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Junior university: fostering young minds' interest in higher education

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The Universidade Júnior (U.Jr.) program, initiated by the University of Porto (U.Porto), Portugal, is a comprehensive educational initiative conducted during the summer months, primarily targeting the 10–18 age group. The program aims to promote science, technology, arts, humanities, and sports knowledge among elementary and secondary-level students and to influence their vocational choices and higher education aspirations. The study analyses the relationship between participation in the U.Jr. program and subsequent enrollment in higher education at U.Porto. It utilises data collected from 2006 to 2022, comparing U.Jr. participants with students who enrolled as freshmen at U.Porto. A Pearson correlation coefficient was applied to establish the connection between these datasets. Data analysis reveals a significant positive relationship between participation in U.Jr. and the choice of U.Porto for higher education. The study shows that 22 out of 100 first-year students at U.Porto in 2021 had previously attended U.Jr. Moreover, the geographical provenance of participants and U.Porto first-year students showed a robust correlation. The findings suggest that U.Jr. has a substantial impact on attracting students to U.Porto and influencing their academic choices. The program's diverse activities, coupled with its inclusive approach, have been instrumental in increasing the university's attractiveness and helping mitigate the country's low higher education rates. The study underscores the importance of such initiatives in shaping students' educational trajectories and choices for higher education.

KEYWORDS

health research, junior university, pre-university schooling, teachers in training, teacher education, multidisciplinary activities, stakeholders, public engagement

1 Introduction

Several studies have already highlighted the benefits of educational summer programs for young children, such as:

- Reducing the summer holidays "learning gap";
- Assisting in the reduction of school drop-out rate (Vinas-Forcade et al., 2019);

- c. Keeping higher education as a plausible goal despite adverse socio-economic backgrounds;
- d. Introducing participants to knowledge areas and themes not usually taught at school;
- e. Providing a setting for interaction amongst students from diverse backgrounds.

These programs are vital for students with a low-SES background, especially when the parents have low schooling (Alexander et al., 2007).

Programs prepared by Children Universities may present several benefits according to participants' age, school governance (whether private or state-run), region of origin, or family background (Gomes, 2007). Such benefits seem particularly relevant to the motivation of students with limited school achievement (Sloan McCombs et al., 2011) and whenever participants come from remote rural areas or low-income families (Sagyndykova et al., 2021). The motivation of youngsters also depends on developing challenging and stimulating learning programs (Bazrafcan et al., 2014).

The main barrier to participation in summer schools has traditionally been the affordability of such programs by low-income families, who are otherwise willing to expand their children's learning opportunities. Paying fees and accommodation or ensuring transportation implies costs that not everyone can afford.

However, it is possible to develop strategies to overcome such difficulties, especially involving local authorities, for instance, the city halls. In this work, we will describe in detail the educational summer program (Junior University) designed by the University of Porto (U.Porto) in Portugal and present data on the course of the 'juniors' attendants up to their enrollment in higher education, particularly at U.Porto.

Every year, U.Porto receives over 7,000 participants in the Junior University from both elementary and secondary education. The program happens in July (general program) and September (schools of introduction to research).

These non-formal activities take place mainly during the summer break. According to their age group and school year, students may enrol in several formats of the more comprehensive program: *Experimenta no Verão* ("Try it on summer"), *Oficinas de Verão* ("Summer workshops"), *Verão em Projeto* ("Projecting Summer" – weekly programs) and *Escola de Línguas* ("Language school" – fortnightly programs), with vacancies allocated on a first-come, first serve basis. Participation is contingent upon an application and selection process in thematic schools, which introduce pupils to different research fields (Maths, Physics, Chemistry, and Health and Life Sciences – all weekly programs).

Activities are developed and coordinated by professors and researchers from U.Porto and conducted by university students, who sometimes are students, often training for a teaching career.

2 The Portuguese context

In the last decades of the 20th century, Portugal saw a massive increase in the demand for higher education. During the first 5 years of the 21st century, the dropout rate among Portuguese students in both elementary and secondary schools hovered around 38.5% (46.2%

for boys and 30.25% for girls). By 2021, the dropout rate in Portugal for students aged 18–24 had fallen significantly to 5.9% (7.7% for males and 4.1% for females).

Between 1975 and 2001, the average annual enrollment growth in higher education exceeded 5% (almost an exception among OECD countries) (PORDATA, 2022). The number of enrolled students in Portugal peaked in 2003 (400,831), followed by a slight downward trend until 2015. Since then, it has grown again, with 411,995 enrolled students in 2021. Enrollment in higher education has thus remained steady for the past 20 years (Figure 1).

The Ministry of Education planned to extend mandatory education to 12 years, which happened in 2009. In 2009, the number of pupils in secondary education was very high, around 500,000. A brief analysis of the flow of students within the Portuguese educational system reveals that steady attrition occurs along the different cycles. The government has dealt with the problem in two main ways: on one side, by diversifying the offer of elementary and secondary level courses, notably by a wide variety of "training" and "professional" courses directed to students who do not want to follow the "regular" school curricula, but also to school dropouts, and to adults already part of the workforce who wish to improve their qualifications; on the other side, and subject to much criticism, it has developed procedures for the "recognition and validation of competences" that have spectacularly raised the number of graduates from each of those educational cycles. The system is remarkably permeable, meaning that graduation in 1 cycle allows the student to enter a different path (e.g., from "regular" to "professional") in the following cycle. After secondary level graduation, students can enter higher education through special exams for applicants over 23 years of age, a significant group in Higher Education recruitment, particularly in private institutions.

Despite the high enrollment growth rate, the level of HE attainment in Portugal is still low. Compared to the OECD, in 2021, Portugal was clearly below average (Figure 2). Most adults aged 25–64 have not completed secondary education, which is not much different from Colombia and Brazil. In Portugal, 40.5% of the adult population has not completed secondary education, 28.4% has attained that level, and 31.1% have completed higher education.

In the European Union context, Portugal is at the bottom of the table in adult education (Figure 3). It is clearly out of sync with the European trend, where most adults have completed secondary education. At the same time, the percentage of people who have completed higher education is one of the lowest in Europe. Portugal is 5th from the bottom, marginally better than Hungary, Slovakia, the Czech Republic, and Italy.

Despite the significant fall in the dropout rate felt since the turn of the century, the percentage of pupils enrolled in preschool, elementary, and secondary school, compared with the total population of the same age groups, shows that there is still work to be done mainly for secondary students, who represent 85.1% of their age group (Figure 4).

According to the Ministry of Science, Technology and Higher Education, in 2023, most higher education students in Portugal are enrolled in Social Sciences, Commerce, and Law (33.5%), followed by Engineering, industry, and Construction (19.9%), Health and Safety (15.5%), Arts and Humanities (10.3%), Science, Math and IT (9.0%),

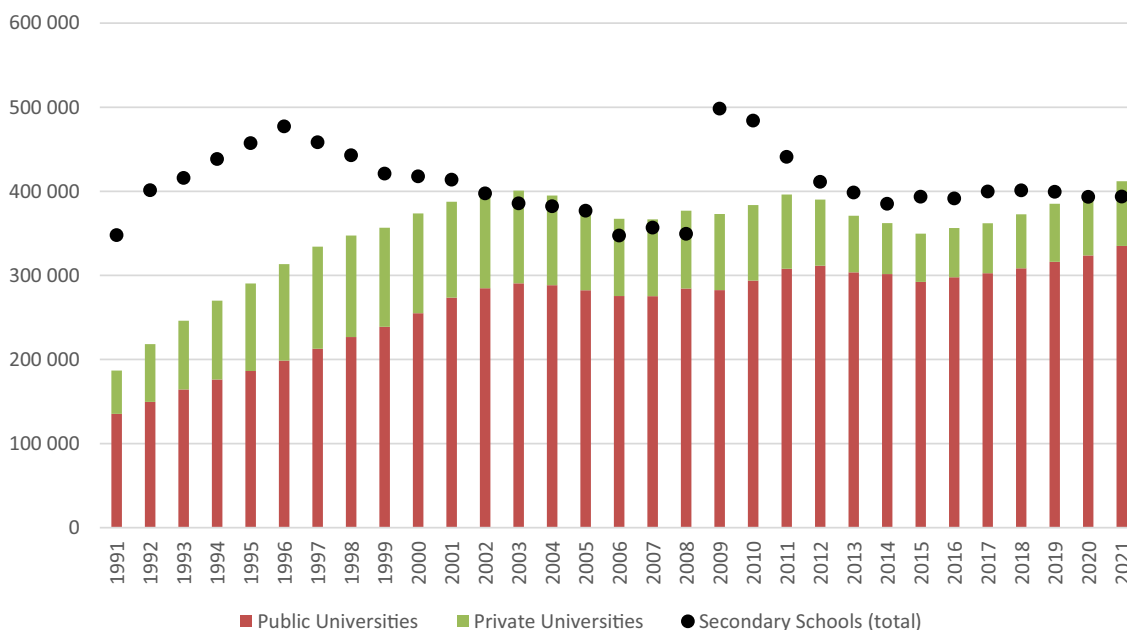


FIGURE 1 Students enrolled in secondary and higher education in Portugal, 1991–2022. Source: PORDATA (2023).

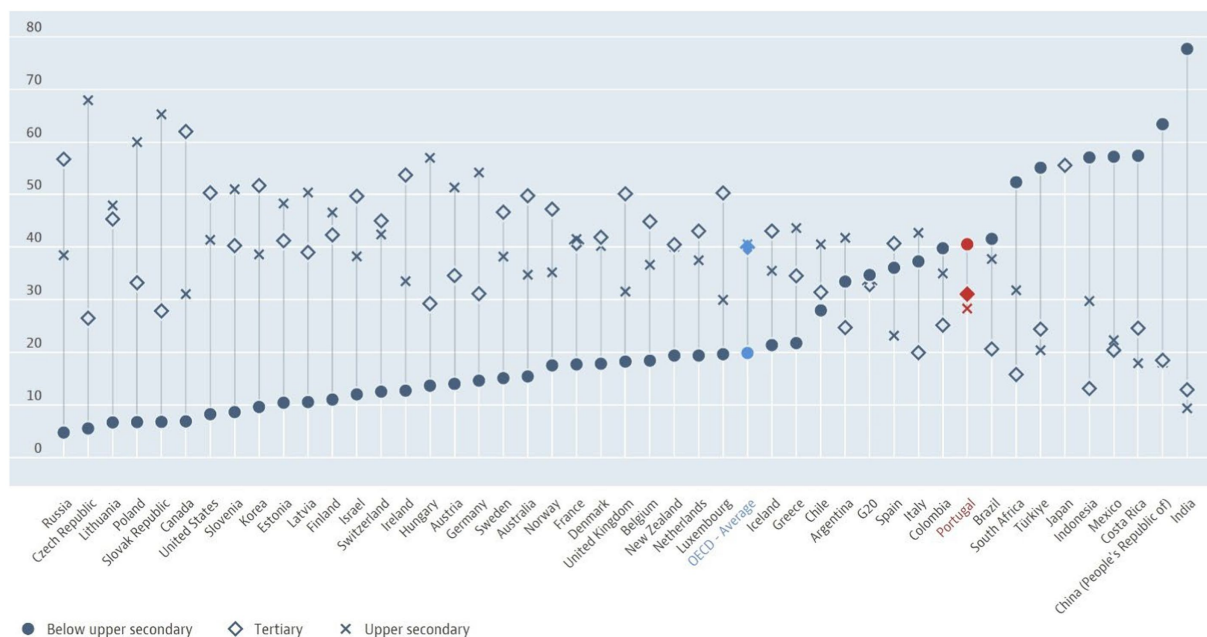


FIGURE 2 Adult education level: Portugal is among a global selection of countries. Source: OECD (2022).

Services (5.7%), Education (3.8%) and Agriculture (2.3%). These values indicate that the fields of Science and Humanities remain unattractive for students, which aligns with what occurs in other European countries (PORDATA, 2023).

The high availability of higher education contrasts nonetheless with some economic hardship. In 2022, 18.8% of students attending public universities and polytechnics in Portugal were doing so under a scholarship (PORDATA, 2023).

For many families, enrollment in higher education is still a first-generation experience, and a lack of awareness about academic life and the choices ahead is a significant hurdle. Many young people from low-income families consider the university out of reach, and it is mainly for them that new opportunities ought to be created, providing exposure to the University’s academic environment. To do so, the influence of teachers in the classroom is not enough; shared experiences with other young people are essential to stimulate their

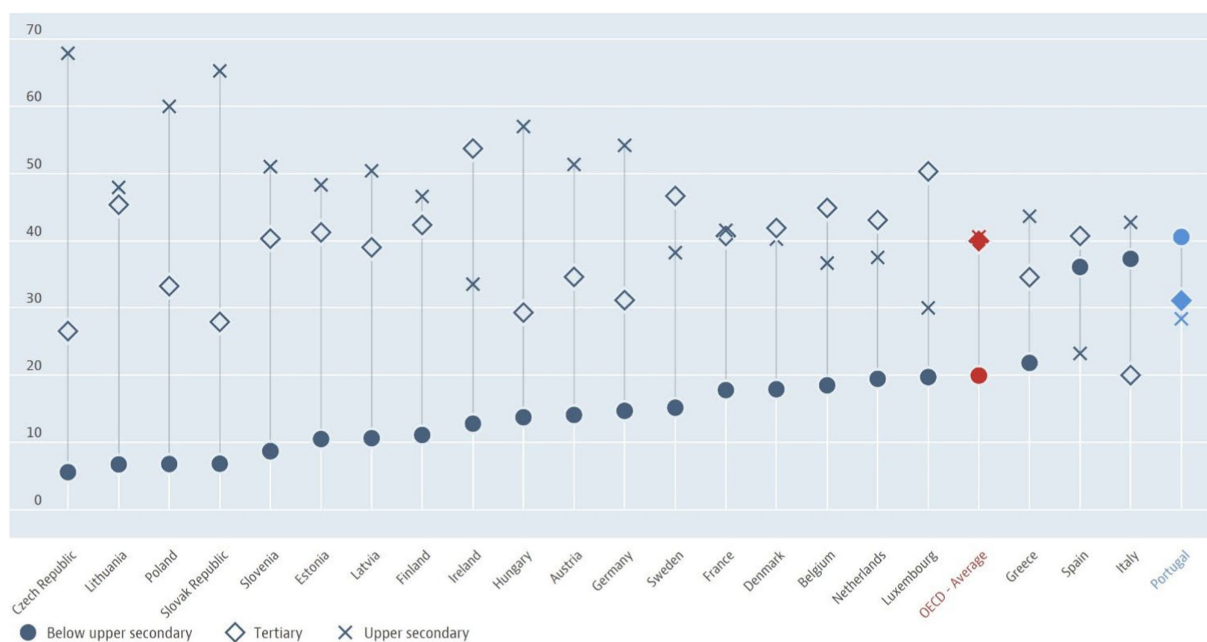


FIGURE 3 Adult education level: Portugal in the European Union context. Source: OECD (2022).

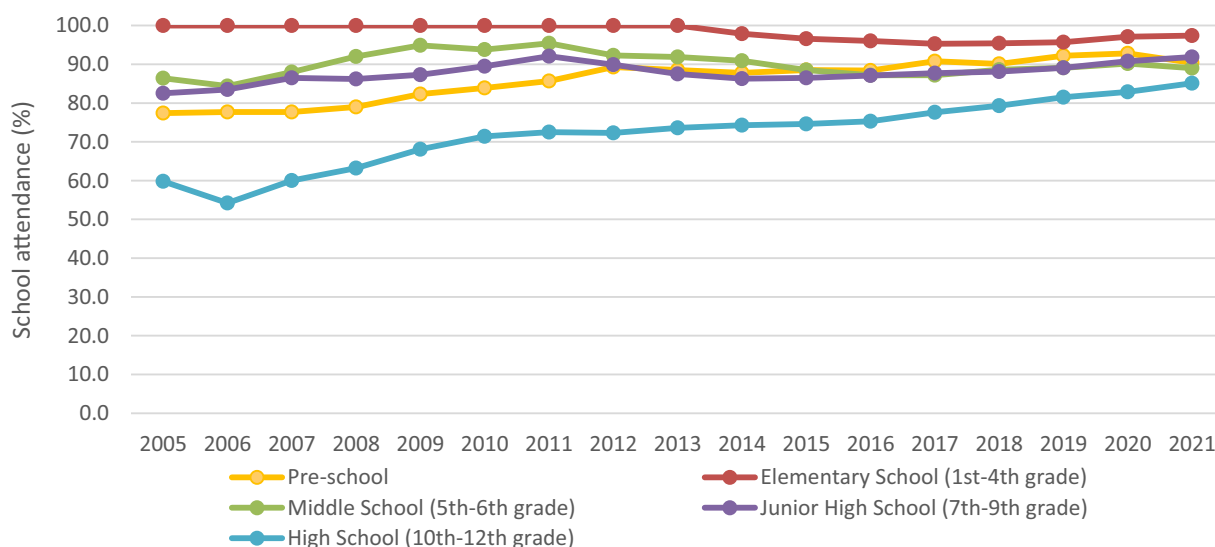


FIGURE 4 School attendance rate in Portugal, 2005–2021. Source: PORDATA.

interest in further education. Furthermore, the falling birthrate in Portugal, mirroring the rest of Europe, will undoubtedly negatively impact higher education attendance rates.

Several initiatives have been developed throughout Europe to attract young people to higher education. Many (e.g., Children’s Universities) have flourished, targeting primary and secondary education students to motivate them to pursue knowledge in different subjects. As mentioned by some authors, the individual in question (their motivation) and the immediate circle both actively participate in forming the conscious job choice (Balakhonov et al., 2021).

The University of Porto has been developing initiatives to foster youngsters’ interest in furthering their studies. U.Porto has been present in schools nationwide by participating in over one hundred career days or university fairs. Furthermore, U.Porto also promotes Open Days for the school community organized by its 14 Faculties and open schooling projects in direct cooperation with schools. Worthy of note are Mostra da U.Porto and Universidade Júnior.

Mostra da U.Porto (the University of Porto annual fair) has occurred every year since 2003. This fair was designed to target several stakeholders. Firstly, it aims to present the diversity of knowledge

areas and academic offer of the University to prospective higher education students, thus stimulating their eagerness for, and interest in, higher education and research, as well as providing them support and guidance in their choice of study programs and careers; secondly, it is also an opportunity to communicate to the broader community and society at large, advertising the activities of research centres and postgraduate training programs, to make the ordinary citizen aware of the University's global action and its relevance for social, technological, cultural, economic and environmental development.

Junior University is mainly directed to students of the "regular" school curricula and tries to develop an aspiration to HE, simultaneously – and logically – reducing the school dropout rate, particularly in the group most prone to this behavior, namely students from low-income families.

3 The Junior University: how to attract young students to higher education?

The Junior University (Universidade Júnior - U.Jr) is an extensive educational program conducted during the summer months by the University of Porto and is directed mainly at the 10–18 age group. Junior University's primary goal is the promotion of knowledge – in the fields of science, technology, arts, humanities, and sports – among elementary and secondary-level students (Universidade Júnior, 2023).

To this end, several learning programs and minor research projects are annually designed by university professors and mainly implemented by undergraduate and graduate students under supervision and, in some cases, by junior researchers. Usually, each edition includes more than 150 different non-formal activities covering many different areas, which allow students to acquire specific and varied knowledge that can help them in formal education contexts and everyday life activities.

U.Jr. also intends to influence the process of vocational choice, returning to society a part of the investment that was made and contributing to mitigate the low HE rates of the country - one of the aspects that throughout history has been one of the main reasons for its underdevelopment.

As such, U.Jr. has been addressing multiple issues, including vocational orientation, introduction to specific scientific areas or topics, promotion of higher education desirability, and knowledge-based careers. Furthermore, the program provides a glimpse into the everyday life at the 14 Faculties that integrate the University.

A crucial aspect of U.Jr. involves promoting the inclusion of pupils from underprivileged socioeconomic backgrounds and ensuring the representation of minorities and all social classes. This inclusive approach is achieved through several strategies:

1. Establishment of Protocols with Municipalities: U.Jr. has established protocols with various municipal councils across the country, including the islands, to support transportation and financial aid. This enables broader participation in the Junior University program.
2. Scholarships by U.Porto: The University of Porto offers scholarships to students from socioeconomically disadvantaged families. These scholarships are granted to students who demonstrate strong academic performance and

financial need, ensuring that talent and potential are nurtured regardless of economic barriers.

3. Collaborations for Inclusive Programs: Through protocols with various entities, U.Jr. also develops programs tailored for young people with disabilities. This initiative ensures that the program is accessible and accommodating to all students, reflecting a commitment to diversity and inclusivity.

In the organization of the Junior University, the importance of the involvement of various stakeholders is considered (Marques et al., 2013), as well as the definition of a clear structure regarding the organization of the project and a set of essential structures at various levels (Table 1).

During the summer programs, participants develop interactions and establish connections among themselves, and those networks persist beyond the summer. The pupils often subsequently contact the University of Porto, sometimes within the framework of academic projects they are developing with their teachers in school, other times to exchange points of view or to inquire about possible choices for their future in the university.

In 2008, U.Jr. jointly established an international European network, the European Children's University Network (EUCU.net), headquartered at the University of Wien. EUCU.NET launched an interactive and collaborative Web Portal to support the interaction and exchange of information and provide ongoing support for members. The network established Mentoring Partnerships that fostered the transfer of know-how and created a framework for cooperation.

3.1 Working with stakeholders

The University of Porto has been identifying and establishing partnerships with other community and local institutions, private and public, that have steadily increased since the Junior University's beginning, especially concerning the development of educational activities and relations with the youngsters. Such is the case with the Casa da Música Concert Hall, the Serralves Foundation, the Gaia Biological Park, the Ciência Viva Agency, and several others which adhered more recently, such as Arouca Geopark, Museum FC Porto, CICCOPN, Transport and Communication Museum, Portuguese League Against Cancer, etc.

3.2 A network of municipalities

An essential component of the U.Jr. is the promotion of pupils from underprivileged socioeconomic groups. From its inception in 2005, the Junior University was designed to be a program where municipal support was a key component. As such, agreements with almost 50 municipalities, associations, and companies from all over the country were developed. These strong connections are essential for the project because they grant the social inclusion of pupils from underrepresented groups in the summer courses.

Several agreements were then initiated and maintained. Other municipalities, along with more companies and associations, have expressed their desire to participate in the program. Support may take the form of scholarships, which can cover both the weekly fee and the accommodation cost, or merely provide transportation.

TABLE 1 Main points considered in the organization of the Junior University project.

Stakeholders	<p>Internal: academic community: schools, research units, rector, and social services.</p> <p>External: educational partners: cultural, scientific, educational, and business institutions of the city and region.</p> <p>Logistical partners: national ministry of defense (accommodation halls).</p> <p>Local governments: agreements with municipalities to allow the free participation of talented young people in economically disadvantaged situations.</p> <p>Local governments promote the project among schools and offer transportation, registration fees, or accommodation.</p> <p>Corporate partners: companies in the food, publishing, communication, and transportation sectors.</p>
Structure, capacity, and competencies	<p>Executive/scientific board, coordination and activities' tutors.</p> <p>Executive/scientific board: constituted by U.Porto professors from different faculties, its primary responsibility is to assess the project scientifically and evaluate the proposals submitted at the contest of ideas stage. Likewise, this group is responsible for reflecting on the strategic issues of the project and its alignment with the institution's objectives.</p> <p>Coordination: it is responsible for the project's technical, logistical, and financial implementation.</p> <p>Tutors: a vast team of students and young researchers are responsible for presenting the proposals, preparing the programs, and monitoring the activities under the supervision of senior professors and researchers.</p>
Development and infrastructure	<p>Human Resources: academic community – students, teaching, and administrative staff.</p> <p>Physical infrastructures: U.Porto's or partner institutions' facilities – University canteens provide more than 70.000 meals; Seven buses transport the participants between U.Porto's campuses and to the field trips. The students' travels from other regions all over the country to Porto are supported by the services of local authorities. More than 1,000 students enrolled in the lodging program.</p> <p>Communication: carried out at a national level through – Media: national and regional newspapers, radio, and television; Internet: the websites of U.Porto and the partners.</p> <p>Newsletter: the university has a weekly newsletter sometimes dedicates some topics to young people and schools.</p> <p>Advertising materials: posters and flyers sent to schools and local governments and distributed at school fairs. Mupis are placed in Porto and the surroundings.</p>

3.3 The Junior University general program

The general program is usually organized on a weekly basis (an exception is made for the Language School, which is an entire fortnight). Through the U.Jr. website, youngsters apply freely to one of the available five sub-programs by their school year:

- Try it in the summer for 11–12 years old;
- Summer workshop for 13–14 years old;
- Thematic workshop for 13–14 years old;
- Projecting summer for 15–17 years old;
- Language school for 11–17 years old.
- “Try it in the summer” and “Summer workshops” where students participate in five different day-long activities, each dedicated to a specific scientific area.
- “Thematic workshops” where two groups working on two areas of knowledge get together to share ideas and present their conclusions.
- “Projecting summer” is a week-long activity around a single subject.
- The “Language school” aims to develop students' language skills in various languages.

The proposed programs and activities follow a standard methodology/framework that emphasises:

- the active role of the students;
- the offer of creative and interactive activities for individuals and groups.
- whenever possible, the use of interdisciplinary approaches;
- the communication with an adult audience, disseminating the activities of research centres and postgraduate training offers;

- the promotion of awareness of the university's relevance for ordinary citizens' social, technological, cultural, economic, and environmental development.

3.4 Schools for introduction to research: attracting the best students

The U.Jr. program, particularly the “Schools for Introduction to Research,” has also been seeking to attract the best students to U.Porto.

The Schools for Introduction to Research are targeted at secondary education students with good academic results and focus on Chemistry, Physics, Maths, and Life and Health Sciences. Students from the secondary level can apply, but only a few are admitted, depending on their school performance. The best secondary students selected every year after their application can work for 5 days close to professors and researchers. They guide small groups of pupils through demanding projects in biomaterials, bone regeneration, molecular biology, genetic engineering, cardiology, sports and health, pharmacy, nutrition, cancer, veterinary medicine, chemistry, physics, mathematics ...

In these Schools, selected students are placed in small groups and, under researchers' guidance, participate in seminars and develop basic research projects. It culminates in a public presentation attended by their peers, the instructors and faculty members. The feedback on this activity was very positive. In fact, despite specific research assignments being highly challenging, the presentations consistently stand out for their scientific rigor and creativity. In 2019, these schools engaged 212 pupils in the proposed activities (Life and Health Sciences, 57; Physics, 84; Chemistry, 15; Maths, 56).

At the end of the 5 days, all groups must present the results of their research at a final congress that we organize, where the students can discuss the results with each other and with professors and researchers.

4 Methodology research process

This paper analyses the relationship between participation in the U.Jr. program and posterior enrollment in the University of Porto to understand how participation in U.Jr. might influence youngsters in pursuing higher education studies at the University of Porto. The importance of this evaluation is related to one of the purposes of the U.Jr. program: to increase the attractiveness of U.Porto.

4.1 Aim and significance of the study

The main goal of this investigation is to analyse the relationship between U.Jr. attendance and student recruitment by U.Porto. Increasing the attractiveness of U.Porto is one of the primary purposes for developing the U.Jr. program. For that purpose, data systematically collected since the 2006 edition will be used.

The analysis presented herein is based on a data comparison between participants in the U.Jr. project between 2006 and 2022 and data from students who enrolled as freshmen in U.Porto during the first phase of the (yearly) national application process. It allowed the research team to establish the percentage of students enrolled in U.Porto who had previously participated in Junior University.

A comparison of the geographic provenance of U.Jr. participants and first-year students in U.Porto further compounded this analysis. To do so, a Pearson correlation coefficient was used to find a correlation between both datasets, showing a strong and significant result ($r = 0,95$; $p < 0,05$).

4.2 Sample

The study was based on simplified ID, georeferenced but purged for anonymity, and related to the following populations:

- Participants in U.Jr. between 2006 and 2022. Due to the COVID-19 pandemic and the consequent suspension of the program, data from the years 2020 and 2021 editions are missing.
- Students enrolled as freshmen in U.Porto during the first phase of the national application process for the same years.

4.3 Instruments

The data was gathered from surveys during U.Jr's summer programs' application process and U.Porto's enrollment process, focusing on students enrolled in the first university year at the first phase of the national application process. Names have been purged from the study.

The comparison of georeferenced data was also made through surveys of both these groups. Once again, names were purged from the study.

5 Results and discussion – from the Junior University to the “real” university: effects on student recruitment at the University of Porto

In the fifteen editions of U.Jr. organized (from 2005 to 2019), 81,280 children and teenagers between 10 and 18 years of age participated in the program, corresponding to an average of 5,080 participants in each edition. The distribution of the total participation in each project can be seen in [Table 2](#).

The most significant number of the participants comes from the country's northern region. However, they also comprise many children and teenagers from all over Portugal, both from the Continent and the Azores and Madeira islands. U.Jr. has also become known in foreign countries, and participants have come from countries such as the United States, Spain, France, China, Thailand, Mozambique, Angola, Cape Verde, and São Tomé and Príncipe, in addition to children of foreign origin who live in Portugal.

The data analysis reveals that participants in the U.Jr. tend to select, by large, the University of Porto when they finish their secondary degree. The chart of [Figure 5](#) depicts this effect: it counts the participants in at least one edition of the U.Jr. (subsequent enrollments omitted) that entered the University of Porto in the primary phase of national access to HE.

Since 2006, the number of students that have participated in the U.Jr. program and subsequently enrolled at U.Porto has been increasing until 2018. Since then, this percentage has remained more or less stable. In 2021, 22 out of 100 first-year students previously attended U.Jr. The analysis from the U.Jr. point of view shows the relative weight of each edition to student recruitment in each year.

There is a positive relationship between participation in the Junior University and the choice of the University of Porto.

6 Discussion

One key finding derived from the data analysis conducted in this study is the consistent and gradual increase, over the years, in the proportion of students engaging in U.Jr. at least once and later pursuing higher education at the University of Porto. This growth trend eventually stabilized at approximately 22%.

Regarding their geographical provenance, it can be concluded that there is a meaningful and robust correlation between the origins of the students who participated in U.Jr. and those who were admitted to U.Porto.

There are limitations to the analysis presented. The main one is that it is difficult to evaluate the impact of U.Jr. on students' choice to engage in higher education studies, i.e., no causal relationship between attending U.Jr. and enrolling at the university was established.

TABLE 2 Participants in U.Jr. over the 2005–2019 period at the general program and the schools for introduction to research.

	Participants														
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
General program		4,013	4,274	4,407	4,241	4,853	4,927	5,093	4,855	5,100	5,671	6,535	6,674	6,895	7,424
Chemistry		-	-	15	20	19	20	20	25	20	20	20	20	20	16
Life and health sciences		88	230	100	68	90	72	78	80	65	62	66	58	51	57
Maths		-		61	101	95	54	51	43	29	19	26	15	41	56
Physics		53	101	108	94	88	95	70	81	74	73	75	74	75	84
TOTAL	3,167	4,154	4,620	4,696	4,523	5,146	5,168	5,317	5,079	5,288	5,845	6,722	6,841	7,078	7,636

In 2020 and 2021, no face-to-face activities were held due to the pandemic.

In future analysis, different data concerning participants, such as study preferences, socio-economic situation, area of residence, gender, influences by family, friends or role models, use of social media platforms, school performance, etc., could be used to determine which factors impact the decisions to participate in U.Jr. and to enrol at the University (Sjaastad, 2012; Sojkin et al., 2012; Jalaluddin et al., 2019; Mukanziza and Singirankabo, 2022). Moreover, interviews and surveys with former participants could be conducted to assess if and how U.Jr. played a role in their choice of further studies and professional careers. This will involve collecting sufficient data from participants over the years.

As referred, the program addresses the question of diversity and inclusion, particularly concerning socio-economically underprivileged children and adolescents by, in collaboration with different stakeholders, offering fees, transport costs and accommodation. One possible future analysis would be to investigate the impact of the U.Jr. on such participants, especially in what concerns opening their prospects of engaging in further studies and avoiding school dropout.

Numerous programs worldwide take the form of summer schools, offering courses tailored to specific subjects and primarily attracting youth already inclined toward those knowledge domains. In the Portuguese educational system, students initially select study areas after the 9th grade. This decision involves choosing between disciplines such as sciences, humanities, economics, law, arts, etc., with the option for subsequent changes. The U.Jr. program goes beyond conventional summer schools by facilitating exposure to diverse knowledge domains. This exposure might be valuable in guiding students as they decide on their preferred study areas post-9th grade. Additionally, it may aid in selecting specific higher education programs for those attending from 10th to 12th grade. Further investigations should be conducted to evaluate, using both qualitative and quantitative data, the impact of U.Jr. in offering such a perspective to the participants.

7 Conclusion

At the national level, U.Jr. has the impact of inspiring several Portuguese universities to follow a similar path by developing educational programs for pre-university students.

U.Porto’s vision relies on four strategic pillars: Education, Research, Internationalization, and Governance. It is one of Portugal’s largest HE institutions and the most in-demand university.

U.Porto plays an essential role in the country’s HE development and has an increased sense of responsibility regarding the progress that needs to be made.

The initiative also reinforces the culture of cooperation and teamwork inside the University, as revealed by the Rector inviting all the academic staff every year to propose ideas for each edition of the initiative.

The authors are aware that very diverse factors shape students’ university choices. Still, we trust that the promotion of knowledge among young people in this framework will be reflected in HE student recruitment. Moreover, U.Porto is consistently attracting students with the highest grades at a national level. It is currently the most sought-after University in Portugal, averaging two applicants per vacancy. The success of the University vis-a-vis

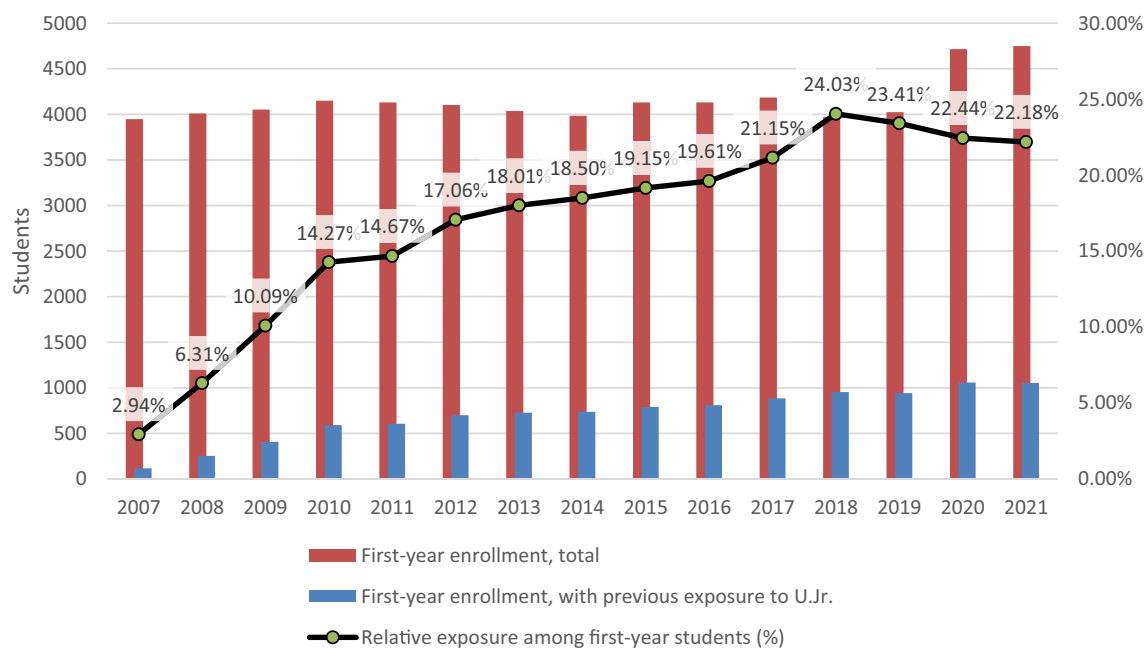


FIGURE 5
U.Porto first-year students and their participation in U.Jr., 2007–2021.

its capacity to attract a school audience is firmly correlated to initiatives such as U.Jr. and other promotional activities, like the Open Days, the Mostra da U.Porto and school reach-out initiatives. The success of the undertaken activities is reflected not only in the satisfaction expressed by participants but also in their next option of proceeding toward Higher Education and doing so in U.Porto.

The impact of U.Jr. is also felt by the instructors (many of whom are themselves former participants of U.Jr), typically recent graduates or undergraduates in their final year, who develop essential teaching skills under the guidance of faculty members.

Follow-up studies will continue to be conducted to analyse the long-term impact of UJunior. This cross-sectional study will also allow the adoption of measures for improvement in activities intended to be motivating and playful while promoting students' engagement with science.

Data availability statement

The data analyzed in this study cannot be made available for the sake of confidentiality. Requests to access these datasets should be directed to VS, vsilva@reit.up.pt.

Ethics statement

Ethical approval was not required for this study involving human data as the research was carried out for evaluative purposes and made use of existing information. Written informed consent to participate in this study was not required from the subjects and/or

their parents/legal guardians in accordance with the national legislation and the institutional requirements.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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