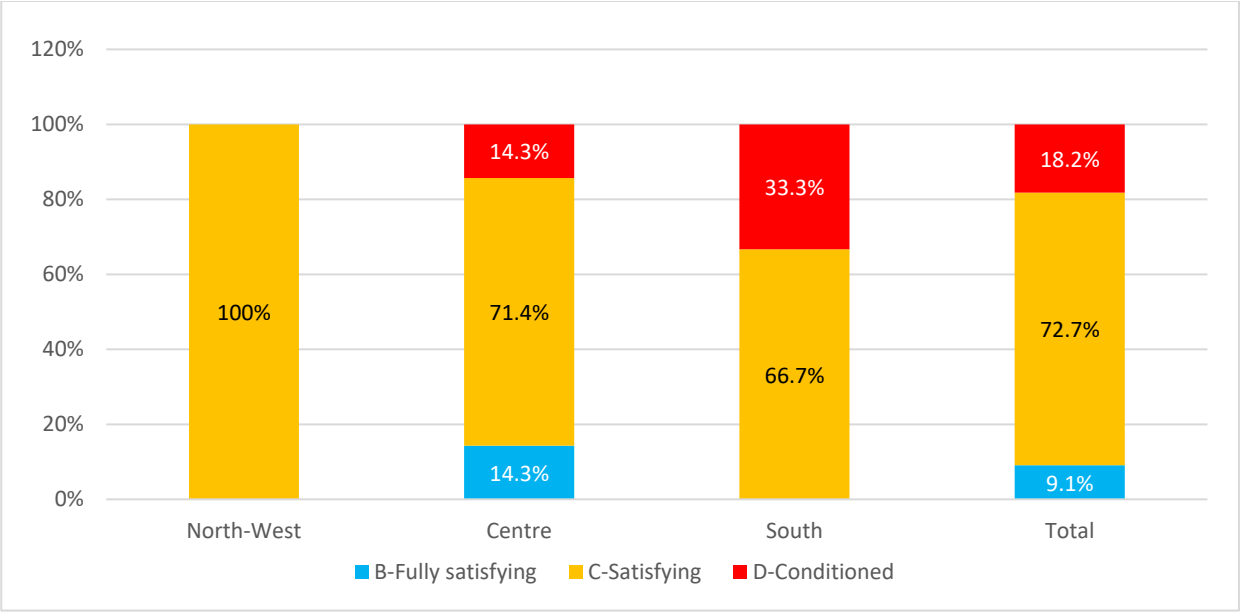
ANVUR, the National Agency for the Evaluation of the University System and Research, is responsible for monitoring the quality of teaching and research at Italian universities, including telematic universities. The evaluations conducted by the agency showed rather heterogeneous results in the telematic universities: some realities received positive judgments for the organisation of the educational offer and for the ease of access to teaching materials, while others showed significant limitations, particularly with regard to the interaction between students and lecturers, the lack of laboratory activities and the learning monitoring system.

Among the most frequently criticised aspects is the lack of interaction with the teaching staff, an element that many students consider inferior to face-to-face courses. Examination methods have also often been at the centre of debate, with doubts relating to the transparency and effectiveness of the tests, although recent legislation has made face-to-face examinations compulsory to ensure greater rigour. The ratio between the number of lecturers and students in telematic universities is particularly unbalanced: there are on average 202 students per lecturer, compared to 27 in traditional universities. This imbalance has a direct impact on the type of teaching offered, which is often characterised by more standardised content, a prevalent use of recorded video lectures and tests structured mainly by multiple-choice tests. The possibility of direct interaction between students and lecturers is also affected, which remains rather limited.

The evaluations conducted by ANVUR confirm a less favourable picture for telematic universities. While almost half of the public universities receive very positive or fully satisfactory ratings, only a small percentage of the telematic universities reach the level of full satisfaction and none obtain the highest rating [Table 1.3]. Some even present situations such as to receive conditional accreditation, a sign of critical issues still to be resolved.

Table 1.3 - Periodic accreditation ratings of the telematic universities by geographic area

Assessment	**North-west**	**Centre**	**South**	**Total**	**%**
B-Fully satisfying		1		1	9,1%
C-Satisfying	1	5	2	8	72,7%
D-Conditioned		1	1	2	18,2%
Total	**1**	**7**	**3**	**11**	**100%**



Source: elaboration based on data from the National Student Registry (ANVUR) [5]

To try to close this gap, a decree was introduced in 2021 by Minister Messa requiring telematic universities to adapt to the same requirements as traditional universities, with a deadline set for November 2024. The current minister, Anna Maria Bernini, has instead chosen a more gradual path [10], extending the time for adaptation by at least three years. This softer choice has aroused perplexity, fueling fears of a possible gradual transformation of the university system into a private one [6].

The decision to allow telematic universities more time to adapt to the standards of traditional universities could contribute, in an indirect way, to a gradual privatisation of the university system. This is because Italian telematic universities are mostly private or controlled by private entities and are growing rapidly due to their flexibility and accessibility. Offering them an extension in adaptation allows these universities to continue operating with less costly organisational models, often characterised by a reduced number of lecturers compared to the number of enrolled students, less physical presence on courses and a lighter didactic organisation. All this may be cost-effective, but it may have implications for the quality of education.

Meanwhile, public universities are required to meet stricter standards, both in terms of teaching and internal organisation. This disparity can generate unbalanced competition, in which public universities are less competitive, especially in the eyes of those students who seek faster, more flexible and work-compatible paths. In a system where telematic universities attract more students, a shift in educational demand occurs, which may affect the allocation of resources, attention and centrality within the public sector.

Over time, this dynamic may have implications for the long-term balance of the state university network. If enrolments fall, public funding decreases, and with it the ability to offer a comprehensive, inclusive and

quality education. Thus, even without explicit reform, we are witnessing a slow transformation in which the private model, more streamlined but characterized by different institutional priorities compared to traditional public universities, is progressively legitimised. This dynamic may encourage public universities to adopt more market-oriented logics, reducing their function of guaranteeing equal access and the right to study**.**

Added to this is a still uncertain perception on the part of the world of work: although the degrees awarded by telematic universities are legally equivalent to those of traditional universities, in some contexts reservations remain as to their actual validity.

It will still take time and the availability of more comprehensive data to understand to what extent the increase in enrolment in telematic universities can be attributed to the rising cost of living, the effects of the pandemic or, rather, to a change in student preferences. Some recent surveys indicate a growing disinterest in university (European Commission 2022, Wall Street Journal-NORC Poll 2023). Among young people, there is a growing perception that a degree does not guarantee employment, or at least not a satisfactory one. With this in mind, many may prefer faster and more flexible educational paths: telematic universities, compared to traditional ones, offer a higher probability of completing the three-year degree within the stipulated time (see Table 1.2).

There is a growing number of students who choose telematic universities with the aim of advancing in a public career, where possession of a degree is often more important than the prestige of the institution awarding it [11]. The issue of the social stigma attached to e-universities, which are accused of allegedly being less strict in examinations, must also be considered. However, there is currently insufficient empirical evidence to confirm or deny this perception. Moreover, the spread of telematic universities could also be the natural result of the digital evolution that has made the new generations more inclined and prepared to follow entirely digital paths.

However, it should be remembered that telematic university education also has its criticalities. In the absence of direct and constant interaction with lecturers, students must rely on a strong capacity for self-learning. Some studies [12] show that the introduction of online courses has indeed broadened access to university, but at the same time it is associated with weaker educational outcomes in the short term and, in some cases, less favourable employment outcomes in the long term compared to those who have taken face-to-face courses with similar characteristics.

2. The structure of the teaching staff: recruitment dynamics and academic configurations compared

Over the past two decades, the spread of telematic university education has attracted growing attention in international literature, which has gradually begun to question the institutional, organizational, and professional implications associated with this educational model. In many national contexts, the expansion of digital universities has been interpreted as part of a broader process of differentiation in higher education systems, characterized by the coexistence of traditional institutions and alternative providers focused on educational flexibility and widening access.

Existing studies have focused mainly on aspects such as the quality of educational provision, the characteristics of the student population, the employment outcomes of graduates and, more recently, the economic sustainability of online models. The dimension relating to academic staff, on the other hand, has been much less explored: only a limited part of the literature has systematically analysed the composition of the teaching staff in telematic universities or the possible interactions with traditional institutions, while the dynamics of mobility between the two segments of the university system remain largely unexplored.

In this scenario, the Italian case presents elements of particular analytical interest. Unlike other countries, where online education has developed more gradually or often within existing universities, in Italy, telematic universities have experienced a relatively rapid expansion since the mid-2000s, favoured by a regulatory framework that has fully recognized their institutional status. The degrees awarded by these universities have the same legal value as those awarded by traditional universities, helping to position them not as marginal players but as an integral part of the national university system.

However, behind this rapid expansion, formally legitimised by ministerial accreditations and encouraged by a social context increasingly favourable to online learning, there are structural dynamics that deserve closer analysis. One of the least discussed but most important aspects concerns the recruitment of teaching staff. While telematic universities have been able to attract a new audience of students, often working adults or residents of peripheral areas, the composition of their staff raises questions about the quality, stability and consistency of the academic programmes offered.

This section investigates the composition of academic staff in Italian online universities through quantitative indicators and empirical evidence. Particular attention is paid to recruitment patterns and to the timing of appointments in recent years. The aim is not to make general accusations or fuel prejudices against a specific category of universities, but to bring to light a possible systemic phenomenon: the “hasty” formation of teaching groups through the use, on the one hand, of young researchers or aspiring academics who are not

structurally integrated, often unable to find permanent positions in traditional universities; on the other hand, to older professors, sometimes already retired or nearing the end of their service, recruited more for their symbolic prestige than for their actual ability to guarantee lasting teaching and scientific support.

This section takes a systematic approach to reconstructing and analysing the academic trajectories of professors working at Italian telematic universities, integrating personal, professional, and scientific information. The starting point is the individual examination of the biographies available in the official databases of the Ministry of University and Research (CINECA – "CercaUniversità"), through which it was possible to reconstruct, for each teacher, the chronological sequence of institutional affiliations, changes in role, type of contract, academic seniority, and any periods of inactivity or discontinuity in service. The analysis was based on a complete sample of eleven telematic universities recognized by the MUR, for a total of approximately 4,400 unique faculty members considered in the period 2015–2024. To ensure a homogeneous comparison, a balanced sample of eleven traditional universities was selected, including large, medium, and small universities distributed throughout the country, consisting of: Politecnico di Torino, Politecnico di Milano, University of Torino, Genova, Pavia, Parma, Bologna, Padova, Firenze, Palermo, and La Sapienza, for a total of over 41,000 faculty members. These institutions were selected to ensure variability in size, geographical distribution, and institutional characteristics, providing a representative benchmark for the national academic system. For each teacher in the telematic sample, variables such as age, year of first entry into the university system, institutional origin (distinguishing between traditional universities, other telematic universities, or first entry without previous affiliations), role held at the time of first appointment, career progression, extent of scientific activity (assessed through the consistency and continuity of publications recorded in bibliometric databases), as well as the number and frequency of fixed-term or contract positions. This set of information made it possible to construct a longitudinally consistent profile for each teacher, useful for identifying recurring patterns such as entry at an advanced age, late academic careers, predominantly contract-based recruitment, and mobility into or out of telematic universities.

The analysis was conducted from a dual perspective. On the one hand, a descriptive examination of the distribution of variables (age, roles, origin, contract type) was carried out to outline the structure of the academic staff in telematic universities; on the other hand, the same indicators were calculated for the sample of traditional universities, so that direct comparisons could be made on a statistical basis. In particular, normalization and estimation techniques were applied to each variable to calculate absolute and relative frequencies, allowing for the construction of distribution graphs and the measurement of any significant deviations. The goal is to produce an interpretative map of the differences between systems, highlighting the elements that uniquely characterize telematic universities compared to the established models of the traditional university system. This approach allows not only to describe the phenomenon, but

also to interpret it considering the institutional, organizational, and regulatory mechanisms that have influenced the evolution of the sector over the last twenty years.

Attention will be paid to the hypothesis, which will be verified using statistical tools and explanatory models, that many telematic universities, in the process of expanding their offerings or adapting to regulatory requirements, have selected teachers based more on speed and administrative functionality than on scientific merit or consolidated teaching experience. In this sense, the figure of the “young person excluded” from conventional academic careers, as well as that of the “professor in decline”, would not represent isolated anomalies, but rather symptoms of a recruitment strategy which, while formally complying with the rules, raises questions of appropriateness and teaching quality.

The interest of this research also lies in the broader reflection on the role of universities in the 21st century, on the relationship between digitalisation and teaching quality, between accessibility and academic standards. While the telematic model can offer valid solutions in terms of inclusion and personalisation of learning, it is also necessary to question how this model is implemented, with what human resources, and what the long-term consequences are for the national scientific and cultural fabric.

In conclusion, this thesis does not aim to make definitive judgements, but to contribute, through rigorous and documented empirical analysis, to the debate on the sustainability and fairness of the Italian university system. The broader aim is to contribute to a debate on how innovation can be reconciled with the quality and credibility of academic institutions.

2.1 Student-Faculty Ratio

Italian telematic universities exhibit a markedly reduced number of tenured academic staff relative to their enrolled student populations. This imbalance is typically offset by the extensive employment of adjunct faculty. For instance, Pegaso University, the largest Italian telematic institution with approximately 99,500 students, relies on only a few dozen tenured professors (full and associate professors, along with researchers) to form its permanent academic staff [14]. At the opposite end of the spectrum, the very small UniDav (Leonardo da Vinci), with just 78 students in the 2021/22 academic year, employs a minimal number of instructors but maintains a more manageable student-to-faculty ratio [15].

Overall, telematic universities appear to operate with relatively small permanent academic staffs. In 2024, the total number of tenured professors employed across all Italian telematic institutions was slightly above one thousand. Several universities employ only a few dozen permanent faculty members, while smaller institutions have fewer than twenty. eCampus, for example, with about 42,700 enrolled students in 2023 [14], employs hundreds of contract professors to deliver its courses, despite its small number of tenured

staff. Similarly, Pegaso, Mercatorum, and other institutions affiliated with the Multiversity group heavily rely on external collaborators to support their teaching missions.

The technical and administrative workforce is also relatively limited. The absence of physical campuses significantly reduces the need for on-site administrative staff compared to traditional universities. Despite managing large student bodies, telematic universities operate with streamlined organizational structures. This suggests a substantial per capita workload for administrative and support personnel—particularly in student services, academic tutoring, and IT assistance. Many of these services are outsourced or supplemented through digital platforms and call centers, thereby containing the size of the non-academic workforce.

The analysis of the ratio between academic staff and student population is one of the most significant aspects for assessing the organizational structure of a university and the sustainability of its educational offering. This ratio, widely used in university system quality assessment exercises, is a crucial indicator of both the ability to guarantee adequate levels of teaching service and the degree of investment by institutions in the permanent academic component. In the case of telematic universities, this issue is particularly relevant due to the structure of these institutions, which is atypical in many respects: on the one hand, the absence of physical and logistical constraints allows them to manage very large numbers of students; on the other hand, the need to contain costs and operate with a more flexible organization tends to favour extensive use of contract teachers rather than permanent staff.

In order to understand the extent to which these characteristics affect the ability of telematic universities to maintain a balance between educational demand and available academic resources, a detailed analysis of the composition of the teaching staff and the resulting numerical ratios is proposed. The data considered covers eleven Italian telematic universities and includes, for each university, the number of different types of teachers (tenured, fixed-term researchers, contract teachers, and research fellows) as well as the number of enrolled students. Based on this information, it is possible to construct a series of indicators that allow us to assess, on the one hand, the overall impact of academic staff on the education system and, on the other, the actual level of academic structuring of universities.

This section of the thesis therefore aims to offer a critical reading of the internal dynamics of telematic universities, highlighting the differences between institutions of very different sizes and the sometimes-significant distance that separates the telematic model from the traditional one. The objective is twofold: on the one hand, to identify any critical issues arising from imbalances between students and teachers, and on the other, to understand to what extent these imbalances are structural and attributable to the very logic of how telematic universities operate. Two distinct indicators are used: the student-to-total faculty ratio, capturing overall teaching capacity, and the student-to-tenured faculty ratio, reflecting the structural core of

the academic staff. At the end of the chapter, the tables reporting the raw data used to do the analysis and construct the graphs are also provided, in order to ensure transparency and replicability of the analysis.

The first indicator analysed is the ratio between the number of enrolled students and the total number of teachers employed by each university, including both permanent staff and contract staff. This parameter provides an immediate picture of the degree of "teaching density" that characterizes the various telematic universities, providing a summary measure of the overall burden that each institution bears in order to guarantee the delivery of courses. Unlike the ratio of students to tenured faculty, which reflects the level of consolidation of the academic staff, the ratio calculated on all faculty members highlights the ability of universities to meet educational demand through flexible organizational models that rely heavily on external collaborations.

The adoption of this indicator is particularly useful in the case of telematic universities, as it highlights the great variability within the sector: some small universities have a disproportionately high number of faculty members in relation to students, while universities with large student bodies make intensive use of non-tenured staff to maintain minimum levels of teaching coverage. The analysis of the total student/faculty ratio therefore provides an initial overview of the organizational choices of individual universities and their ability to sustain, at least in numerical terms, the educational load resulting from the high number of enrolled students.

An analysis of the ratio between the number of enrolled students and the total number of teachers employed in the two university models considered, telematic and traditional, highlights profound structural differences. The data provided for the twenty-two universities in the sample allow us to grasp, with considerable precision, the weight of the academic staff in relation to the student population and to understand how each system organizes its teaching capacity.

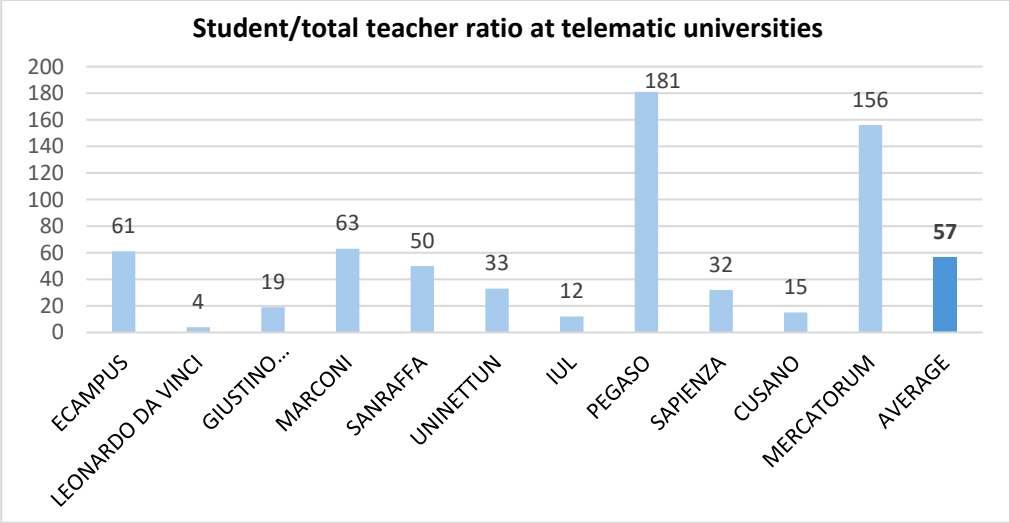
In the group of telematic universities, the student/total faculty ratio is very high [Figure 2.1], with marked variations between institutions. Large universities such as Pegaso, with 99,566 students and 551 teachers in total, have a ratio of 181 students per teacher, while Mercatorum has 156 students per teacher with 56,333 enrolled students and 361 teachers in total. Even eCampus, which has 42,741 students and 706 teachers, has a ratio of 61 students per teacher. Other smaller universities show lower values but still higher than the traditional sector average: this is the case of IUL, which with 1,763 students and 146 teachers has a ratio of 12 students per teacher, or Leonardo da Vinci, with a ratio of 4 students per teacher, the lowest value observed in the telematic sample.

Overall, the average for the eleven telematic universities is around 57 students per teacher, a figure that reflects the high concentration of teaching on a relatively small number of teachers, often supported by a large number of contract staff.

The scenario changes radically when looking at traditional universities [Figure 2.2]. Here, the student/total teacher ratios are systematically lower and much more homogeneous. In many cases, the number of students per teacher falls below the threshold of 15: the University of Genoa, for example, has 11 students per teacher, the same value recorded in Pavia. Even large institutions such as La Sapienza have significantly lower ratios than their telematic counterparts: with 111,960 students and 5,591 teachers in total, the ratio is 20 students per teacher. The average for traditional universities in the sample is 15 students per teacher, an order of magnitude lower than the values found in telematic universities.

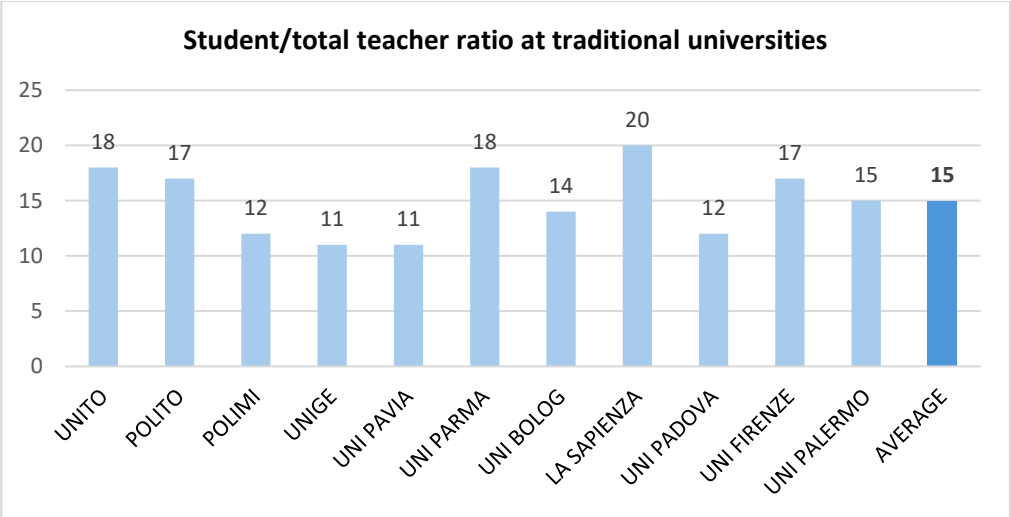
A direct comparison between the two groups therefore highlights a clear divergence in organizational structures. Telematic universities operate with much smaller staff numbers in proportion to the number of students enrolled, entrusting most of the teaching to contract lecturers; traditional universities, on the other hand, employ a higher overall number of lecturers, distributed more proportionally to the student population. The gap between the two systems is such that it suggests they respond to different operating logics: telematic universities focus on streamlined structures and a high degree of digitization of educational processes, while traditional universities maintain a balance closer to established academic standards, with a larger and more diverse teaching staff.

Figure 2.1 - Student/total teacher ratio at telematic universities (a.y. 2023/24)



Source: elaboration based on data from the National Student Registry (ANVUR) [5]

Figure 2.2 - Student/total teacher ratio at traditional universities (a.y. 2023/24)



Source: elaboration based on data from the National Student Registry (ANVUR) [5]

To evaluate the relationship between the size of the student body at universities and the total number of academic staff, Pearson's linear correlation was applied, one of the most established tools for estimating the degree of association between two quantitative variables. The aim of this analysis is to verify whether, as the number of enrolled students increases, universities tend to increase the total number of teachers proportionally, and whether this behavior differs between telematic and traditional universities. In other words, Pearson's correlation allows us to measure the extent to which the student/teacher ratio reflects structural dynamics consistent with different organizational models.

Pearson's r statistic is based on the covariance between the two variables, standardized by their respective standard deviations. In general form, it can be expressed as:

$$r = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \cdot \sum(y_i - \bar{y})^2}},$$

where x_i represents the number of students at the i-th university, y_i represents the total number of teachers, and $\bar{x}$ and $\bar{y}$ represent the respective averages. The coefficient takes values between –1 and +1: positive values indicate a direct relationship, while negative values indicate an inverse relationship; values close to zero suggest no linear relationship.

Applying this methodology to the eleven telematic universities, we obtain a coefficient of r = 0.360. The value is positive and of moderate intensity, indicating the existence of a trend, albeit not particularly marked, according to which telematic universities with a larger number of students tend to employ a larger overall teaching staff. However, this association remains weak, as in several universities the total number of faculty members seems to be determined more by organizational choices, teaching models based on extensive use

of external contracts, or cost-containment strategies, rather than by a real proportional adjustment to the size of the student population.

A very different dynamic emerges in the eleven traditional universities, where the coefficient is r = 0.865, a very high value that highlights a strong and systematic linear correlation between the total number of faculty members and the number of students. In these institutions, the expansion or contraction of staff tends to follow the trend in the student population more consistently, reflecting a governance model that is more regulated by planning criteria, ministerial constraints, and structural requirements linked to the teaching load.

The comparison between the two systems is particularly revealing: while in telematic universities the total number of teachers grows only partially as the number of students increases, in traditional universities this relationship appears robust and consistent. This difference suggests that the telematic system still operates according to the logic of organizational flexibility, with heavy reliance on contract staff who do not necessarily follow the numerical evolution of enrolment, while the traditional system maintains a more stable structure that is proportionate to educational needs. Overall, the results show that the relationship appears significantly weaker in telematic universities compared to traditional ones. In telematic universities the relationship is weaker and reflects organizational models characterized by greater internal variability and less structured recruitment processes.

After examining the overall ratio between the number of students and the total number of teachers, it is necessary to isolate a more structural component of the academic staff: tenured professors. Unlike contract teachers or temporary staff, tenured staff represent the stable core of the educational offering, guarantee continuity in teaching and research, participate in university governance, and support the institutional quality of the university in the long term. For this reason, the ratio of students to tenured faculty is a more sensitive indicator of a university's ability to sustain a balanced educational model and ensure an adequate level of academic supervision.

Analysing this ratio also allows us to identify significant differences between telematic and traditional universities. In the former, the structural presence of academic staff tends to be smaller, while in traditional universities, permanent staff form the backbone of the academic system. Comparing the two models using the same metric therefore allows us to assess the extent to which the number of tenured faculty members is proportionate to the number of students and whether distinctive patterns emerge in the two systems.

The objective of this part of the analysis is therefore twofold: on the one hand, to measure the density of permanent staff in different universities; on the other, to verify whether the presence of tenured professors follows different logic in telematic and traditional systems, thus helping to outline their respective organizational configurations more precisely. This perspective allows us to integrate more comprehensively

what has already been observed for the academic staff, highlighting the crucial role of the permanent component in defining the quality and sustainability of university teaching.

The ratio of students to tenured professors at telematic universities reveals an organizational structure that is heavily skewed toward a limited number of permanent staff compared to the size of the student cohorts. The data show very high ratios *[Figure 2.3]*, with values in several cases exceeding several hundred students per tenured professor. There are considerable variations within the group: the range varies from around 45 students per tenured professor at Giustino Fortunato University to over 400 in larger institutions, such as Pegaso or Mercatorum, while eCampus, Marconi, and Cusano have intermediate values of between 150 and 250 students per professor. Even in smaller universities, such as Leonardo da Vinci or IUL, the ratio remains significantly higher than the standards commonly observed in traditional universities.

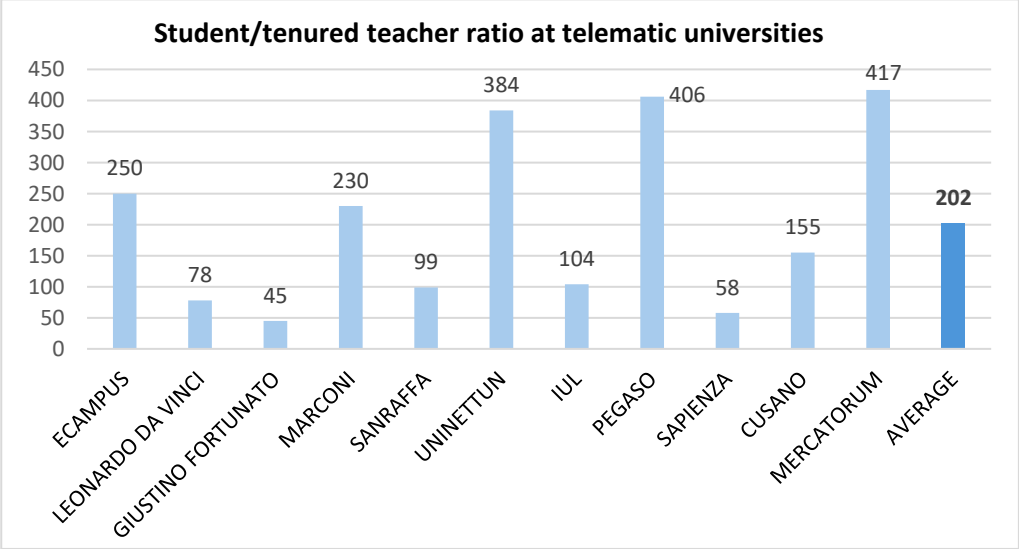
These figures highlight the adoption of an operating model based on a very small permanent staff and a massive use of non-tenured professors or contract staff, who are used to absorb most of the teaching load. The concentration of permanent staff is therefore disproportionate to the size of the student population, with potential implications for academic supervision, the continuity of educational programs, and the ability to guarantee an adequate level of institutional oversight. From an analytical point of view, the internal variability of the values also indicates that telematic universities do not constitute a homogeneous group: some seem to be seeking greater balance, while others tend to push the model of severe compression of permanent staff to the maximum. The picture that emerges for traditional universities is radically different. The ratio of students to tenured faculty is very low [*Figure 2.4*], ranging from 22 to 32 students per tenured professor. The differences between universities are relatively limited: institutions such as Bologna, Florence, and Palermo have around 25–30 students per professor, while technical-scientific universities such as the Polytechnic University of Milan and the Polytechnic University of Turin have slightly lower ratios or are fully in line with the sample average.

The most significant aspect is not so much the precise ranking of individual universities as the overall stability of the distribution. In the data analysed, no traditional university exceeds a ratio of 32 students per tenured professor, confirming an organizational structure based on a well-sized permanent staff. This balance reflects an academic model in which tenured professors play a central role in teaching, research, and governance, ensuring continuity and methodological depth in educational programs.

A comparison between the two systems highlights a significant structural difference. In telematic universities, the student/tenured faculty ratio can exceed ten times that observed in traditional universities. Telematic universities have values ranging from 45 to over 400 students per permanent faculty member, while traditional universities have a narrow range of 22–32. This divergence is not the result of contingent dynamics but reflects two profoundly different organizational models: on the one hand, a telematic system based on

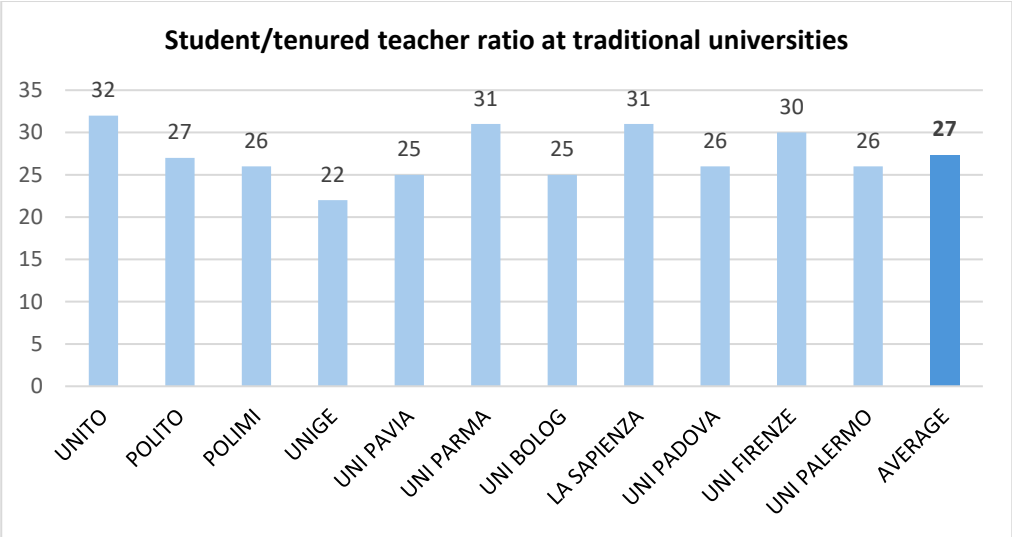
a very small core of permanent staff and extensive use of contract workers; on the other, a traditional system that assigns tenured professors a central and indispensable role. These differences are not limited to numerical dimensions, but suggest possible implications for the quality of education, long-term sustainability, and the ability of universities to effectively oversee teaching processes. While in traditional universities the stable presence of permanent staff enables a more direct relationship with students and greater institutional continuity, in telematic universities the extremely low density of tenured teaching staff indicates a much more flexible but less structurally consolidated model, based on a high degree of outsourcing of teaching.

Figure 2.3 - Student/tenured teacher ratio at telematic universities (a.y. 2023/24)



Source: elaboration based on data from the National Student Registry (ANVUR) [5]

Figure 2.4 - Student/tenured teacher ratio at traditional universities (a.y. 2023/24)



Source: elaboration based on data from the National Student Registry (ANVUR) [5]

Moving from an overall analysis of teaching staff to one limited solely to tenured professors, a clearer picture emerges of the structural relationship between the size of the student body and the ability of universities to support their institutional functions internally. Unlike the overall staff, which includes a very large component of contract or temporary teachers, tenured staff represent the permanent backbone of universities and constitute the resource that most directly reflects long-term investments in academic activity.

Applying Pearson's correlation index to this subset allows us to verify the extent to which the expansion of the student population is accompanied by a strengthening of the structured component of the academic staff. The results of the analysis show marked differences between the two groups of universities. For telematic universities, the correlation obtained is 0.887, a high value that indicates a positive and consistent association: in distance learning universities, as the number of students increases, the number of tenured faculty members also increases in a relatively regular manner. This result indicates a trend towards the progressive formalization of staff, consistent with recent regulatory pressures aimed at expanding the permanent structure.

In traditional universities, the coefficient is even higher, at 0.963, indicating an almost proportional relationship between the student population and the size of the tenured faculty. This value is in line with the consolidated structure of state universities, where personnel planning has long been based on more structured criteria, bound by both qualitative requirements and relatively stable organizational models.

The comparison between the two coefficients therefore suggests that, despite a structural difference in the number of tenured faculty members, telematic universities show an internal dynamic that tends to converge towards patterns more similar to those of the traditional system. The very high correlation recorded for both categories indicates that the number of tenured faculty members does not grow randomly, but responds,

with varying intensity, to the expansion of the student body, highlighting a progressive alignment with the organizational sustainability criteria required by the national university system.

The heavy reliance on contract-based staff and the sparse presence of permanent academics raises questions regarding the quality and organization of education delivered. An insufficient core of tenured faculty can negatively impact student mentorship, research continuity, and the accreditation of academic programs. Notably, ANVUR's evaluations *[see the chapter 1.3]* have generally been unfavourable toward telematic universities, with only UniNettuno achieving a satisfactory standard. Most telematic institutions were assigned a "C" rating, while two received a "D" due to unresolved critical issues.

In conclusion, a comprehensive analysis of faculty composition in telematic universities reveals pronounced structural imbalances: minimal tenured staff, an overwhelming number of contract-based instructors, disproportionately high student-to-faculty ratios, and a reduced presence of senior academics relative to traditional institutions. Statistically, telematic universities operate with an average of one tenured faculty member for every 202 students, a figure significantly higher than the national university system average. While current corrective measures, such as mandated quotas for full professors, may gradually improve this scenario, telematic universities continue to rely on a highly flexible instructional model. This approach enables the cost-effective delivery of hundreds of courses to thousands of students but raises questions regarding the long-term sustainability and academic structuring of these institutions.

Table 2.1- Student and Faculty Composition by Institution (Tenured vs. Non-Tenured) – Telematic Universities (a.y. 2023/24)

University	**Tenured faculty**	**Fixed-term researchers**	**Adjunct faculty**	**Research fellows**	**Total faculty**	**Total tenured faculty**	**Enrolled students**
ECAMPUS	111	60	523	12	**706**	**171**	**42741**
L. DA VINCI	0	4	72	0	**76**	**4**	**312**
G. FORTUNATO	31	18	69	0	**118**	**49**	**2183**
MARCONI	64	18	214	3	**299**	**82**	**18854**
SANRAFFA	87	45	131	1	**264**	**132**	**13129**
UNINETTUN	33	11	460	1	**505**	**44**	**16877**
IUL	11	6	129	0	**146**	**17**	**1763**
PEGASO	133	112	301	5	**551**	**245**	**99566**
UNITELMA SAPIENZA	34	28	41	10	**113**	**62**	**3614**
CUSANO	85	34	1096	23	**1238**	**119**	**18400**
MERCATORUM	96	39	226	0	**361**	**135**	**56333**

Source: elaboration based on data from Higher Education Data Portal [8]

Table 2.2- Student and Faculty Composition by Institution (Tenured vs. Non-Tenured) – Traditional Universities (a.y. 2023/24)

University	**Tenured faculty**	**Fixed-term researchers**	**Adjunct faculty**	**Research fellows**	**Total faculty**	**Total tenured faculty**	**Enrolled students**

UNITO	1892	511	769	1051	**4223**	**2403**	**76922**
POLITO	858	408	99	674	**2039**	**1266**	**34809**
POLIMI	1348	475	876	1447	**4146**	**1823**	**47726**
UNIGE	1104	331	816	524	**2775**	**1435**	**31631**
UNI PAVIA	770	279	932	468	**2449**	**1049**	**26385**
UNI PARMA	794	196	300	380	**1670**	**990**	**30420**
UNI BOLOG	2664	770	822	1918	**6174**	**3434**	**84234**
LA SAPIENZA	2780	790	643	1378	**5591**	**3570**	**111960**
UNI PADOVA	2058	683	1702	1480	**5923**	**2741**	**70803**
UNI FIRENZE	1417	417	411	1070	**3315**	**1834**	**55111**
UNI PALERMO	1324	383	857	281	**2845**	**1707**	**43655**

Source: elaboration based on data from Higher Education Data Portal [8]

2.2 Faculty Composition by Academic Rank

Telematic universities exhibit distinctive characteristics in the composition of their faculty compared to traditional universities. One notable difference is that these institutions employ significantly fewer full-time, tenured faculty members relative to the size of their student body. On average, telematic universities have about 202 students per tenured faculty member, whereas traditional universities have approximately 27 students per faculty member. This indicates that although telematic universities enroll more than ten percent of Italy's university students, they employ far fewer tenured professors than conventional institutions, suggesting a potential understaffing of their teaching staff.

Over the last decade, telematic universities have significantly expanded their tenured faculty ranks. According to data from the Ministry of University and Research (MUR), the number of permanent faculty members at these institutions more than doubled between 2012 and 2022, rising from 747 in 2012 to 1,598 in 2022[14]. Over the same period, the total number of university faculty nationwide (across public, private, and telematic universities) remained essentially stable at about 115,000[14]. Consequently, the share of university faculty employed by telematic universities grew from approximately 0.6% in 2012 to over 1.3% in 2022, indicating that these institutions have expanded their faculty, albeit from a small base. *Table 2.3* summarizes this trend over time.

Table 2.3– Permanent Faculty in Telematic Universities Compared to the National System (2012–2022)

ACADEMIC YEAR	TENURED FACULTY IN TELEMATIC UNIVERSITIES	TOTAL FACULTY IN UNIVERSITY SYSTEM	**% OF TELEMATIC FACULTY IN THE UNIVERSITY SYSTEM**
2012	747	116.911	**0,64%**
2013	873	115.819	**0,75%**
2014	1.010	114.343	**0,88%**
2015	1.114	112.127	**0,99%**

2016	1.085	111.649	**0,97%**
2017	1.094	110.675	**0,99%**
2018	1.173	110.492	**1,06%**
2019	1.222	111.146	**1,10%**
2020	1.301	111.446	**1,17%**
2021	1.384	113.004	**1,22%**
2022	1.598	116.033	**1,38%**

Source: elaboration based on data from the National Student Registry (ANVUR) [5]

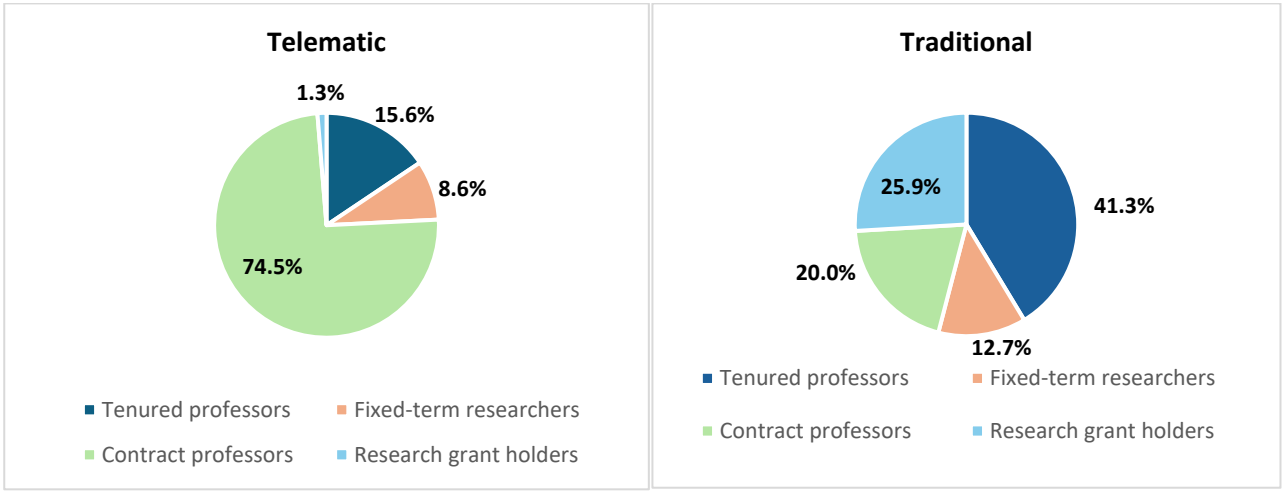
Despite the absolute increase in faculty numbers, the composition of academic staff within telematic universities remains heavily skewed toward non-permanent or temporary positions. Multiple studies have highlighted that distance-learning institutions have largely structured their academic personnel around fixed-term appointments. As early as 2015, approximately 71% of faculty members at telematic universities were employed on temporary contracts, compared to an average of just 6% at traditional institutions [19]. This trend included extensive reliance on so-called fixed term "professori straordinari," a contractual category introduced in 2005 and frequently used to retain retired faculty from public universities [19].

Analysing the composition of the academic staff is essential to understanding the different organizational structures that characterize telematic universities compared to traditional universities. The distribution of types of teachers reflects fundamental institutional choices, recruitment models, and levels of internal stability, allowing us to identify structural differences that are difficult to attribute to mere contingent factors. Data on telematic universities show a system that is heavily skewed towards external forms of employment: only 15.6% of teaching staff are permanent, while 8.6% are fixed-term researchers and as many as 74.5% are contract lecturers. Research fellows account for just 1.3% of the total. This configuration highlights a model based on an extremely small structural core, accompanied by massive and systematic use of external collaborators, which guarantees flexibility but exposes the institution to forms of organizational instability.

A profoundly different pattern emerges in traditional universities, where 41.3% of the academic staff are full and associate professors, almost triple the proportion found in telematic universities. Fixed-term researchers account for 12.7%, while contract lecturers account for 20%, significantly lower than the 74.5% observed in telematic universities. Particularly significant is the presence of research fellows, accounting for 25.9%, indicating a strong investment in the early stages of academic careers and greater integration of young researchers into institutional life. Taken together, these data outline two profoundly distinct academic models: telematic universities operate through a flexible and largely outsourced structure, while traditional

universities maintain a more stable, structured faculty oriented towards scientific and educational continuity. The implications of these differences, in terms of educational quality and long-term sustainability, are central to interpreting the developments and critical issues of the two systems.

Figure 2.5- Average Distribution of Faculty Types in the Two University Models



Source: elaboration based on data from the National University Registry (Cineca) [20]

These data point to a highly flexible organizational model, albeit one that is potentially precarious, where the extensive reliance on short-term contractual staff or faculty without research obligations may have implications for the organization and delivery of teaching, the long-term planning of academic programs, and the development of a cohesive academic community.

Furthermore, a significant portion of newly appointed faculty appears to be drawn from two recurrent categories: early-career individuals with no previous appointments in the public academic system, and senior professors, often already retired or approaching retirement from traditional universities. This dual recruitment pool warrants further analytical attention in the following chapters.

2.3 Analysis of the Faculty Age Profile

The age distribution of academic and research staff represents a crucial indicator for understanding recruitment patterns and the processes through which universities consolidate their institutional structures. This variable is not merely descriptive: age composition reflects hiring policies, the degree of career stabilization within institutions, and, more broadly, the organizational model adopted by each university. For this reason, comparing telematic universities with traditional institutions in terms of the average age of their faculty and the distribution of staff across age brackets provides valuable insights into the internal functioning of the two systems.

The analysis presented in this study is based on official data provided by the Italian Ministry of University and Research (MUR) through the USTAT portal [8]. In particular, the USTAT database reports, for each university, the number of faculty members classified into predefined age groups. These groups include under 25, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, 60–64, and 65 or above. The data are provided directly in absolute terms and were not reconstructed at the individual level.

For the purposes of this study, these absolute values were used to compute the relative distribution of faculty members across age groups within each institutional category. This step allows for a meaningful comparison between telematic and traditional universities, independently of differences in their overall size. In particular, the use of relative distributions makes it possible to identify structural differences in recruitment patterns and career composition, rather than simply reflecting variations in the total number of academic staff.

The sample considered includes eleven telematic universities and eleven traditional universities, selected in order to ensure a sufficiently broad and comparable representation of the two segments of the Italian higher education system. The group of traditional universities comprises La Sapienza, Politecnico di Torino, Politecnico di Milano, and the universities of Torino, Genova, Pavia, Parma, Bologna, Padova, Firenze, and Palermo. The telematic group includes institutions such as eCampus, Pegaso, UniNettuno, UniMarconi, UniCusano, Mercatorum, San Raffaele, IUL, Giustino Fortunato, Leonardo da Vinci, and Unitelma. The simultaneous inclusion of these two groups makes it possible to construct a homogeneous comparative framework, suitable for identifying regularities, structural differences, and potential deviations from prevailing organizational models.

It is important to note that, given the aggregated nature of the data, the analysis does not rely on individual-level age information and does not allow for the reconstruction of personal career trajectories over time. Instead, it focuses on the overall demographic structure of academic staff within each institutional context. While this approach limits the possibility of analyzing individual career dynamics, it provides a reliable and standardized basis for examining differences in the age composition of faculty across telematic and traditional universities. The raw data underlying the analysis presented in this section are reported in the tables included at the end of the chapter, to ensure transparency and allow for a direct verification of the results.

A joint observation of the demographic distributions in the two sets of universities reveals a profoundly differentiated structural picture, reflecting very different recruitment models, institutional strategies, and consolidation dynamics. Telematic universities have a demographic curve characterized by a marked disproportion between the various age groups: the presence of young people is extremely low, while those in the middle of their careers and older age groups are overrepresented. In contrast, traditional universities

show a much more balanced profile in which generational turnover is more evident, and the distribution more closely resembles the pyramid structure typical of mature academic systems.

In telematic universities, the under-30 age group is virtually absent: only 0.05% of teachers are under 25, and just 1.74% are between 25 and 29. Adding the first two age groups together, we arrive at just over 1.8% of the entire teaching staff, a completely marginal value. The 30-34 age group also remains small (9.21%), and only the 35-39 age group shows a more significant increase (12.25%). Overall, therefore, teachers under the age of 40 represent just over 23% of the total in telematic universities.

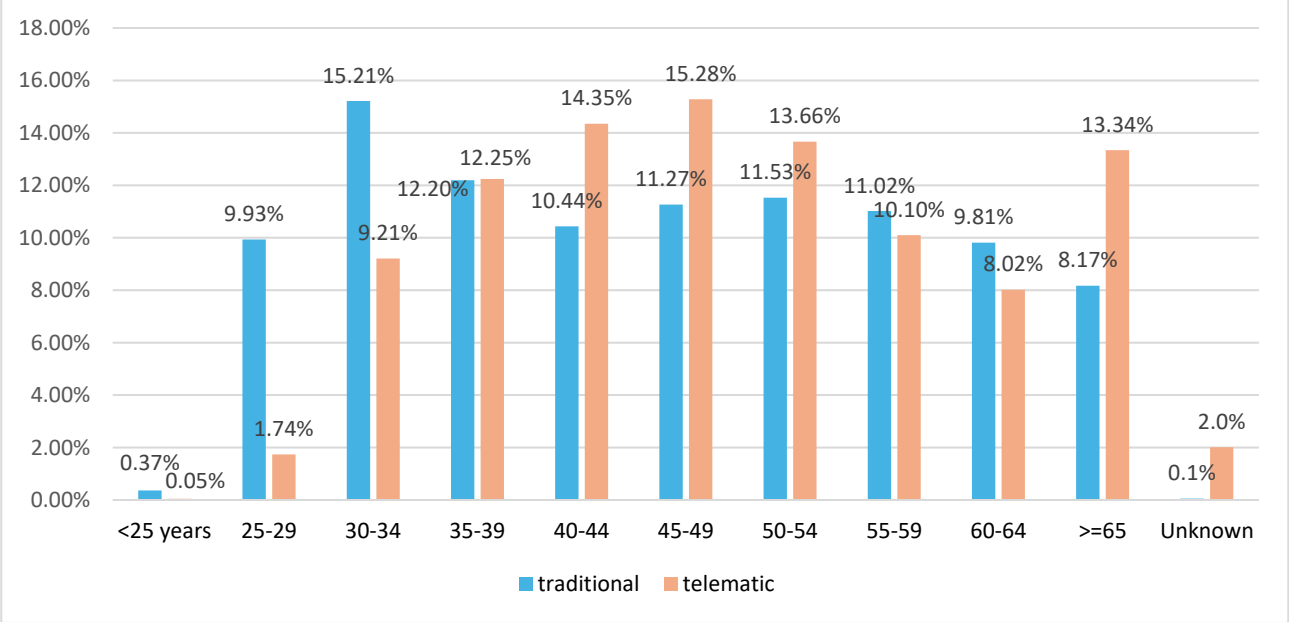
Traditional universities, on the other hand, have a much more varied age structure and are more open to the entry of new academic generations. Already in the 25-29 age group, there is a presence of 9.93%, to which is added 15.21% in the 30-34 age group, while the share of 35–39-year-olds reaches 12.20%. As a result, almost 37% of traditional teachers are under the age of 40, more than double the figure for telematic universities. The difference is significant not only in quantitative terms, but above all in what it reveals about recruitment methods: the traditional system continues, albeit with well-known slowness, to bring in researchers in the early stages of their careers, while telematic universities seem to draw from a smaller and more polarized pool, in which young people are underrepresented.

The divergence between the two models is also clearly evident in the middle stages of careers. Telematic universities record very high figures among those aged between 40 and 54: 14.35% in the 40-44 age group, 15.28% in the 45-49 age group, and 13.66% in the 50-54 age group. Adding these together gives a total of almost 44% which represents a real peak in the curve. Traditional universities show significant percentages in the same age groups (10.44%, 11.27%, and 11.53%, respectively), but the overall incidence is lower and more evenly distributed. The fact that almost half of the telematic academic staff is concentrated in the 40–54 age group suggests a recruitment model that favors individuals who are already at an advanced stage in their careers, often with previous experience elsewhere or with professional backgrounds outside the academic world.

The difference is even greater in the older age groups. Traditional universities have 9.81% of faculty in the 60–64 age group and 8.17% in the over-65 age group. In telematic universities, on the other hand, the two age groups account for 8.02% and 13.34% respectively. This implies that telematic universities have a percentage of over-65s that is more than five percentage points higher than traditional universities. This data is crucial: telematic universities have a particularly large number of older teachers, which may reflect an institutional strategy aimed at recruiting professors who are nearing the end of their careers at state universities or who are already retired, often through flexible and non-structured contracts. The higher average age is therefore consistent with a model that relies on mature academics, most of whom are not permanently employed by the university.

In summary, when comparing the two demographic profiles, a double anomaly emerges in the telematic system: on the one hand, the very low presence of young people, a sign of limited recruitment in the early stages of their careers, and on the other, the large representation of very elderly people, often with contractual and unstructured roles. Traditional universities, while not without their problems, present a more balanced picture, in which the entry of new generations of researchers is combined with the natural presence of senior professors.

Figure 2.6- Age distribution of academic staff



Source: elaboration based on data from the National University Registry (MIUR) [7]

Table 2.4 - Faculty Age Distribution by Institution – Telematic Universities (a.y. 2023/24)

UNIVERSITY	<25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	>=65	UNKNOWN
ECAMPUS	0	14	86	94	126	118	104	73	38	53	0
L. DA VINCI	0	0	1	3	3	12	20	8	28	1	0
GIUSTINO FORTUNATO	0	2	5	16	26	21	18	6	13	11	0
MARCONI	0	0	24	23	32	60	58	42	28	32	0
SANRAFFA	0	2	21	39	47	49	38	28	17	23	0
UNINETTUN	0	4	14	27	47	51	55	39	41	227	0
IUL	1	5	15	7	26	26	25	11	14	10	6
PEGASO	1	18	67	82	81	88	63	60	44	25	22
UNITELMA SAPIENZA	0	2	16	15	18	17	16	12	8	9	0
CUSANO	0	25	117	191	171	173	159	122	93	127	60

MERCATORUM	0	4	37	39	51	54	42	41	27	66	0

Source: elaboration based on data from Higher Education Data Portal [8]

Table 2.5 - Faculty Age Distribution by Institution – Traditional Universities (a.y. 2023/24)

UNIVERSITY	<25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	>=65	UNKNOWN
UNITO	9	286	558	514	527	553	483	525	407	361	0
POLITO	11	327	428	274	196	181	203	188	159	72	0
POLIMI	22	782	658	454	385	388	427	409	337	282	2
UNIGE	5	200	365	333	278	334	321	342	295	283	19
UNI PAVIA	8	196	360	297	295	280	284	240	263	226	0
UNI PARMA	5	134	249	184	175	191	201	216	184	131	0
UNI BOLOG	34	698	1033	781	643	682	727	621	571	384	0
LA SAPIENZA	13	428	836	655	523	625	621	637	685	568	0
UNI PADOVA	29	601	931	802	629	635	649	618	493	536	0
UNI FIRENZE	11	309	580	401	321	311	371	352	354	305	0
UNI PALERMO	4	127	262	324	323	457	456	388	289	215	0

Source: elaboration based on data from Higher Education Data Portal [8]

2.3.1 Statistical Tests for the Analysis of Age Distributions

To assess whether the differences observed in the demographic distributions between telematic and traditional universities are attributable to an actual structural deviation or can instead be attributed to chance, it is appropriate to use statistical tests that allow two categorical variables to be compared.

Before presenting the results of the demographic comparison between traditional and telematic universities, it is necessary to clarify the statistical strategy adopted. The analysis of age distribution was conducted using a set of complementary tests, selected with the aim of capturing different dimensions of the phenomenon and ensuring the interpretative soundness of the results.

First, the chi-square test of independence was applied, which allows us to verify whether the observed distributions differ in a statistically significant way between the two institutional contexts. This test provides an overall measure of the association between categorical variables but does not allow us to assess the intensity of the relationship identified. For this reason, Cramer's V index was subsequently calculated, which is useful for estimating the strength of the association that emerged from the chi-square analysis. While the first test answers the question of whether there is a statistically significant difference, the second clarifies how relevant this difference is from a substantive point of view.

However, an analysis based exclusively on frequencies may not detect any deviations in the central tendency of the two populations. To address this issue, Welch's t-test was used to compare the average age of teachers in traditional and telematic universities. Unlike Student's t-test, Welch's version does not assume equality of variances and is therefore particularly suitable for comparing groups that may differ in size and internal

variability, as in the case under consideration. Finally, the analysis was supplemented by skewness and kurtosis indices, which allow for a more in-depth description of the shape of the distributions. These measures make it possible to identify any asymmetries and deviations from normality that might remain hidden by focusing exclusively on averages or frequencies. In particular, Skewness indicates greater concentration towards younger or older age groups, while Kurtosis provides information on the degree of dispersion around the mean value.

The sequence of tests follows a precise analytical logic: the chi-square test ascertains the existence of structural differences; Cramer's V evaluates their intensity; Welch's t-test verifies whether these differences are also reflected in the mean age; finally, skewness and kurtosis refine the interpretation by highlighting the underlying characteristics of the distributions. Taken together, these tools allow for a multidimensional reading of the data, reducing the risk of partial interpretations.

The approach adopted therefore ensures that the tests are not redundant but mutually integrated: each contributes to illuminating a specific aspect of the demographic structure of the teaching staff in the two university models.

Chi-square test

The Chi-square test of independence is used in demographic structure analyses and, more generally, in the study of the relationship between frequencies observed in contingency tables. The idea behind the test is simple: if there is no relationship between the type of university and age group, the distribution of teachers in the various classes should, on average, follow the same pattern in both groups. Any deviation between the observed frequencies and those expected under the assumption of independence is quantified using a statistic that measures the overall magnitude of the deviations, weighting them according to the size of the cells.

The purpose of using this test is not only to verify the existence of a difference between the two distributions, but also to determine its statistical significance, i.e., to establish whether the deviation found is too large to be attributed to random fluctuations. Once the statistical value and the relative p-value have been obtained, it will then be possible to assess whether the demographic composition of teachers in telematic universities systematically diverges from that of traditional universities. The following paragraph presents the results of the test applied to the data collected and discusses their interpretation.

Applying the chi-square test to the age distribution of teachers in telematic and traditional universities produced a χ^2 statistic of 673.86, with 9 degrees of freedom, calculated according to the standard formula for contingency tables $(r-1)\times(c-1)$. In this case, the cross-classification between ten age categories and the two institutional types of universities results in $(10-1)\times(2-1)=9$ degrees of freedom. This value, already extremely high compared to the critical thresholds commonly adopted in inferential statistics, indicates a

very marked deviation between the observed frequencies and those that would be expected if the two distributions were independent. The calculation of the p-value, obtained using the chi-square distribution function, returns to a value of 2.87×10^{-139}, i.e., a number so close to zero that it is, for all practical purposes, indistinguishable from it. A p-value of this magnitude implies that the probability of observing a difference between the two distributions at least equal to that found, assuming that the two populations really had identical demographic structures, is extremely low. In other words, the result provides very strong evidence against the null hypothesis of independence between the type of university and the age distribution of teachers. The differences observed cannot be attributed to chance but reflect an actual structural misalignment between telematic universities and traditional universities.

This result confirms and reinforces what has already emerged in the descriptive analysis: the two university models have profoundly different demographic configurations. Telematic universities are characterized by a lower presence of young faculty members and, at the same time, a relatively higher concentration in the more advanced stages of their careers, while traditional universities show a more balanced distribution across the entire age range. The chi-square test therefore allows us to state, with unassailable statistical certainty, that these discrepancies are neither episodic nor marginal, but represent a distinctive and systematic feature of the two academic systems.

In conclusion, the inferential analysis confirms that the age distribution of teaching staff does indeed depend on the type of university. Telematic and traditional universities have significantly different internal demographic structures, and this divergence is an essential element in understanding the dynamics of recruitment, consolidation, and development of the two university models.

Cramér's V

Once the chi-square test established that there is a statistically significant difference between the demographic distributions of telematic and traditional universities, it is necessary to assess the intensity of that difference. The chi-square test allows us to determine whether the two variables are associated, but it does not provide any indication of the strength of the association. For this reason, in analyses involving contingency tables, it is standard practice to combine statistical significance with an effect size index.

One of the most used measures for this purpose is Cramér's V, a normalized coefficient that ranges between 0 and 1 and allows us to quantify the strength of the association regardless of sample size. Unlike chi-square, which is strongly influenced by the amount of data, Cramér's V provides a standardized and comparable assessment, allowing us to determine whether the observed difference is only statistically significant or also substantial from an interpretative point of view. In the context of this analysis, the use of Cramér's V allows us to determine how much the age distribution of teachers depends on the type of university, overcoming an interpretative limitation of chi-square alone and offering a summary measure of the magnitude of the effect. Based on the results obtained, it will then be possible to understand whether the differences observed

are numerically relevant or whether, despite being statistically significant, they have a limited substantive impact.

The Cramér index, calculated from the chi-square statistic obtained in the previous analysis, returns a value of 0.12. Although the chi-square test has unequivocally shown that the age distribution of teachers differs significantly between telematic and traditional universities, the extent of the association detected by Cramér's V is modest. This indicator, which varies between 0 and 1, does not measure the statistical significance of the difference, but the strength of the link between the two variables. A value of 0.12 indicates that, although there is a systematic relationship between the type of university and age distribution, this relationship is not particularly strong. In substantive terms, the two university models do indeed have different demographic profiles, but their overall distance is not extreme: the most marked differences emerge mainly in the younger age groups and among the over-65s, while the middle age groups show greater overlap. Cramér's V therefore allows us to complete the interpretation of the chi-square: the difference between the distributions is not random, but its magnitude is limited, confirming that telematic universities have a distinctive demographic structure without, however, constituting a model that is totally distinct from that of traditional universities.

Welch's t-test

When comparing the average ages of teachers at telematic and traditional universities, it was necessary to use a statistical method that would allow for a rigorous assessment of whether the differences observed between the two groups were attributable to real variation or random fluctuations. To this end, Welch's t-test was used, a variant of the better-known Student's t-test, which is particularly suitable in cases where the groups have non-homogeneous variances and different sample sizes. This condition accurately describes the situation under examination: on the one hand, the academic staff of traditional universities, which is much larger and characterized by greater age dispersion; on the other hand, a smaller group of telematic teachers, with a less extensive age distribution but not overlapping with the previous one.

The Welch test allows two means to be compared by appropriately weighing the variances of the groups, avoiding the often-unrealistic assumption of equal variances. The principle is to estimate the probability that the observed difference between the two means could have been generated under the null hypothesis of equality, and to quantify this evidence using a t-statistic and a corresponding p-value. Since the calculation of degrees of freedom in the Welch test is derived from a specific formula that combines the variances and sample sizes, the test provides a more reliable assessment than the classic version when homoscedasticity conditions are not guaranteed.

In the context of this analysis, the use of Welch's t-test made it possible to accurately examine the difference between the average age of teachers in the two university systems, integrating the evidence already emerging from the analysis of the overall distributions and offering further confirmation of the nature of the structural differences between telematic and traditional universities.

To verify whether the observed difference between the average age of teachers at telematic and traditional universities was attributable to chance or reflected a systematic divergence between the two groups, Welch's t-test was applied. This procedure is particularly appropriate in our context, as it allows us to compare two sample distributions with different numbers and variances without assuming equality of variances, as required by the classic t-test. The analysis was conducted using the central values of the age groups as representative of their respective ranges, replicated according to the frequencies observed for each group, so as to obtain two fully comparable sample sets.

The test returned a t-statistic value of –17.62, accompanied by 5454.08 degrees of freedom. The magnitude of the t-statistic, which is very high in absolute terms, indicates a significant distance between the two sample means relative to the internal variability of the groups. This result is further confirmed by the p-value obtained, equal to 1.198×10^{-67}, an extremely small value that allows us to reject the null hypothesis of equality of means with a substantially total confidence margin. In other words, if the average age of teachers in the two sets of universities were really the same, the probability of observing a difference equal to or greater than that found would be almost zero.

The Welch's t-test statistic is defined as

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}},$$

Where X_1, X_2 are the sample means of the two groups (average age of faculty in traditional and telematic universities), s_1^2, s_2^2 are the sample variances of the two groups (squared standard deviations), and n_1,n_2 are the group sizes. The effective degrees of freedom are calculated with the Welch–Satterthwaite equation,

$$df = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{(s_1^2/n_1)^2}{n_1 - 1} + \frac{(s_2^2/n_2)^2}{n_2 - 1}},$$

and applying these formulas to the data yields $X_1 = 45.7$, $s_1 = 12.5$, $n_1 \approx 41129$ (traditional universities) and $X_2 = 48.9$, $s_2 = 11.3$, $n_2 \approx 4289$ (telematic universities), which results in a test statistic of $t \approx -17.6$ with a very small p-value, indicating that the difference in average age between the two groups is statistically significant.

The results indicate that, if the two-population means were truly identical, the probability of observing a difference as large as, or larger than, the one obtained would be extremely small. The test therefore supports rejecting the null hypothesis of equality, leading to the conclusion that the average age of faculty members in telematic universities is higher than that of their counterparts in traditional institutions. It is important to note that the absolute difference is modest, approximately 3.2 years, yet the statistical robustness of the finding suggests that it cannot be attributed to random variation. This reinforces the interpretation that telematic institutions tend to employ a somewhat older academic workforce, consistent with recruitment strategies that have favoured individuals already in advanced stages of their careers. In this respect, Welch's test proves particularly suitable, as it allows for a comparison between two distributions that are similar in shape but not perfectly homogeneous in their internal variability, providing a reliable assessment of the significance of the differences observed.

Kurtosis and Skewness

After examining the overall differences in the age structure of the teaching staff at the two types of universities and verifying, through significance analysis and comparison of averages, that the demographic profiles of telematic and traditional universities do not coincide, it is possible to examine the shape of their respective distributions in greater detail. This phase of the analysis does not aim to confirm the presence of already documented deviations, but rather to clarify whether these deviations underlie more complex structural configurations.

In the debate on telematic universities, for example, there is a recurring hypothesis that their demographic composition shows a tendency towards polarization, with concentrations in the younger and more advanced career groups, to the detriment of the intermediate classes. To verify whether this impression is empirically supported by the data, it is necessary to examine elements of the distribution that do not emerge from the analysis of means and variance alone, and which require descriptive measures that are more sensitive to the geometry of the curve.

In this perspective, indicators of asymmetric and, above all, kurtosis take on a central role. Asymmetry allows us to identify any imbalances between the young and old tails of the distribution, while kurtosis allows us to understand whether the observations tend to concentrate around a single age group or whether they are more dispersed. A particularly high or, conversely, unusually low kurtosis may suggest anomalous configurations, indicating respectively a strong concentration around a peak or a flattening that could conceal fewer regular structures.

The following analysis, therefore, does not repeat indicators already used but broadens the perspective, seeking to establish whether the differences observed between the two university systems correspond to a single distribution model or whether, on the contrary, more complex profiles are configured. This step is

essential to assess whether, in addition to a different average age, telematic universities have peculiar structural features in the demographic composition of their teaching staff.

The analysis of kurtosis allows us to further examine the structure of the age distributions of faculty members in the two groups of universities. The calculated values, equal to k = 1.79 for traditional universities and k = 1.98 for telematic universities, indicate in both cases a platykurtic shape, i.e., flatter than the normal distribution (whose theoretical value is 3). This means that the ages of academic staff in both systems tend to be distributed relatively evenly, with a less marked concentration around the mean and less pronounced tails than in a leptokurtic distribution.

Despite this general similarity, the slight difference observed between the two values is significant from an interpretative point of view. The higher kurtosis of telematics suggests a slightly more concentrated distribution around the average age and, at the same time, a greater presence of values distant from the average compared to traditional ones. In other words, although no real multimodality emerges, the age distribution in telematic universities shows a tendency to combine a more compact central range with a certain persistence of older ages, consistent with the recruitment model already highlighted above, characterized by a relatively low presence of very young teachers and a proportionally higher share of professors over 65 years of age. Traditional universities, on the other hand, have a flatter overall distribution, reflecting greater internal heterogeneity and a more balanced representation of different age groups. This result also fits into a picture that has already emerged in previous analyses, where traditional universities showed a more stable generational turnover and a more significant presence of teachers in the early stages of their academic careers.

Overall, the kurtosis values confirm that the two distributions, while not radically different, reflect distinct organizational models: more concentrated and skewed towards mature age in the case of telematic universities, more evenly distributed in the case of traditional universities.

After examining the kurtosis, which provides an indication of the concentration of values around the mean, it is necessary to broaden the analysis by also considering how the ages of teachers are distributed around the center. To address this aspect, we use the skewness index, which allows us to assess whether the curve tends to slope toward younger or older ages. This information naturally complements what has already been obtained from the kurtosis, as it no longer concerns the 'height' of the distribution but its direction of imbalance. A positive skewness indicates that the tail extends towards older ages, implying that the main part of the distribution is concentrated on relatively young values. When the index takes on a negative value, the opposite occurs: the greater weight is concentrated on the more mature age groups, and the tail shifts to the left. This parameter therefore makes it possible to assess whether the differences that have already

emerged between telematic and traditional universities, in terms of dispersion and compactness, are also accompanied by a different distribution orientation.

The introduction of skewness fits coherently into the analysis carried out so far. After clarifying that neither distribution shows marked 'punctuality' around the mean, the asymmetry index allows us to understand in which direction they tend to shift and with what intensity. This step is particularly important because the recruitment models adopted by the two university systems can produce different demographic configurations not only in terms of variability but also in terms of how the entire distribution is positioned relative to the mean.

Applying the formula based on third-order central moments to the age distributions of the two groups of universities reveals some interesting differences. For traditional universities, the skewness is $g = 0.12$, while for telematic universities it is $g = 0.09$. In both cases, the value is positive, albeit modest, indicating a slight tendency for the distributions to have a longer tail towards the older age groups. This is not an unexpected anomaly: academic careers, especially in structured roles, require a long time to mature, and this tends to shift the center of gravity of the distribution to the right.

What is more relevant, however, is the comparison between the two categories of universities. The higher skewness value of traditional universities suggests that, within this group, the presence of professors in the more advanced stages of their careers is relatively more pronounced than in telematic universities. The age distribution in traditional universities therefore shows a slightly more pronounced right tail, consistent with a system characterized by established career paths, slower turnover cycles, and a greater weighting of senior staff. Telematic universities, while also showing a slight asymmetry towards older ages, have a less pronounced skewness. This result can be interpreted as the combined effect of two phenomena already highlighted in previous analyses: on the one hand, the lower use of young researchers in the early stages of their careers, and on the other, recruitment that also includes a significant proportion of senior lecturers, sometimes already nearing the end of their traditional academic careers. Together, these factors generate a more compact overall distribution, with a marked central peak and a less extended right tail than traditional distributions.

In summary, the skewness values confirm a picture that has already emerged through the chi-square test and the analysis of kurtosis: the age distributions of the two university systems have different structures, but do not diverge radically. Traditional universities show a slightly higher concentration in the senior age groups, while telematic universities show a more centered profile that is less skewed towards the upper age groups. These are small but significant differences, reflecting the distinctive recruitment models and institutional trajectories of the two sectors.

Summary of statistical analysis results

The set of analyses conducted on the demographic distribution of academic staff in the two groups of universities – traditional and telematic – allows us to outline a robust and statistically sound comparative picture. The various tools used, while operating on different analytical levels, converge in highlighting recognizable, albeit not extreme, structural differences between the two university models.

The first element of evaluation derives from the chi-square test, applied to the distribution of teachers in the ten age groups defined by the MUR. The value obtained ($\chi^2 = 673.86$, with 9 degrees of freedom) and the extremely small p-value ($p = 2.88 \times 10^{-139}$) unequivocally indicate that the age distribution is not independent of the type of university. The two populations are therefore not extracts from the same distribution: there are systematic discrepancies between the demographic profiles of teachers at traditional universities and those at telematic universities. However, the measure of the intensity of this association, provided by Cramér's V, returns to a value of 0.12, which should be interpreted as a small effect. This suggests that the differences, although clearly present, are not such as delineating two radically divergent demographic structures; rather, they are concentrated in specific segments of the distribution. Welch's t-test, designed to compare the average ages of the two populations, adds a further piece of interpretation. The value obtained ($t = –17.62$, with $df \approx 5454$) and the relative p-value (1.19×10^{-67}) show that the difference between the two averages is statistically significant. The estimated average age for telematic university professors is in fact higher than that of traditional university professors. Although this difference is not very large in absolute terms (3.2 years), it cannot be attributed to chance and confirms the presence of a slight shift towards older age groups among telematic university professors. This data is consistent with previous observations on recruitment strategies, which are often geared towards individuals who are already mature from an academic point of view.

The assessment of the overall shape of the distributions, obtained using the kurtosis and skewness coefficients, completes the picture. The kurtosis values ($k = 1.79$ for traditional universities and $k = 1.98$ for telematic universities) indicate a flatter distribution than normal in both cases, although telematic universities show a slightly more concentrated curve around the central values. This suggests that telematic teaching is more concentrated in the middle age groups, while the traditional distribution is more ‘spread out’, reflecting greater career heterogeneity.

Skewness, calculated using third-order central moments, provides convergent indications. The values obtained ($g = 0.12$ for traditional universities and $g = 0.09$ for telematic universities) reveal a slight positive asymmetry in both distributions, i.e., a longer tail towards older ages. However, the asymmetry is more pronounced in traditional universities, where the presence of senior lecturers appears to be relatively more consistent, while in telematic universities the distribution is more centered and less skewed towards older age groups.

Taken together, these results allow us to draw some systematic conclusions. Traditional universities maintain a broader and more articulated age distribution, with greater representation of both younger and older age groups, consistent with a system equipped with established progression mechanisms and career paths spanning several decades. Telematic universities, on the other hand, have a structure that is more concentrated in the middle age groups and a more limited intake of young teachers, combined with the presence of some senior profiles, often coming from late transitions or career retraining. However, there is no evidence of bimodality or marked fractures: the differences are systematic but not extreme, reflecting distinct institutional models rather than anomalous dynamics.

Ultimately, the joint analysis of descriptive and inferential metrics confirms that the two university systems have different demographic configurations, consistent with their institutional history, their respective recruitment mechanisms, and the role, traditional or telematic, they play in the overall structure of the Italian academic system.

3. Academic mobility between telematic and traditional universities

In the context of the Italian university system, the concept of academic mobility can take on different meanings depending on the level of analysis adopted. In a broad sense, mobility can refer to the transition between individual universities, a change in role or contract type, a change in the scientific affiliation declared in publications, or temporary forms of collaboration such as visiting professorships, substitute teaching positions, or contract assignments. However, an analysis that includes all these dimensions indiscriminately would risk producing results that are difficult to interpret and poorly comparable over time.

Considering the objectives of this research, academic mobility is therefore defined in a structural and institutional sense, as the transfer of a teacher between two different types of universities, distinguishing exclusively between:

- Traditional, state and non-state universities
- Telematic universities, recognized by the Ministry of University and Research.

From this perspective, a professor is considered mobile if, during their career, they are affiliated in different years with universities belonging to different types (traditional → telematic or telematic → traditional). The following are not included in the definition adopted:

- transfers between universities of the same type

- changes in role or contractual status within the same university
- multiple or temporary affiliations not accompanied by a formal change of location
- affiliations declared exclusively in bibliometric terms.

This methodological choice responds to two main needs. First, it allows for a high degree of consistency with the theoretical framework of the thesis, which aims to compare two institutional models of universities rather than individual organizational realities. Second, it significantly reduces information noise and misclassification problems by focusing the analysis on observable, formally recorded, and longitudinally comparable transitions.

It is important to emphasize that this definition does not intend to capture all possible forms of academic mobility, but only those that reflect a stable relocation of the teacher within a different university model. In this sense, the mobility analyzed represents an indicator of the dynamics of interaction between traditional and telematic universities, rather than a general measure of the fluidity of individual academic careers.

The analysis of academic mobility flows is based on official data published by the Ministry of University and Research through the CercaUniversità (CINECA) platform, which provides personal and professional information on teachers and researchers working at all Italian universities, including traditional state and non-state universities, as well as recognized telematic universities. For each individual, it is possible to reconstruct, on an annual basis, the university of affiliation, the academic role held, and the reference year.

The time frame considered covers the period 2000–2023. This choice is motivated by two main factors. On the one hand, the data are systematically available and sufficiently reliable from the early 2000s onwards; on the other hand, this interval allows us to observe academic careers before and after the introduction of telematic universities into the Italian university system. As discussed in the previous chapter, the first telematic universities were recognized between 2004 and 2006, making it impossible, by definition, for anyone to move to this type of university in previous years. In light of this, the period 2000–2003 is interpreted as a baseline phase, in which all affiliations observed necessarily refer to traditional universities. Starting in 2004, however, it becomes possible to observe the first transitions between the two types of universities. This temporal asymmetry does not represent a distortion of the analysis, but a structural feature of the phenomenon studied, which is explicitly incorporated into the methodological approach.

The reconstruction of individual trajectories is carried out according to the following procedure. For each teacher included in the sample, an annual chronological sequence of the university of affiliation is created. Each annual observation is then recoded into a dichotomous variable that identifies the type of university (traditional or telematic). Starting from this sequence, it is possible to identify:

- careers spent entirely in traditional universities

- careers spent entirely at telematic universities
- trajectories characterized by one or more transitions between the two types.

The unit of analysis is the individual teacher, observed longitudinally. All teachers in the database are included, regardless of academic role, in order to maximize observational coverage; the role is then used as a control variable. However, as will be discussed in the following sections, academic role and age are treated as explanatory and control variables, to avoid structurally different forms of mobility being improperly assimilated.

This approach allows us to build a consistent longitudinal database, based on official and homogeneous information over time, suitable both for a descriptive analysis of aggregate flows and for the estimation of statistical models aimed at identifying the observable determinants of mobility between traditional and telematic universities.

The final dataset is organized in a teacher-year panel format. An extract of the original observations is provided in Appendix A.

This section presents a descriptive analysis of academic mobility flows between traditional universities and telematic universities, with particular attention to the differences between academic groups and their evolution over time. In line with the definition introduced above, mobility is identified exclusively as a transition between types of university observed in consecutive years.

The analysis of academic mobility flows is based on the longitudinal reconstruction of the individual careers of the teachers present in the database. Starting from the annual institutional affiliation data, a longitudinal panel was constructed in which each observation corresponds to a teacher-year pair.

For each teacher, the observations were sorted chronologically and used to identify transitions between types of universities in consecutive years. In line with the operational definition adopted, a mobility transition is recorded only when a faculty member is affiliated with a different type of university than in the previous year (traditional university → telematic university, or vice versa). Non-consecutive observations over time and permanence in the same type of university are considered missing data or absence of mobility, respectively.

The unit of analysis of flows is therefore the annual transition observed between two consecutive years in the career of each teacher. Based on these transitions, mobility flows are aggregated by year and then summarized in multi-year sub-periods in order to reduce the volatility of annual values and take into account the institutional evolution of the university system. In particular, the observation period is divided into five sub-periods: 2000–2005, 2006–2010, 2011–2015, 2016–2020, and 2021–2023. This division makes it possible to distinguish between the phase prior to the introduction of telematic universities, the initial phase of the

phenomenon's emergence, and the subsequent phases of consolidation. To take into account structural differences throughout the academic career cycle, teachers are classified into four macro-categories of roles: researchers, associate professors, full professors, and extraordinary professors. This classification allows for separate analysis of mobility dynamics in different career stages, preventing heterogeneous phenomena from being improperly aggregated.

Finally, in addition to absolute flows, the analysis uses transition rates calculated as the ratio between the number of professors who make an inter-typological transition each year and the total number of professors belonging to the type of university of origin in the same year. This choice allows for a comparison of the relative intensity of mobility over time and between groups, considering the significant differences in size between traditional and telematic universities.

2000-2005

The period 2000–2005 represents a structural baseline phase for the analysis of academic mobility flows between traditional universities and telematic universities. In fact, during these years, telematic universities were not yet operational or fully integrated into the Italian university system, having only been formally recognized starting in the two-year period 2004–2006. Consequently, all affiliations observed in the period under consideration necessarily refer to traditional universities. This implies that it is theoretically impossible to observe any inter-typological transition, either into or out of telematic universities.

Table 3.1 shows, for each year of the period 2000–2005, the total number of transitions observed between consecutive affiliations, all of which can be traced back to the traditional → traditional type.

Table 3.1 – Academic mobility flows during the baseline period (2000–2005)

YEAR	TRANSITION TYPE	N. OF CASE
2000	traditional → traditional	42.810
2001	traditional → traditional	49.881
2002	traditional → traditional	52.364
2003	traditional → traditional	51.266
2004	traditional → traditional	51.569
2005	traditional → traditional	53.901

Source: based on MUR data – CercaUniversità platform[20]

The total absence of flows between different types should not be interpreted as a sign of immobility in the academic system as a whole, but rather as a direct consequence of the institutional constraints of the period.

In these years, the mobility observed reflects only movements within the traditional university system, without it being possible to distinguish between dynamics of attraction or outflow towards alternative university models. This phase therefore has a dual analytical function. On the one hand, it allows us to verify the consistency and completeness of the longitudinal data, showing a flow structure compatible with the regulatory context of the time. On the other hand, it provides an essential basis for comparison for the interpretation of subsequent periods, in which the entry of telematic universities will make new trajectories of inter-institutional mobility observable.

In this sense, the period 2000–2005 provides a necessary reference point for assessing whether and to what extent the emergence of telematic universities has introduced discontinuity in academic career paths.

2006-2010

The five-year period from 2006 to 2010 represents a phase of institutional transition in the Italian university system, coinciding with the operational launch of the first telematic universities. Starting from this period, it became possible for the first time to observe academic mobility flows between traditional universities and telematic universities, albeit initially to a very limited extent.

Table 3.2 shows the distribution of mobility flows between the different types of universities for each year of the period considered. Alongside the persistence of the dominant component of traditional → traditional transitions, both traditional → telematic transitions and, to an even lesser extent, telematic → traditional transitions emerged for the first time.

Table 3.2 – Academic mobility flows between types of universities (2006–2010)

YEAR	TRAD → TRAD	TRAD → TELEM	TELEM → TRAD	TELEM → TELEM
2006	55.168	2	0	0
2007	54.724	2	0	26
2008	54.703	5	0	71
2009	50.875	4	1	122
2010	48.568	5	6	226

Source: based on MUR data – CercaUniversità platform[20]

In the period 2006–2010, transitions to telematic universities remained marginal in terms of numbers compared to the overall size of the academic system. However, their emergence marked a significant qualitative change: for the first time, the Italian university system was no longer characterized by a single institutional type.

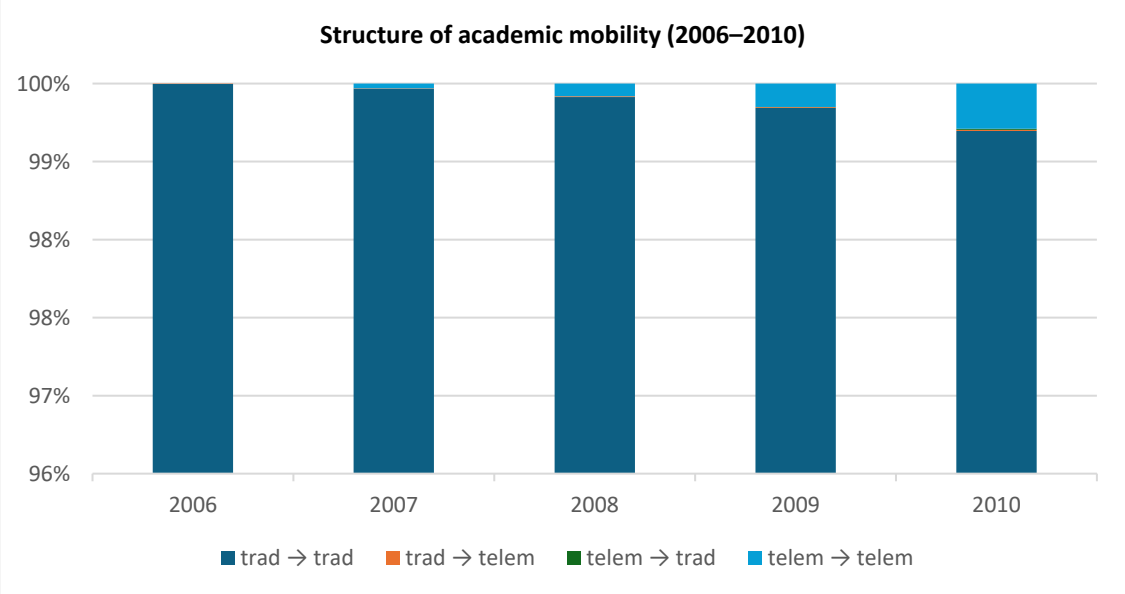
Transitions from traditional to telematic universities were initially very limited, with values ranging from 2 to 5 cases per year. In relative terms, these transitions represent an extremely small proportion of the total number of transitions observed, as confirmed by the transition rates calculated on the total number of teachers affiliated with traditional universities.

At the same time, since 2007, there has been a growing number of careers spent entirely within telematic universities, as indicated by the gradual increase in telematic → telematic transitions. This trend reflects the gradual consolidation of these institutions, which are beginning to build their own permanent teaching staff.

Telematic → traditional transitions, on the other hand, were virtually non-existent until 2008 and remained extremely limited in subsequent years, suggesting that, in this initial phase, mobility is mainly oriented towards telematic universities rather than away from them.

It is important to note that the flows observed during this period do not yet allow for robust interpretations of the individual motivations behind mobility. Rather, the small numbers suggest that we are in a phase of institutional experimentation, in which telematic universities are beginning to attract a limited number of faculty members, without significantly affecting the overall balance of the academic system. However, this phase paves the way for the dynamics that can be observed in subsequent periods, when the increase in the size of the telematic sector will enable a more structured analysis of flows, including in relation to the academic role and career position of the teachers involved.

Figure 3.1- Structure of academic mobility between traditional and telematic universities (2006-2010)



Source: based on MUR data – CercaUniversità platform [20]

2011-2015

The period 2011–2015 marks a phase of consolidation and progressive structuring of telematic universities within the Italian university system. Compared to the previous five-year period, mobility flows between traditional universities and telematic universities become more clearly observable and structurally identifiable, although they remain quantitatively limited when compared to the overall size of the system.

Table 3.3 shows the evolution of mobility flows during the period considered, distinguishing between the four possible types of transition.

Table 3.3 – Academic mobility flows between types of universities (2011–2015)

YEAR	TRAD. → TRAD.	TRAD. → TELEM.	TELEM. → TRAD.	TELEM. → TELEM.
2011	49.128	1	0	287
2012	48.910	6	4	282
2013	47.787	19	7	358
2014	46.399	6	6	520
2015	45.682	3	4	591

Source: based on MUR data – CercaUniversità platform [20]

In the five-year period 2011–2015, there was a gradual increase in the absolute number of teachers permanently affiliated with telematic universities, as evidenced by the growth in telematic → telematic transitions. This trend signals the transition from an initial experimental phase to a phase of stabilization of the teaching staff within telematic universities.

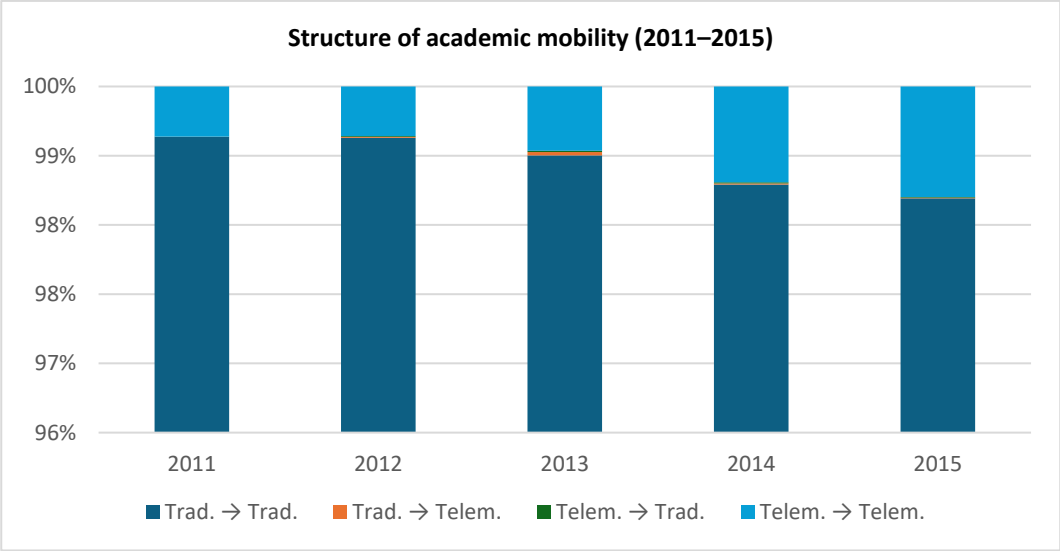
At the same time, traditional → telematic transitions show a slight increase compared to the previous period, with a peak in 2013. Although these flows remain numerically marginal, their persistence over time suggests that access to telematic universities is no longer an episodic phenomenon, but a structural component, albeit a minority one, of academic career trajectories.

Transitions in the opposite direction (telematic → traditional) are present in almost all years of the period but continue to represent a very small proportion of the overall flows. This indicates that, once they have entered the telematic sector, teachers tend to remain there, at least in the short term observed.

Overall, the period 2011–2015 can be interpreted as a phase in which inter-typological mobility took on a more defined form, without significantly altering the general structure of the Italian university system. Mobility remains heavily skewed towards traditional universities, but telematic universities are beginning to establish themselves as an autonomous institutional segment with its own internal dynamics. This evolution makes it possible, starting from this period, to conduct a more detailed analysis of flows, considering not only

the direction of mobility but also the individual characteristics of the teachers involved, starting with their academic role.

Figure 3.2- Structure of academic mobility between traditional and telematic universities (2011–2015)



Source: based on MUR data – CercaUniversità platform.

2016-2020

The period 2016–2020 represents a phase of structural consolidation of relations between traditional universities and telematic universities in the Italian university system. In recent years, telematic universities have become fully institutionalized, and the mobility observed can no longer be interpreted as a transitional or experimental phenomenon.

Table 3.4 shows, for each year, the distribution of academic transitions between the two types of universities in the period 2016–2020.

Table 3.4 – Annual academic mobility flows between types of universities (2016–2020)

YEAR	TRAD → TRAD	TRAD → TELEM	TELEM → TRAD	TELEM → TELEM
2016	45.489	2	5	557
2017	44.891	3	8	610

2018	45.500	4	8	648
2019	46.325	12	8	665
2020	46.944	4	10	678

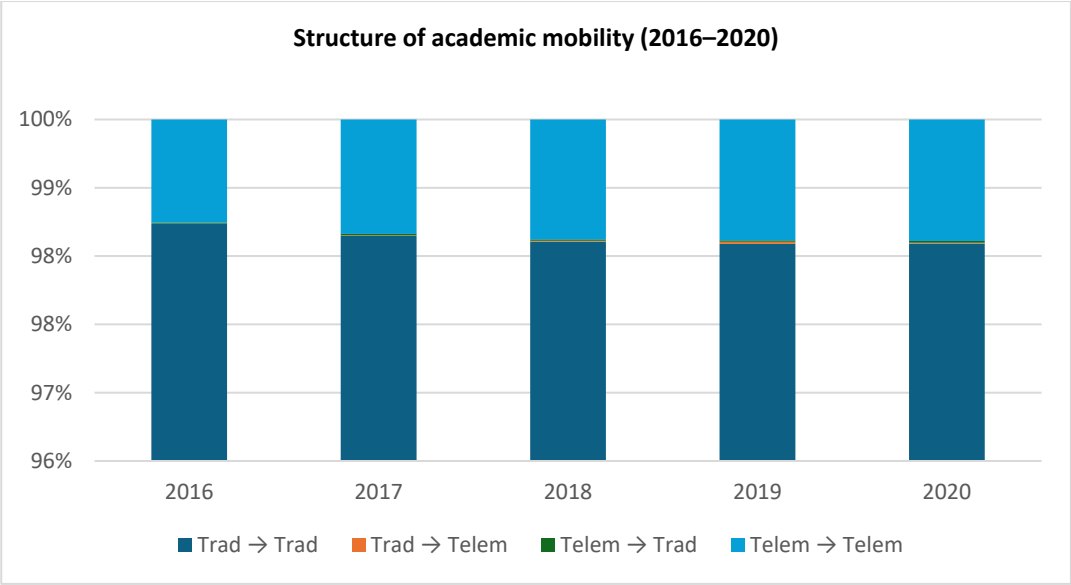
Source: based on MUR data – CercaUniversità platform [20]

The dominant factor remains the strong persistence within traditional universities. In each year of the period considered, over 43,000 teachers were affiliated with traditional universities in two consecutive years, confirming the structural stability of this segment of the university system. Transitions from traditional universities to telematic universities are numerically very limited. The number of transitions varies from a minimum of 2 cases in 2016 to a maximum of 12 cases in 2019, never exceeding thresholds that could indicate a systematic attractiveness of telematic universities to academic staff from the traditional sector. At the same time, there is growing internal stability within telematic universities. The number of teachers who remain affiliated with telematic universities for two consecutive years is gradually increasing, from 557 in 2016 to 678 in 2020. This trend suggests a process of career consolidation within telematic universities, rather than a dynamic of high turnover.

However, it is important to note that mobility is not unidirectional. In each year of the period considered, there were transitions from telematic universities to traditional universities, with values ranging from 5 to 10 cases per year. Although quantitatively limited, these flows indicate that affiliation with a telematic university does not necessarily represent a terminal position in an academic career and that a certain permeability between the two institutional models remains over time.

Overall, the empirical evidence for the period 2016–2020 describes a system characterized by stable coexistence between traditional and telematic universities. Telematic universities do not emerge as either a marginal short-term pool or a hub capable of significantly attracting academic staff from traditional universities. Rather, they are a distinct but integrated segment of the university system, characterized by low levels of inter-typological mobility and progressive internal stabilization.

Figure 3.3- Structure of academic mobility between traditional and telematic universities (2016–2020)



Source: based on MUR data – CercaUniversità platform [20]

2021-2023

The period 2021–2023 represents the most recent phase of the analysis and allows us to observe the dynamics of academic mobility in a now fully mature context, in which telematic universities are firmly integrated into the Italian university system. Compared to previous periods, there are signs of a selective intensification of mobility, although inter-typological flows remain quantitatively limited.

Table 3.5 shows the annual flows of academic mobility between traditional and telematic universities in the period 2021–2023.

The analysis of mobility flows is limited to the year 2023, which represents the last year for which it is possible to observe complete transitions between two consecutive years.

Table 3.5 – Academic mobility flows between traditional and telematic universities (2021–2023)

YEAR	TRAD → TRAD	TRAD → TELEM	TELEM → TRAD	TELEM → TELEM
2021	48.234	4	9	570
2022	50.846	25	10	621
2023	52.914	71	8	746

Source: based on MUR data – CercaUniversità platform[20]

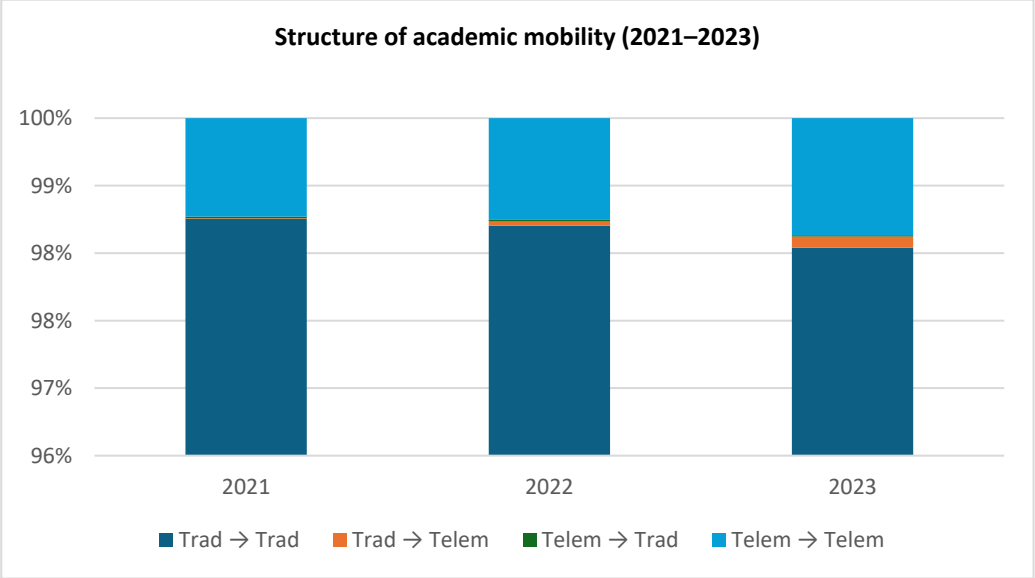
In the four-year period 2021–2023, enrolment in traditional universities continues to be the dominant component of the system, with an increasing number of Traditional → Traditional transitions, consistent with the overall expansion of the panel observed in recent years. Compared to previous periods, however, there

is a more marked increase in transitions from traditional to telematic universities. Year 2023 represents a significant peak, with 71 cases of Traditional → Telematic transitions, a figure significantly higher than those recorded in the previous five-year periods. Although numerically limited in relation to the overall size of the system, these flows indicate greater permeability between the two institutional models. Transitions from telematic universities to traditional universities remain limited and relatively stable, fluctuating between 8 and 10 cases per year. This trend suggests that the reverse transition continues to represent a minority trajectory.

Remaining within telematic universities (Telematic → Telematic) shows high and increasing values until 2023, signaling a further consolidation of academic careers in this segment.

These results suggest that, in the most recent phase, mobility between traditional and telematic universities not only persists but is becoming more empirically visible, emerging as a structural, albeit marginal, phenomenon in the Italian university system.

Figure 3.4- Structure of academic mobility between traditional and telematic universities (2021–2023)



Source: based on MUR data – CercaUniversità platform[20]

Comparative summary of mobility flows (2011–2023)

The analysis of academic mobility flows between traditional universities and telematic universities in the three periods considered (2011–2015, 2016–2020, and 2021–2023) shows an extremely stable structure over time, characterized by overall low levels of inter-type mobility and a strong persistence of careers within the same type of university.

In all the periods analyzed, the dominant flow is represented by permanence in traditional universities (traditional → traditional). This result reflects the quantitative size of the traditional sector, but also a high

level of job stability that remains unchanged over time, with no signs of erosion due to the expansion of telematic universities. Transitions from traditional to telematic universities are systematically rare in every period. Although there has been a gradual increase in the absolute number of transitions, particularly in the most recent period (2021–2023), these flows remain marginal when compared to the overall population of traditional university faculty. This suggests that telematic universities do not exert a significant attraction on the established faculty of traditional universities.

At the same time, there is a clear trend towards internal consolidation within telematic universities. The number of faculty members who remain affiliated with telematic universities in consecutive years (telematic → telematic) grows progressively from the first to the third period, indicating increasing career stability once entry into this segment of the university system has taken place. Flows in the opposite direction (telematic → traditional) are present in all periods but remain at low and relatively stable levels. Their existence indicates that affiliation with a telematic university is not necessarily irreversible, although it remains a statistically infrequent event.

Overall, empirical evidence suggests that the expansion of telematic universities has not led to a substantial rebalancing of academic mobility flows in the Italian university system. Rather, the system appears to be characterized by the coexistence of two institutional models with low mutual permeability, in which mobility between types of universities is a structurally limited phenomenon and not a central mechanism for the allocation of academic staff.

3.1 Academic mobility and role: analysis methodology based on transition rates

The analysis of aggregate flows showed that academic mobility between traditional universities and telematic universities is a quantitatively limited phenomenon. However, interpretation based exclusively on absolute values is potentially misleading, as the different groups of teachers vary greatly in size both over time and between academic roles. In particular, the academic staff of traditional universities is numerically far superior to that of telematic universities, and the different career bands (researchers, associate professors, full professors) vary greatly in size.

To overcome this interpretative limitation, the analysis is extended by calculating transition rates, which allow us to assess the relative probability of mobility between types of universities, given the same size of the reference group. In this perspective, the focus shifts from absolute flows to the propensity for mobility, allowing for more informative comparisons between academic roles and time periods. Transition rates are calculated on an annual basis, considering only transitions between consecutive years. For each teacher, pairs of observations relating to two consecutive years (t and t+1) are identified; a transition is recorded only if the

teacher is present in both years and if institutional affiliation is observable on a continuous basis. This criterion allows for the exclusion of career interruptions or missing observations, reducing the risk of misclassification.

Formally, for each year t, academic role r, and type of university of origin o, the transition rate to a destination type d is defined as:

$$T_{t,r,o\to d} = \frac{N_{t,r,o\to d}}{N_{t,r,o}}$$

Where the numerator represents the number of professors with role r who, in year t, transition from university type o to type d, while the denominator indicates the total number of teachers with role r affiliated with type o in year t and also observable in the following year.

The analysis distinguishes four types of transition:

- traditional → traditional
- traditional → telematic
- telematic → traditional
- telematic → telematic

Particular attention is paid to inter-type transitions (traditional → telematic and telematic → traditional), while intra-type transitions are used as denominators for calculating rates.

To reduce volatility due to low absolute numbers, especially in the case of telematic universities, the results are analyzed both on an annual basis and by aggregating the years into sub-periods consistent with those used in the descriptive analysis of flows (2011–2015, 2016–2020, 2021–2023). This approach allows structural trends to be highlighted without placing excessive weight on short-term fluctuations. Using transition rates, it is therefore possible to assess whether academic mobility to and from telematic universities is systematically associated with specific stages of academic careers, offering a more refined reading of the dynamics observed in the aggregate flows.

A methodological limitation of this analysis concerns the measurement of academic role. Due to data availability constraints, the role associated with each teacher is treated as time-invariant and corresponds to the most recent observed position. As a consequence, career progression over time is not explicitly captured, and some transitions may be attributed to a role that differs from the one effectively held at the time of mobility. Therefore, the results by academic role should be interpreted as indicative of general patterns rather than precise estimates of mobility at each stage of the academic career.

As for researchers, they show the highest levels of inter-type mobility in the entire university system in all periods considered. In the period 2011–2015, the transition rate from telematic universities to traditional ones remained stable at around 2%, while the opposite flow, from traditional universities to telematic ones, remained below 0.05%. This marked imbalance suggests that, in this initial phase, affiliation with a telematic university for researchers is often temporary, serving as a stepping stone back into the traditional university system. In the subsequent period, between 2016 and 2020, the rates of researchers leaving telematic universities for traditional ones remain high, fluctuating between 2% and 3%. At the same time, the rates of entry into telematic universities by researchers from the traditional sector remain extremely low, always below 0.1%. This trend reinforces the interpretation of telematic universities as a segment characterized by greater turnover in the early stages of academic careers, rather than as a stable destination.

In the most recent period, 2021–2023, the transition rate from telematic universities to traditional universities for researchers remains above 2%, while the opposite rate shows a slight increase, albeit remaining below 0.2%. The persistence of this differential indicates that, even at a stage of full maturity of the telematic university system, the latter are not the preferred destination for researchers, but rather an intermediate stage or a temporary solution.

Moving on to associate professors, mobility rates are significantly lower than those observed for researchers in all the periods analysed. In the period 2011–2015, transitions from traditional universities to telematic universities were close to zero, while the reverse flows, from telematic to traditional universities, were less than 2%. This picture indicates greater career stability once the level of associate professor has been reached, as well as a lower propensity to use telematic universities as a channel for mobility. In the period 2016–2020, this pattern remains largely unchanged. Telematic universities show a very limited ability to attract associate professors from the traditional sector, while returns to traditional universities, although present, are neither systematic nor quantitatively significant. Even in the most recent period, 2021–2023, there is a slight increase in the rates of entry into telematic universities by associate professors, but the values remain below 0.05%. The mobility of this group therefore appears to be episodic and not structural.

Finally, full professors have the lowest levels of mobility in the entire system in all the periods considered. In the period 2011–2015, transitions to telematic universities are practically absent, while return flows to traditional universities are extremely limited. This pattern continued in the period 2016–2020, during which transition rates from traditional to telematic universities remained close to zero, and those from telematic to traditional universities rarely exceeded 1%. In the period 2021–2023, there are no signs of significant involvement of full professors in inter-type mobility dynamics. This result contradicts the hypothesis that telematic universities mainly recruit professors at the end of their careers from the traditional sector, suggesting instead that mobility to telematic universities is not a widespread strategy in the advanced stages of academic careers.

Table 3.6 - Transition rates between traditional and telematic universities by academic level and period (2006–2023)

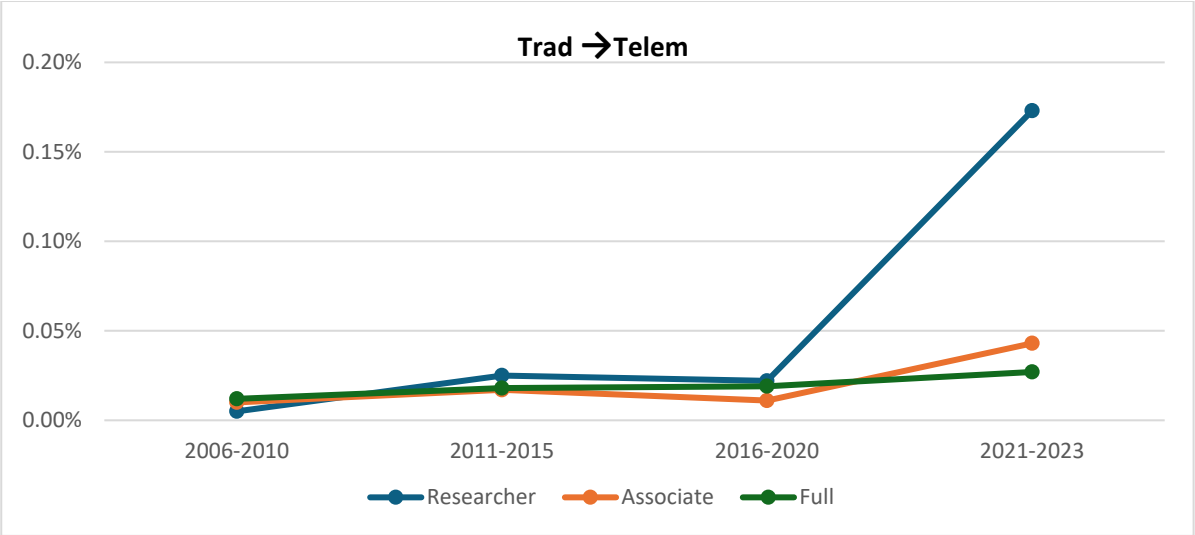
PERIOD	ROLE	TRAD → TELEM	TELEM → TRAD
2006–2010	Researcher	0,005%	2,86%
	Associate	0,010%	0,00%
	Full	0,012%	0,00%
2011–2015	Researcher	0,025%	2,07%
	Associate	0,017%	1,90%
	Full	0,018%	0,00%
2016–2020	Researcher	0,022%	2,43%
	Associate	0,011%	2,53%
	Full	0,019%	0,70%
2021–2023	Researcher	0,173%	2,61%
	Associate	0,043%	1,78%
	Full	0,027%	0,99%

Source: based on MUR data – CercaUniversità (CINECA) [20]

Overall, the analysis of rates confirms that mobility between traditional and telematic universities is a quantitatively limited phenomenon, heavily concentrated in the early stages of careers and mainly taking the form of an outflow from telematic universities to the traditional system. Telematic universities thus emerge more as a transitional space than as a final destination for academic careers, especially for researchers.

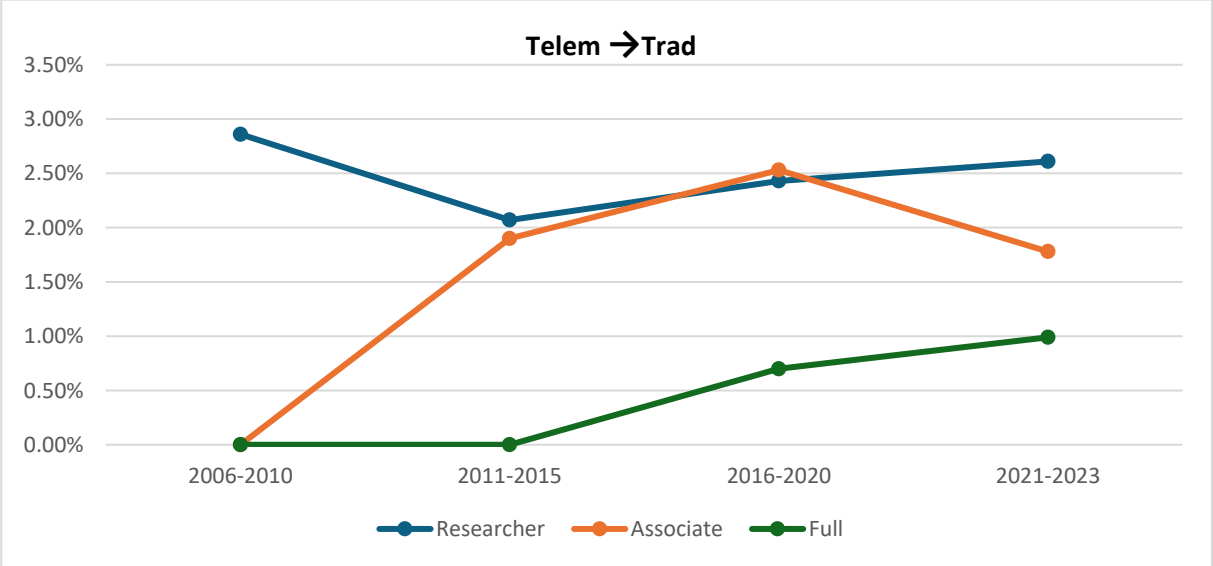
It should be noted that adjunct professors are not included in this reading of rates by role. This choice is motivated by the heterogeneous and often temporary nature of this figure, as well as by the relatively small number of observations, which would make an interpretation of mobility rates in comparative terms less robust.

Figure 3.5- Transition rates from traditional to telematic universities by academic level and period (2006–2023)



Source: based on MUR data – CercaUniversità (CINECA) [20]

Figure 3.6- Transition rates from telematic to traditional universities by academic level and period (2006–2023)



Source: based on MUR data – CercaUniversità (CINECA) [20]

The analysis of the average annual transition rates between traditional universities and telematic universities allows us to integrate and refine what we observed in the examination of absolute flows, offering a comparable measure of mobility in different periods and for different academic groups. Overall, there is a strong structural asymmetry between the two systems: the rate of mobility from traditional universities to telematic universities is extremely low throughout the entire period, while mobility in the opposite direction (telematic → traditional), although involving small absolute numbers, appears to be relatively more frequent when compared to the pool of teachers employed in telematic universities.

This difference can be interpreted as an effect of the different institutional weight of the two types of universities in the Italian system. On the one hand, the traditional system represents the dominant and majority universe in terms of employment; this makes it statistically rare for a teacher to move to the telematic system in proportion. On the other hand, telematic universities represent a quantitatively smaller segment and are therefore more 'sensitive' to departures, so even a relatively modest number of transitions to traditional universities can translate into high rates.

A particularly relevant factor concerns researchers, for whom the rates of departure from telematic universities to traditional ones are consistently higher than for other groups (around 2-3% per year in recent periods). On the contrary, for full and associate professors, the intensity of mobility is generally lower and less regular, suggesting that the interaction between the two university models takes different forms depending on the stage of the career. In the most recent period (2021–2023), there has also been a marked increase in the traditional → telematic rate, especially among researchers. Although this evidence requires caution in its interpretation, it points to a possible strengthening of the attractiveness of telematic universities in recruiting early- and mid-career profiles, at least compared to previous periods.

At this point, it is possible to formulate some interpretative considerations, which are presented explicitly as reasoned hypotheses and not as definitive conclusions. One plausible interpretation is that the telematic system is taking on, at least for some teachers, a 'transitional' or temporary relocation function during their career. In particular, the high relative probability of moving to traditional universities, concentrated mainly among researchers, could reflect the use of telematic universities as an intermediate employment space or contingent professional opportunity, rather than as a stable long-term destination.

At the same time, the increase in traditional → telematic mobility in the most recent period could indicate that telematic universities are gradually expanding their recruitment capacity, or that certain changes in the traditional academic system (career constraints, reduced opportunities, increasing competition) are making the transition to alternative models more frequent. From this perspective, mobility between the two sectors would not be merely a marginal phenomenon, but an indicator of a dynamic relationship between different institutional segments, potentially characterized by forms of complementarity, selection, and redistribution of career opportunities.

4. Academic structure and scientific productivity: a comparative analysis between telematic and traditional universities

The structural characteristics of the faculty are one of the most important factors in understanding how universities operate and evolve. In the previous chapter, significant differences emerged between telematic universities and traditional universities in terms of staff composition, recruitment methods, contractual stability, and demographic profile. These differences are not merely organizational issues; they can directly impact universities' ability to generate scientific knowledge and sustain robust, ongoing research over time.

Considering this evidence, this chapter shifts the focus from the internal composition of the faculty to the observable outcomes of their research activity. If universities differ in the structure of their academic staff, it is indeed reasonable to ask whether these differences also translate into distinct levels of research productivity. This analysis takes on relevance in the Italian context, where telematic universities have experienced rapid expansion, becoming an increasingly visible component of the higher education system. Understanding whether this growth has been accompanied by a comparable capacity for scientific output is therefore essential for interpreting the transformations underway in the national academic landscape.

The assessment of scientific productivity, however, presents an inherent complexity. The quality of research is, in fact, a multidimensional phenomenon that cannot be fully captured through a single quantitative indicator. In this sense, bibliometric tools represent a common analytical compromise in empirical literature, as they allow for the use of standardized parameters that are internationally comparable. Nevertheless, these indicators require interpretive caution, especially when comparing different disciplinary fields characterized by heterogeneous publication and citation practices.

To address this critical issue, the analysis presented in this chapter adopts an approach based on two complementary dimensions of scientific productivity: on the one hand, the quantity of output, measured by the number of articles published over the past five years; on the other, the quality of the journals, assessed using bibliometric indicators of the journals in which the articles are published. Specifically, for each scientific contribution, the SJR (Scimago Journal Rank [22]) of the publishing journal is considered, alongside its classification into quartiles (Q1–Q4), which allows for a more robust comparison across different disciplines. This approach overcomes the limitations associated with the direct comparison of cumulative indicators, facilitating a more coherent understanding of the differences between the two university models.

The chapter therefore presents a comparative analysis of the scientific productivity of tenured faculty members from a selected sample of telematic and traditional universities. The decision to focus on tenured faculty (full professors, associate professors, and researchers) allows for an examination of the most stable segment of the academic body, which is generally more involved in scientific research, thereby reducing potential distortions associated with temporary or primarily teaching positions.

The construction of the sample is a crucial step in ensuring the consistency of comparative analysis. In line with the discussion in the previous chapters, the selection of universities was guided by the need to compare telematic and traditional universities using a sufficiently representative set of cases, while avoiding an overly broad scope of observation that would have made the empirical analysis less robust.

Four telematic universities (Pegaso, eCampus, UniMarconi, and UniNettuno) and four traditional universities (La Sapienza, Bologna, Padua, and the Polytechnic University of Turin) were therefore identified. The choice was not random but considered various factors, including the size of the universities, their level of recognition within the national context, and their ability to represent different organizational models. In particular, the inclusion of the Polytechnic University of Turin allows for the introduction of a university with a strong technical-scientific focus into the group of traditional universities, thereby broadening the diversity of the comparison.

For each university, 25 tenured faculty members were selected, for a total of 200 observations. Faculty members were selected from the official staff lists using a systematic sampling procedure based on alphabetical order, after excluding profiles for which no reliable Scopus Author ID could be identified. The sample thus defined is not intended to statistically represent the entire Italian university system, but rather to provide a coherent and methodologically controlled observational framework, suitable for comparing the two institutional models.

Bibliometric data were collected through the Scopus database, one of the leading international platforms for indexing scientific output, chosen for its broad disciplinary coverage and the presence of author identification systems (Scopus Author ID) that allow publications to be attributed to individual scholars with greater

reliability. For each faculty member, only articles published in the last five years were considered, in order to focus on a more recent and comparable measure of research activity.

For each article, the journal of publication was identified, and its bibliometric indicators were assigned, specifically the SJR score and its corresponding quartile. This allows for an analysis of productivity not only in quantitative terms but also in relation to the relative quality of the journals, considering differences across disciplinary fields.

While acknowledging that these indicators do not fully capture the complexity of scientific quality, they serve as useful proxies for a systematic assessment of differences across various institutional contexts. The analysis is therefore divided into three main stages: an initial assessment of productivity in terms of the number of publications, an analysis of the distribution of articles by journal quality (quartiles), and a more in-depth examination using continuous indicators (SJR), accompanied by robust checks at the faculty level.

4.1 Productivity: number of publications in the last five years

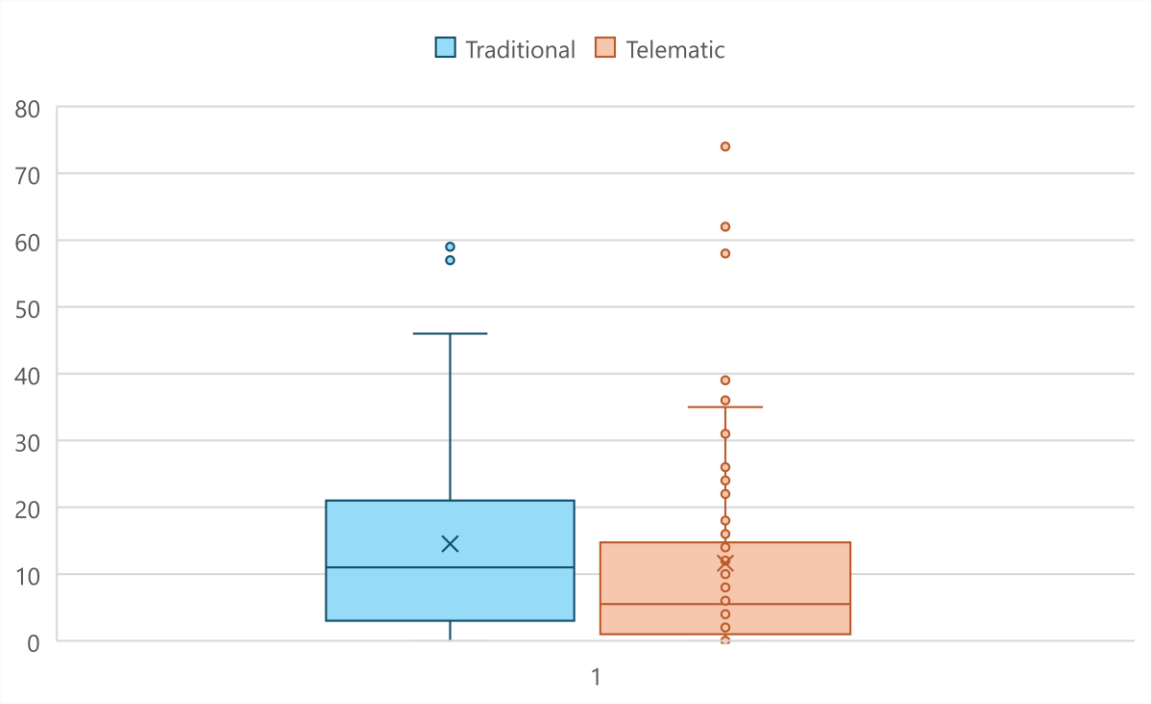
One way to analyze scientific productivity is by examining the volume of output, defined as the number of published articles. From this perspective, the analysis considers the number of articles published by each faculty member over the past five years, limiting itself exclusively to contributions appearing in peer-reviewed scientific journals. This approach ensures an adequate level of comparability across different disciplines, avoiding the inclusion of publication types characterized by heterogeneous editorial standards and dissemination dynamics.

The use of a recent time frame also addresses the need to observe the current level of participation in research activities, reducing the influence of long-term academic trajectories and scientific paths developed in different institutional contexts. In this way, the indicator used allows for a more immediate assessment of research output in the most recent period, providing a more comparable measure between the two groups analyzed.

The descriptive analysis reveals significant differences between telematic universities and traditional universities. Specifically, the median number of publications is 11 for faculty members at traditional universities and 5.5 for those at telematic universities. This disparity suggests that, during the period under consideration, faculty members at traditional universities exhibited a higher level of scientific activity in terms of recent output.

When looking at the mean values, the picture appears somewhat consistent, albeit with a less pronounced difference. The mean number of publications is 14.53 for traditional universities and 11.62 for telematic universities. However, comparing the mean and the median reveals a significant point: the distribution of publications is not symmetrical, particularly in the case of telematic universities.

Figure 4.1- Distribution of the number of publications over the past five years by type of university



	MEAN	ST. DEV.	Q1	MEDIAN	Q3	MIN	MAX
TELEMATIC	11,62	19,97	1	5,5	14,75	0	158
TRADITIONAL	14,53	13,83	3	11	21	0	59

Source: own analysis of Scopus data [21]

Among telematic universities, the gap between the mean and the median is indeed wider, suggesting a highly skewed distribution. This indicates that a relatively small number of faculty members with high levels of productivity are accompanied by a larger proportion of professors with significantly fewer publications. In contrast, in the case of traditional universities, the difference between the mean and the median appears smaller, suggesting a more balanced distribution of productivity among faculty members.

To verify whether the observed differences are attributable to random variations or reflect a structural gap between the two groups, a nonparametric Mann–Whitney statistical test was applied. The choice of this test is motivated by the nature of the data, which exhibit an asymmetric distribution and the presence of outliers—conditions that make the use of parametric tests based on the assumption of normality less appropriate.

The test results indicate that the difference between the two groups is statistically significant ($p < 0.01$), ruling out the possibility that the observed gap is due to chance. In other words, the data provide evidence that faculty members at traditional universities tend to publish, on average, a greater number of articles than faculty members at telematic universities during the period under consideration.

Overall, this initial evidence suggests the existence of a difference in the quantitative dimension of scientific productivity between the two institutional models. However, this result does not exhaust the analysis of scientific performance. The number of publications, in fact, represents only one dimension of productivity and does not provide information on the quality of the journals in which the contributions are published.

For this reason, in the following sections, the analysis will be extended to the qualitative dimension of scientific output, using bibliometric indicators related to the journals in which the articles are published, in order to provide a completer and more detailed picture of the differences between telematic and traditional universities.

4.2 Quality of Scientific Output: Distribution of Journals by Quartile

In addition to the quantitative aspect of scientific productivity, it is essential to consider the quality of the journals in which the articles are published. While the number of publications provides a measure of the intensity of research activity, it does not allow for an assessment of the differences in the standing of journals within their respective disciplinary fields. For this reason, the analysis is supplemented by bibliometric indicators that allow for the evaluation of the relative quality of the journals.

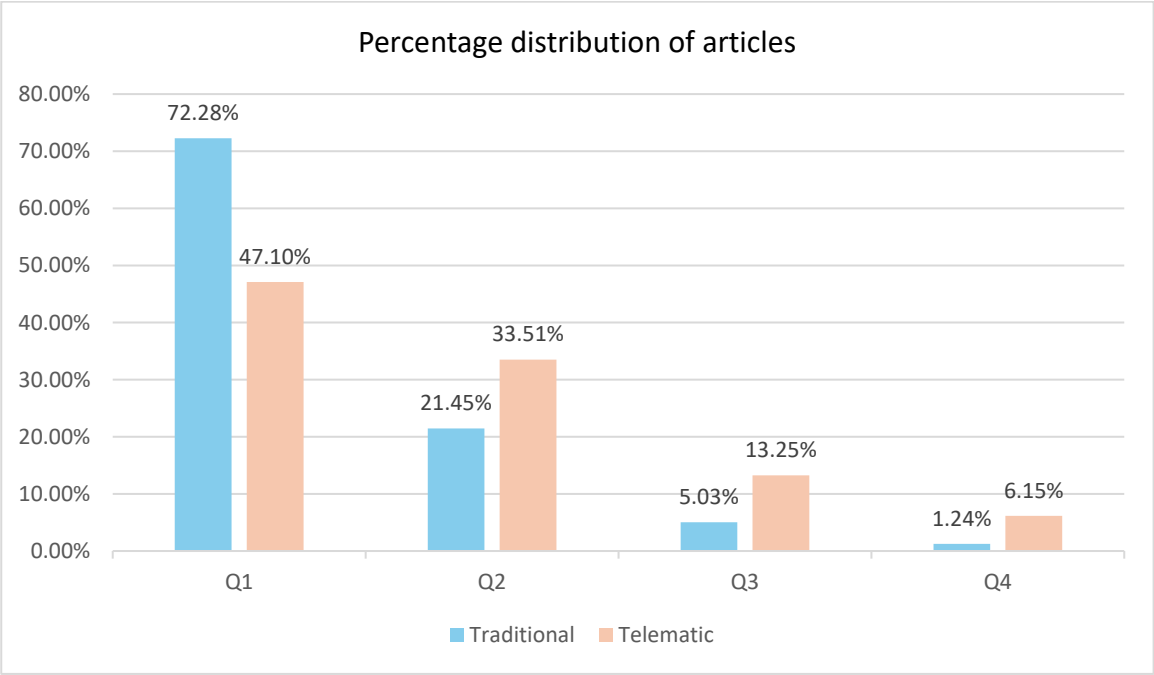
Specifically, we have chosen to classify each article based on the quartile of the journal to which it belongs, using the SJR (Scimago Journal Rank) indicator. The division into quartiles allows each journal to be placed within its disciplinary context, distinguishing between journals in the first quartile (Q1)—which represent the top 25% of journals with the highest relative impact—and journals in the subsequent quartiles (Q2, Q3, and Q4), characterized by progressively lower levels.

This approach is particularly useful in a comparative analysis of universities with a diverse disciplinary composition, as it helps reduce distortions stemming from differing publication and citation practices across

scientific fields. In other words, the quartile serves as a relative measure of editorial quality that makes comparisons between different academic contexts more consistent.

An analysis of the distribution of articles across different quartiles reveals significant differences between telematic universities and traditional universities. Specifically, at traditional universities, 71.9% of publications appear in journals in the first quartile, whereas at telematic universities, this share drops to 46.3%. This gap, amounting to approximately 25 percentage points, represents a significant difference in the ability to publish in high-impact journals.

Figure 4.2-Percentage distribution of articles by journal quartile and university type



Source: own analysis of Scopus data [21]

A closer look at the distribution reveals further points of interest. Telematic universities show a higher concentration of articles in the middle and lower quartiles: 33.0% of publications fall in the second quartile, compared to 21.3% at traditional universities. The difference is even more pronounced in the lower quartiles, where the total share of articles in Q3 and Q4 reaches 19.1% at telematic universities, compared to 6.2% at traditional universities.

Overall, traditional universities show a distribution heavily concentrated in high-impact journals, while telematic universities exhibit a more dispersed distribution across the entire spectrum of quartiles. This result suggests that the differences between the two institutional models are not limited to the quantity of scientific output, but concern, even more markedly, the relative quality of the journals in which research results are published.

To verify the statistical significance of the observed differences, a chi-square test was applied to the distribution of articles across the different quartiles. The results indicate that the relationship between university type and quartile distribution is highly significant ($p < 0.001$), allowing us to rule out the possibility that the observed pattern is attributable to random variations in the sample.

This evidence reinforces the findings in the previous paragraph and helps to paint a coherent picture: traditional universities not only exhibit higher average levels of productivity but are also more oriented toward publications in high-impact journals. In contrast, telematic universities show greater heterogeneity in the distribution of publications, with a more substantial presence in the middle and lower quartiles.

Considering these results, it seems appropriate to supplement the quartile classification with an analysis based on a continuous indicator of journal quality, in order to capture the differences between the two groups in greater detail. In the following section, therefore, attention will be turned to the analysis of the SJR indicator at the individual article level.

4.3 Quality of Scientific Output: Analysis of the SJR Indicator

In order to further explore the qualitative dimension of scientific output, the analysis is extended to include a continuous indicator of journal quality, represented by the SJR (Scimago Journal Rank). While quartile classification allows us to capture differences between groups in terms of the relative distribution of publications, the SJR indicator, on the other hand, allows us to observe these differences with a greater level of detail, avoiding the loss of information associated with a division into discrete classes.

The SJR is a bibliometric indicator that measures the scientific prestige of journals by taking into account not only the number of citations received but also the importance of the citing sources. In particular, citations from more influential journals contribute more significantly to the overall score, according to a network-based evaluation logic that assigns different weights to various sources. This mechanism allows for a more nuanced understanding of journals' positions within the international scientific system, offering a continuous measure of editorial quality.

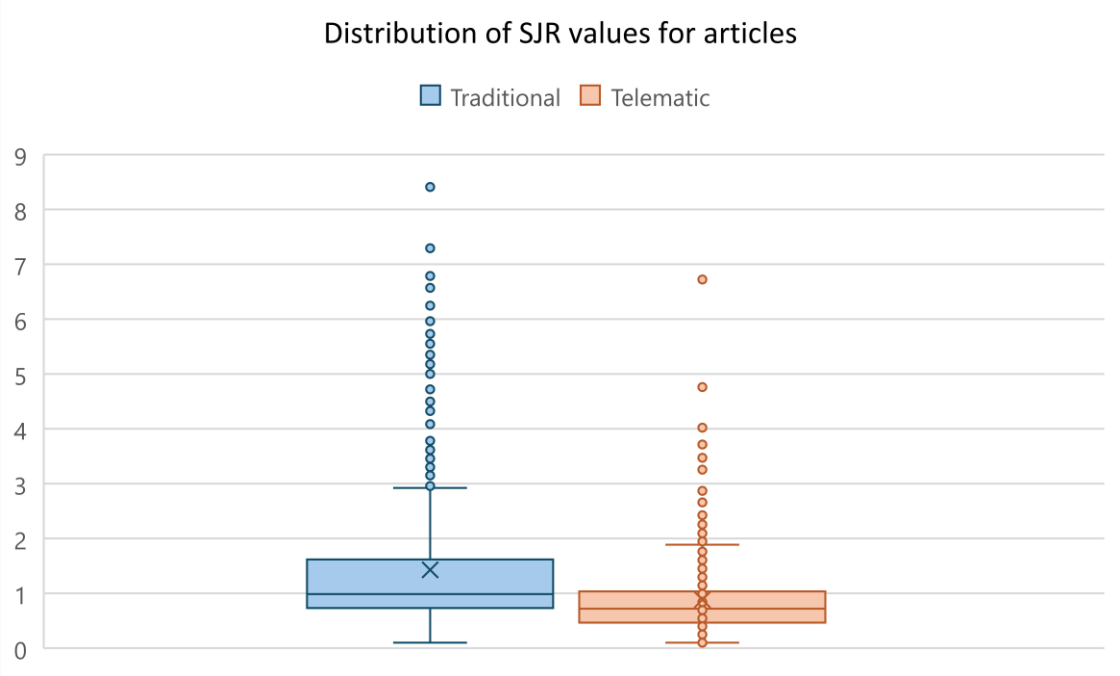
In the context of the proposed analysis, each article was assigned the SJR value of the journal in which it was published, allowing us to construct an overall distribution of values for the two groups under consideration. Unlike quartile classification, this approach allows us to observe not only the relative ranking of the journals but also the magnitude of the differences between them, enabling a more granular comparison between telematic and traditional universities.

The descriptive analysis highlights differences consistent with the findings in the previous paragraph. Specifically, the median SJR value is 0.987 for traditional universities and 0.713 for telematic universities.

Thus, in this case as well, traditional universities show a greater concentration of publications in journals characterized by a higher level of scientific prestige.

When considering the mean values, the gap appears even more pronounced: the mean SJR is 1.416 for traditional universities and 0.865 for telematic universities. The difference between the mean and the median suggests an asymmetric distribution of values, characterized by a few articles published in particularly prestigious journals that contribute to raising the mean value, especially in the case of traditional universities.

Figure 4.3- Distribution of SJR values for articles by university type



	MEAN	ST. DEV.	Q1	MEDIAN	Q3	MIN	MAX	N
TELEMATIC	*0,88*	0,8498	*0,47*	*0,719*	*1,04*	*0,1*	*16,59*	*1155*
TRADITIONAL	*1,43*	*1,60*	*0,73*	*0,987*	*1,62*	*0,1*	*14,13*	*1450*

Source: own analysis of Scopus data [21]

To verify the statistical significance of the observed differences, a nonparametric Mann–Whitney test was applied to the distribution of SJR values. Here too, the choice of a nonparametric approach is justified by the nature of the data, which exhibits a non-normal distribution and the presence of outliers. The test results indicate a highly significant difference between the two groups ($p < 0.001$), confirming that the observed gap is not attributable to random fluctuations.

To verify the robustness of the results with respect to the possible influence of particularly productive individual faculty members, the analysis was replicated at the individual level, considering for each faculty member the average SJR value of their publications. Here too, the differences between the two groups are

confirmed: the median average SJR per faculty member is 1.07 for traditional universities and 0.73 for telematic universities. This result suggests that the observed gap is not attributable solely to the presence of a few outliers but reflects a more generalized difference in publication behavior.

Overall, the analysis based on the SJR indicator significantly reinforces the findings presented in the preceding paragraphs. Traditional universities not only publish, on average, a greater number of articles, but also tend to publish in journals characterized by higher levels of scientific prestige. In contrast, telematic universities show a more limited distribution of SJR values, consistent with a greater presence in the middle and lower quartiles.

These results suggest that the differences between the two institutional models extend beyond the quantitative dimension of scientific output and are even more pronounced in terms of the quality of the journals. The combination of evidence regarding productivity, distribution by quartiles, and SJR values thus allows us to outline a coherent and detailed picture of the differences between telematic and traditional universities, providing a solid empirical basis for the concluding remarks of this chapter.

Conclusions

This study aims to provide a comparative analysis of telematic universities and traditional universities in Italy, with the goal of examining the structural differences between the two models in terms of faculty composition, academic mobility, and scientific productivity. The research stems from the rapid proliferation of telematic universities within the Italian higher education system and the need to gain a deeper understanding of their role within a context characterized by strong institutional regulation and the formal equivalence of academic degrees.

An analysis of the faculty composition revealed significant structural differences between the two models. Telematic universities appear to rely on a relatively small core of tenured faculty, supplemented by extensive use of contract faculty. This organizational structure results in significantly higher student-to-faculty ratios compared to traditional universities, where teaching duties are distributed among a larger and more stable academic staff. Furthermore, the demographic distribution of academic staff shows a lower proportion of faculty members in the early stages of their careers and a higher concentration of senior academics at telematic universities, suggesting the existence of different recruitment models and career dynamics. Overall, this structure suggests an organizational model in which the teaching function may be, at least in part, separated from the traditional academic structure, with possible implications for the stability and continuity of educational activities.

The analysis of academic mobility has further helped to clarify the relationships between the two systems. The results highlight the existence of two-way flows between telematic and traditional universities, although these flows are limited in overall scale. This suggests that, while the two systems are not completely separate, they are not fully integrated either. Rather than indicating structural convergence, these dynamics seem to reflect partial permeability, in which movements between the two types of universities are likely influenced by specific factors—institutional or individual—rather than by a generalized trend. This reinforces the idea that the two systems do not constitute completely alternative segments, but rather partially interconnected subsystems, albeit with still limited levels of integration.

About scientific productivity, the analysis revealed differences in both quantitative and qualitative terms. Faculty members affiliated with traditional universities, on average, exhibit higher levels of scientific output and a greater presence in high-impact journals. However, this finding should be interpreted with caution, given the disciplinary heterogeneity and differences in career paths. The use of SJR-based indicators

improved comparability across sectors, helping to strengthen the robustness of the observed results. These differences may reflect not only individual characteristics of faculty members but also different institutional constraints and incentives between the two types of universities, which influence the nature and intensity of research activity.

Taken together, these findings suggest that telematic universities and traditional universities currently operate according to distinct organizational models. Traditional universities appear to maintain a model based on structured academic careers, a stable faculty composition, and strong integration between teaching and research. Telematic universities, on the other hand, seem to rely more heavily on more flexible organizational structures, characterized by a smaller number of tenured faculty and greater use of external collaborations. Taken together, the three dimensions analyzed—faculty composition, academic mobility, and scientific productivity—paint a coherent picture, in which the observed differences do not appear isolated but are attributable to broader organizational logics that characterize the two institutional models. These differences do not necessarily imply a hierarchical ranking between the two models, but rather reflect different approaches to balancing accessibility, organizational efficiency, and academic structure.

However, it is necessary to consider certain limitations of the study. First, the analysis is based on administrative and bibliometric data which, while comprehensive and systematic, do not fully capture the qualitative aspects of teaching and scholarly output. Second, the use of proxies, such as the year of the first publication to approximate academic seniority, introduces a margin of approximation that must be taken into account when interpreting the results. Finally, comparisons between institutions may be influenced by differences in disciplinary composition and institutional missions, factors that cannot be fully controlled within the scope of this analysis.

In light of these considerations, future research could incorporate qualitative approaches, such as faculty interviews or institutional-level case studies, to explore the mechanisms governing recruitment, mobility, and scholarly output. Furthermore, extending the analysis to other national contexts would allow for an assessment of whether the dynamics observed in the Italian case represent specific characteristics or reflect broader trends in higher education systems.

In conclusion, this study contributes to the debate on the transformation of higher education by providing empirical evidence on the coexistence of different university models within the same institutional framework. The results show that the proliferation of telematic universities represents not only a quantitative expansion of educational offerings but also a form of structural diversification within the academic system, raising significant questions about the future balance between flexibility, accessibility, and the quality of university education.

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Full title: Regulation containing norms concerning the teaching autonomy of universities

Type of act: Ministerial Decree (D.M.)

Number: 509

Date: 3 November 1999

Publication: Official Gazette no. 2 of 4 January 2000, Ordinary Supplement no. 1

Entry into force: 19 January 2000

[2] **Law No 210 of 3 July 1998:**

Full title: Norms for the recruitment of researchers and tenured university professors

Type of act: Law of the Italian Republic

Number: 210

Date of approval: 3 July 1998

Publication: Official Gazette No. 155 of 6 July 1998

Entry into force: 21 July 1998

[3] **Directive No 170 of 21 March 2016**

Subject: Accreditation of training bodies and recognition of courses for the training of school personnel.

Publication: Official Gazette of the Italian Republic, not published directly in the Official Gazette, but available on the Ministry of Education website

Issuing body: MIUR - Directorate-General for School Personnel

[4] **Ministerial Decree No 989 of 25 October 2019**

Subject: General guidelines for university planning 2019-2021

Registration: Registered at the Court of Auditors on 15 November 2019, register no. 3194

Competent office: DPFS-DGSF

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[21] Portale dei dati sulla produzione scientifica Scopus, https://www.scopus.com/pages/home#basic

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Appendix

Appendix A

The dataset used for the analyses was constructed from administrative data provided by the MUR (CINECA – CercaUniversità). The following table shows an extract of the original observations in a teacher-year panel format.

ID_docente	Anno	universita_code	ateneo_nome	tipo_ateneo	Fascia	Genere
CORSI GIANCARLO|M	2000	12	SALENTO	Tradizionale	Ricercator	M
BOGNANNO MATTEO|M	2022	47	Mediterranea di I	Tradizionale	Ricercator	M
CIUFFETTI AUGUSTO|M	2020	01	Politecnica delle M	Tradizionale	Associato	M
PANDEY GAURAV|M	2023	44	Scuola Superiore	Tradizionale	Ricercator	M
BELCARO GIOVANNI|M	2000	53	CHIETI-PESCARA	Tradizionale	Ricercator	M
CATALANO GAETANO|M	2000	26	ROMA La Sapienz	Tradizionale	Ordinario	M
LAURENTI LUCIO|M	2008	55	L'AQUILA	Tradizionale	Ordinario	M
SANTI GIAN MARIA|M	2024	03	Alma Mater Studi	Tradizionale	Ricercator	M
CATALANO STEFANIA|F	2015	05	della CALABRIA	Tradizionale	Associato	F
DELLA POLLA GIORGIA|F	2023	49	CAMPANIA - L. VA	Tradizionale	Ricercator	F
CICOGNANI FILIPPO|M	2002	34	UDINE	Tradizionale	Ricercator	M
FRASCA FEDERICA|F	2023	26	ROMA La Sapienz	Tradizionale	Ricercator	F
ROMA BIAGIO|M	2005	26	ROMA La Sapienz	Tradizionale	Associato	M
SULLAM SARA|F	2018	15	MILANO	Tradizionale	Ricercator	F
LUGLI STEFANO|M	2009	17	MODENA e REGG	Tradizionale	Associato	M
DE LEONARDIS ANTONELL	2019	39	MOLISE	Tradizionale	Associato	F
DESSI' OMBRETTA|F	2011	04	CAGLIARI	Tradizionale	Ricercator	F
ROSSI MICHELA|F	2001	10	FIRENZE	Tradizionale	Ricercator	F
DI BENEDETTO FRANCESC	2021	09	FERRARA	Tradizionale	Associato	M
CONTI LEONARDO|M	2016	10	FIRENZE	Tradizionale	Ricercator	M
NISSI EUGENIA|F	2022	53	CHIETI-PESCARA	Tradizionale	Ordinario	F
COMPAGNO CRISTIANA|F	2013	34	UDINE	Tradizionale	Ordinario	F
CASSETTA MICHELE|M	2010	26	ROMA La Sapienz	Tradizionale	Ricercator	M
LOMBARDI FRANCO|M	2009	32	Politecnico di TOI	Tradizionale	Ordinario	M
CORETTO PIETRO|M	2013	28	SALERNO	Tradizionale	Ricercator	M
CAPRIATI VITO|M	2013	02	BARI	Tradizionale	Associato	M
GEREVINI ALFONSO|M	2020	46	BRESCIA	Tradizionale	Ordinario	M
MORGIA FEDERICA|F	2019	26	ROMA La Sapienz	Tradizionale	Ricercator	F
SACCANI EMILIO|M	2020	09	FERRARA	Tradizionale	Associato	M
BARBARO MARIA BENEDE	2005	31	TORINO	Tradizionale	Ricercator	F
GHIBAUDO GUIDO|M	2000	31	TORINO	Tradizionale	Associato	M
PERRETTI BIAGIO|M	2024	38	BASILICATA	Tradizionale	Ricercator	M
PRATI NANDO|M	2015	34	UDINE	Tradizionale	Ricercator	M
PIRA STEFANO|M	2023	04	CAGLIARI	Tradizionale	Ricercator	M
DAL SASSO PASQUALE|M	2005	02	BARI	Tradizionale	Straordina	M
BROCCARDO LAURA|F	2022	31	TORINO	Tradizionale	Associato	F
ESPA STEFANIA|F	2017	26	ROMA La Sapienz	Tradizionale	Associato	F
TONCELLI ALESSANDRA|F	2017	24	PISA	Tradizionale	Associato	F
CASOLI PAOLO|M	2009	21	PARMA	Tradizionale	Associato	M
CARZACCHI IRMA|F	2004	33	TRIESTE	Tradizionale	Associato	F

Appendix B

The Appendix contains the database used for the analysis of scientific output, constructed from data extracted from the Scopus platform. For each teacher included in the sample, the main bibliometric indicators used in the study were collected in order to ensure methodological transparency and replicability of the analyses conducted.

Scopus ID	Cognome e Nome	Università	Tipo Atene	Ruolo	anno pubblicazi	Rivista	SJR	Quarti
57190017096	ABBONDATI Francesco	Università Telematica Pegaso	Telematico	Associato	2025	Infrastructures	0,66	Q2
57190017096	ABBONDATI Francesco	Università Telematica Pegaso	Telematico	Associato	2024	Coatings	0,539	Q2
57190017096	ABBONDATI Francesco	Università Telematica Pegaso	Telematico	Associato	2024	Ingegneria Ferroviaria	0,148	Q4
57190017096	ABBONDATI Francesco	Università Telematica Pegaso	Telematico	Associato	2023	Sustainability (Switzerland)	0,688	Q1
57190017096	ABBONDATI Francesco	Università Telematica Pegaso	Telematico	Associato	2023	Measurement: Journal of the International Measurement Confederation	1,244	Q1
57190017096	ABBONDATI Francesco	Università Telematica Pegaso	Telematico	Associato	2023	European Transport - Trasporti Europei	0,29	Q3
57190017096	ABBONDATI Francesco	Università Telematica Pegaso	Telematico	Associato	2023	Materials	0,614	Q2
57190017096	ABBONDATI Francesco	Università Telematica Pegaso	Telematico	Associato	2022	ARPN Journal of Engineering and Applied Sciences	0,152	Q4
57190017096	ABBONDATI Francesco	Università Telematica Pegaso	Telematico	Associato	2022	International Journal of Transport Development and Integration	0,262	Q3
57190017096	ABBONDATI Francesco	Università Telematica Pegaso	Telematico	Associato	2022	Measurement: Journal of the International Measurement Confederation	1,244	Q1
57190017096	ABBONDATI Francesco	Università Telematica Pegaso	Telematico	Associato	2021	Ingegneria Ferroviaria	0,148	Q4
57190017096	ABBONDATI Francesco	Università Telematica Pegaso	Telematico	Associato	2021	Sustainability (Switzerland)	0,688	Q1
57190017096	ABBONDATI Francesco	Università Telematica Pegaso	Telematico	Associato	2021	ARPN Journal of Engineering and Applied Sciences	0,152	Q4
57190017096	ABBONDATI Francesco	Università Telematica Pegaso	Telematico	Associato	2021	Coatings	0,539	Q2
57190017096	ABBONDATI Francesco	Università Telematica Pegaso	Telematico	Associato	2021	Measurement: Journal of the International Measurement Confederation	1,244	Q1
55676474400	ADDIMANDO Loredana	Università Telematica Pegaso	Telematico	Associato	2025	International Journal of Child-Computer Interaction	1,019	Q1
55676474400	ADDIMANDO Loredana	Università Telematica Pegaso	Telematico	Associato	2025	Journal of Media Literacy Education	0,542	Q2
55676474400	ADDIMANDO Loredana	Università Telematica Pegaso	Telematico	Associato	2023	Journal for STEM Education Research	0,874	Q1
55676474400	ADDIMANDO Loredana	Università Telematica Pegaso	Telematico	Associato	2021	The Lancet	12,113	Q1
55676474400	ADDIMANDO Loredana	Università Telematica Pegaso	Telematico	Associato	2021	Educational Studies	0,978	Q1
39861098600	AGRATI Laura Sara	Università Telematica Pegaso	Telematico	Ordinario	2025	Online Learning Journal	0,821	Q1
39861098600	AGRATI Laura Sara	Università Telematica Pegaso	Telematico	Ordinario	2025	Center for Educational Policy Studies Journal	0,394	Q2
39861098600	AGRATI Laura Sara	Università Telematica Pegaso	Telematico	Ordinario	2025	Professional Development in Education	1,191	Q1
39861098600	AGRATI Laura Sara	Università Telematica Pegaso	Telematico	Ordinario	2023	Education Sciences	0,73	Q1
39861098600	AGRATI Laura Sara	Università Telematica Pegaso	Telematico	Ordinario	2023	Education and Self Development	0,193	Q3
39861098600	AGRATI Laura Sara	Università Telematica Pegaso	Telematico	Ordinario	2023	Frontiers in Education	0,65	Q2
39861098600	AGRATI Laura Sara	Università Telematica Pegaso	Telematico	Ordinario	2023	Professional Development in Education	1,191	Q1
39861098600	AGRATI Laura Sara	Università Telematica Pegaso	Telematico	Ordinario	2022	Frontiers in Education	0,65	Q2
39861098600	AGRATI Laura Sara	Università Telematica Pegaso	Telematico	Ordinario	2021	Education and Self Development	0,193	Q3
39861098600	AGRATI Laura Sara	Università Telematica Pegaso	Telematico	Ordinario	2021	Education Sciences	0,73	Q1
55871967900	ALTAVILLA Gaetano	Università Telematica Pegaso	Telematico	Associato	2024	Children	0,674	Q2
55871967900	ALTAVILLA Gaetano	Università Telematica Pegaso	Telematico	Associato	2024	Journal of Functional Morphology and Kinesiology	0,804	Q1
55871967900	ALTAVILLA Gaetano	Università Telematica Pegaso	Telematico	Associato	2024	Frontiers in Education	0,65	Q2
55871967900	ALTAVILLA Gaetano	Università Telematica Pegaso	Telematico	Associato	2023	European Journal of Human Movement	0,289	Q2
55871967900	ALTAVILLA Gaetano	Università Telematica Pegaso	Telematico	Associato	2023	Sport Sciences for Health	0,493	Q3
55871967900	ALTAVILLA Gaetano	Università Telematica Pegaso	Telematico	Associato	2023	Sport Sciences for Health	0,493	Q3
55871967900	ALTAVILLA Gaetano	Università Telematica Pegaso	Telematico	Associato	2023	Physical Education Theory and Methodology	0,318	Q3
55871967900	ALTAVILLA Gaetano	Università Telematica Pegaso	Telematico	Associato	2023	Physical Education Theory and Methodology	0,318	Q3
55871967900	ALTAVILLA Gaetano	Università Telematica Pegaso	Telematico	Associato	2023	Journal of Physical Education and Sport	0,379	Q3
55871967900	ALTAVILLA Gaetano	Università Telematica Pegaso	Telematico	Associato	2023	Acta Gymnica	0,33	Q3