

**FROM REGIONAL ATTRACTIVENESS TO DISTANCE
LEARNING IN TERTIARY EDUCATION:
AN ANALYSIS OF SOME DETERMINANTS
BEFORE AND AFTER COVID-19**

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Abstract. The Covid-19 pandemic has accelerated the transition to distance education, helping to reduce the spatial, temporal and economic barriers that constrain student mobility. Recent studies have investigated both the trajectories of interregional mobility and the determinants of success of digital educational models. This paper analyzes the evolution of regional university attractiveness and the diffusion of distance education in Italy at two key moments: a.y. 2016/17 (pre-pandemic) and a.y. 2022/23 (post-pandemic), with the aim of assessing the impact of the increase in online educational offerings on interregional student mobility. The analysis is based on an original dataset that integrates institutional sources (ANS, MIUR - Educational Offerings, TEHA Index) and uses OLS regression models, considering the Attractiveness Index (AI) and Distance Learning Enrollment Rate (RDL) as dependent variables. Explanatory variables include indicators related to university policies, type of educational offerings and territorial attractiveness. The results point to significant determinants and suggest a substitution effect between physical and virtual mobility, shaping a possible paradigm shift towards a more flexible, hybrid and territorially accessible university system.

1. Introduction and literature review

Globally, the pandemic of COVID-19 has triggered significant changes and accelerations, especially within the social sciences (Marginson, 2020). Physical distancing measures and restrictions-differently perceived and applied in different international contexts-have transformed how space is used and shared, affecting relational, educational and work dynamics (Aristovnik *et al.*, 2023). In such a scenario, the use of distance education has been an emergency response, but also an opportunity for structural reflection on the future of tertiary education (Panarello, 2022; MIUR, 2023).

The study of territorial attractiveness assumes central importance in the analysis of the role universities play in regional and international development. In particular, interregional student mobility-defined as the temporary movement of individuals from one region to another within the same nation for reasons of university study

(Attanasio *et al.*, 2020)-is one of the main phenomena observed in relation to territorial attractiveness (Muraglia, 2023).

Traditionally, Italian research on this issue has relied on national sources, such as ANS (National Student Registry) data, using indicators of outgoing (from the region of residence) and incoming (into the region of enrollment) mobility (CNVSU, 2011; ANVUR, 2018). These studies have shown that Italian university mobility is predominantly unidirectional, with substantial flows of students moving from the South to the Center-North (Enea and Attanasio, 2019). Northern regions also show the greatest ability to retain graduates (ISTAT, 2010), as evidenced by the fact that many southern students, once they graduate in the North, tend not to return to their region of origin (Dotti *et al.*, 2013; SVIMEZ, 2014; Vecchione, 2017).

According to the literature on internal student mobility (Ordine and Rose, 2007; Dal Bianco *et al.*, 2009; Strozza, 2010), the propensity to study in a region other than one's region of residence is influenced by structural factors in the area of origin, such as the absence of adequate educational offerings (Bruno and Genovese, 2008).

In this context, the mode of educational delivery - and in particular the spread of distance learning- has emerged in recent years as a relevant element in the analysis of academic attractiveness. This mode emerges as a complementary or alternative factor to traditional determinants of interregional mobility, affecting students' choices of university location. The health emergency from COVID-19 has further amplified this phenomenon, giving distance learning a central role in the university system and helping to break down the geographic and temporal barriers that historically conditioned physical mobility (Almalaurea, 2023).

A number of studies have analyzed the effect of distance learning on the university system. For example, Guri-Rosenblit (2005) pointed out that universities that adopt e-learning models can attract students from wider geographic basins, increasing their competitiveness. Similarly, Beine, Noël, and Ragot (2014) point out that distance learning allows access to educational programs without the economic and social costs associated with physical transfer, configuring itself not only as a tool for inclusion but also as an effective solution in emergency contexts.

According to the European Commission's Education and Training Monitor 2024, the number of students enrolled in Italian online universities has increased fivefold in the past decade. This trend is explained by factors such as greater flexibility in time management, the absence of compulsory attendance, and reduced travel and accommodation costs.

In conclusion, if before the pandemic, attractiveness was based on traditional factors such as the quality of infrastructure, academic reputation, and in-presence educational offerings, the lockdown has forced a forced transition to Emergency Remote Education, forcing rectors and policy makers to rapidly rethink strategies to maintain universities' competitiveness in the national and global context.

In light of the context analyzed and the literature consulted, this paper aims to offer an updated interpretative key to the mechanisms that regulate interregional university mobility in Italy, considering the growing incidence of distance education. The research pursues two main objectives:

RO1: analyze, at the regional level, the evolution of universities' Attractiveness Index (AI) and Distance Learning Enrollment Rate (RDL) between the pre-pandemic period (a.y. 2016/17) and the post-pandemic period (a.y. 2022/23), to capture any structural discontinuities related to the health emergency and the expansion of digital offerings.

RO2: to assess the impact of the increase in university courses delivered in distance learning mode on the territorial redistribution of educational demand and the redefinition of the determinants of interregional student mobility, with particular attention to the role of right-to-study policies.

Through these objectives, the research contributes to enriching the debate on the transition to a more hybrid, flexible and territorially equitable university system, highlighting how digital accessibility and university strategies are progressively flanking - and in some cases replacing - traditional structural and geographic factors in the choice of university location.

2. Data and method

This paper is based on an original data set specially constructed for the analysis, integrating variables from different national institutional sources, some of which are derived from unique surveys. The main sources used include: the National Student Registry (ANS), the Ministry of Universities and Research (MUR), the MUR's Educational Offer Data Bank, the MUR-ANS information system on subsidies and investments for the right to study, and the Territorial Human Capital Attractiveness Index (TEHA) developed by The European House - Ambrosetti.

The analysis focuses on two key academic years: 2016/17, considered the pre-pandemic period, and 2022/23, the post-pandemic period. The choice of these two moments allows to assess the structural effects of the health crisis on the organization of university teaching and student mobility dynamics.

In order to measure the attractiveness of Italian universities and the role of distance education, two main dependent variables were constructed:

Attractiveness Index (AI): represents the net difference between incoming and outgoing students from each region, related to the total number of student *movers*. This synthetic indicator makes it possible to assess the ability of regions to attract students from other areas.

$$AI_{,r} = \frac{I_r - O_r}{I_r + O_r}$$

Distance Learning Enrollment Rate (RDL): measures the percentage of students enrolled in degree programs delivered by distance learning (full or partial) as a percentage of total enrollment in each region.

$$R_{DL,r} = \frac{\sum_{i=1}^{n_r} S_{i,DL,r}}{\sum_{i=1}^{n_r} S_{i,Total,r}} \times 100$$

To investigate the determinants of regional attractiveness, the analysis considers a number of independent variables aggregated at the regional level (Table 1).

Table 1 – Description of Independent Variables.

Variable	Source	Description
Part-time Collaborative Activities (CA)	MUR-ANS – Contributions and Investments	Percentage of students involved in paid collaboration activities within universities (e.g., tutoring, administrative support), as part of student support policies.
Allocated Accommodation Places (AP)	MUR-ANS – Contributions and Investments	Ratio between available student housing beds and the number of applications received, indicating the region's capacity to host non-resident students.
Traditional Course (TC)	MUR – Degree Program Database	Degree programs delivered entirely in person, representing the conventional teaching model.
Distance Learning Course (DLC)	MUR – Degree Program Database	Degree programs delivered fully or predominantly online, removing physical presence requirements and increasingly adopted after the pandemic.
Territorial Human Capital Attractiveness Index (TEHA)	The European House – Ambrosetti	Composite index measuring a territory's ability to attract and retain qualified human capital, based on factors such as employment opportunities, quality of life, infrastructure, and innovation.

The empirical analysis was conducted by estimating Ordinary Least Squares (OLS) linear regression models, separate for each academic year considered (2016/17 and 2022/23). The models estimate the marginal effect of a set of independent variables - related to the mode of degree delivery (traditional, blended or distance learning), the policies adopted by universities (activation rate of part-time collaborations and availability of accommodation), and the level of territorial attractiveness for qualified human capital (measured through the TEHA - Territorial Human Capital Attractiveness Index) - on the two dependent variables: the Attractiveness Index (AI) and Distance Learning Enrollment Rate (RDL). The OLS

method makes it possible to estimate the linear relationship between the variables by isolating the effect of each context and policy factor on college students' mobility behavior and educational preferences. The specification of the model adopted is as follows:

$$Y_r = \beta_0 + \beta_1 CA_r + \beta_2 AP_r + \beta_3 TC_r + \beta_4 DCL_r + \beta_5 TEHA_r + \epsilon_r$$

Where:

- Y_r represents, alternatively, the Attractiveness Index (AI) or Distance Learning Enrollment Rate (RDL) in region r ;
- $CA_r, AP_r, TC_r, DCL_r, TEHA_r$, represent the independent variables already described in Table 1;
- ϵ_r is the error term, which collects the unobserved components.

Estimates were made with standard errors robust to heteroscedasticity. To ensure the statistical validity of the results, diagnostic analyses were conducted on the residuals and multicollinearity checks among the explanatory variables by calculating the Variance Inflation Factor (VIF). Alternative model specifications (inclusion/exclusion of selected covariates) were also tested to verify the sensitivity of the results to the specification assumptions. In some cases, a log-linear form of the dependent variables was also explored, but no significant changes in the main results were found.

The adoption of the regional level as the unit of analysis, while not allowing for the capture of the punctual dynamics manifested at the level of individual universities or degree programs, is nevertheless functional to the objective of identifying territorial macro-trends in university mobility. This methodological choice is justified by the fact that many of the policies supporting students - particularly those aimed at ensuring the viability of courses of study, removing economic obstacles to accessing and continuing university studies, and promoting interregional mobility - are the responsibility of the regions (Art. 34 of the Italian Constitution). Within this institutional framework, aggregating data at the regional level is not only consistent with the administrative structure of the policies under analysis, but also allows us to observe more clearly the link between institutional interventions and student mobility behavior.

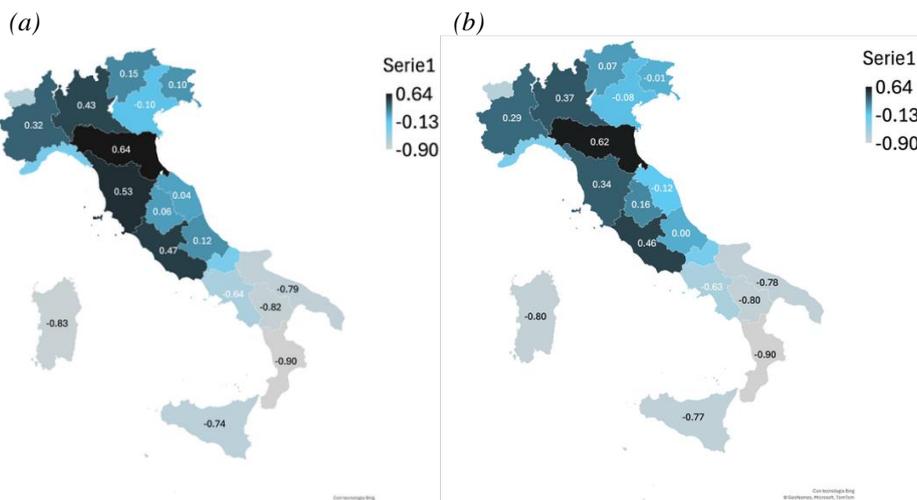
3. Attractiveness Index and diffusion of Distance Learning: a pre and post Covid-19 intra-regional comparison

Figure 1 shows the regional distribution of the Attractiveness Index (AI) of Italian universities in the academic years 2016/17 (Figure 1a) and 2022/23 (Figure 1b), that

is, before and after the Covid-19 pandemic. In 2016/17, the regions with the highest values of the index were Emilia-Romagna (0.64), Tuscany (0.53), and Lazio (0.47), all located in north-central Italy. At the macro-regional level, an average value of 0.43 was observed in the North, 0.48 in the Center, and -0.63 in the South and Islands, where regions such as Calabria, Basilicata, Sicily and Sardinia showed strongly negative values, confirming the established imbalances in outflows.

In 2022/23 (Figure 1b), the index shows a slight decline in historically attractive regions: Emilia-Romagna both drop to 0.62, Tuscany to 0.34, Lazio to 0.46, Lombardy from 0.43 to 0.37, and Piemonte from 0.32 to 0.29. The average value in the North falls slightly to 0.39, while that in the Center stands at 0.44. In the South and the Islands, the index remains negative, but there are slight signs of improvement in some regions: Puglia goes from -0.79 to -0.78, while Campania, Calabria, Sicily and Sardinia maintain stable negative values.

Figure 1 – *The attractiveness Index (AI) of universities in the academic year 2016/17 (Figure 1a - left panel) and in the academic year 2022/23 (Figure 1b- right panel).*



Source: own elaborations based on ANS data.

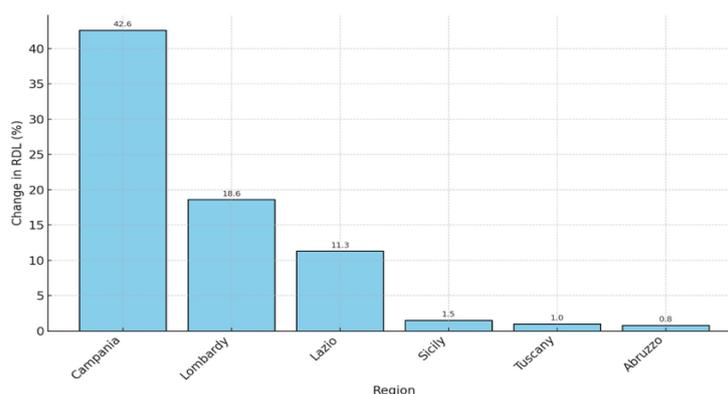
Figure 2¹ highlights regional changes in the rate of enrollment in distance learning (RDL) courses between 2016/17 and 2022/23. The increase is generalized and significant, reflecting a structural transformation of university educational offerings, accelerated by the pandemic. In 2016/17, Lazio was the only region with a high

¹ Figure 2 shows only those regions where the pandemic and the expansion of distance learning produced the most significant changes in enrollment rates, in order to highlight the most relevant shifts.

incidence of enrollment in online courses (47.3%), followed by Campania (12.4%), while in the rest of the country the percentages were almost zero (between 0.2% and 4.6%). In 2022/23, Lazio reaches 58.6%, Campania 55%, and Lombardy rises from 4.6% to 23.2%. Significant growths are also observed in regions such as Sicily (from 0% to 1.5%), Tuscany (from 0.2% to 1.2%) and Abruzzo (from 0.3% to 1.1%).

This increase in distance learning has important implications for interregional student mobility. On the one hand, remote accessibility to university courses may have reduced the need for physical travel, contributing to the decrease in attractiveness experienced in some North Central regions (Figure 1b). On the other hand, the possibility of attending university remotely may have partially contained student emigration from southern regions, explaining the slight signs of recovery in the attractiveness index in some of them between 2016/17 and 2022/23 (Figures 1a and 1b).

Figure 2 – Change in Rate of Students Enrolled in Distance Learning (RDL) between period before (a.y. 2016/17) and after Covid-19 (a.y. 2022/23).



Source: own elaborations based on MUR – Degree Program Database

This change has major implications for the spatial attractiveness of universities and interregional student mobility. On the one hand, the increase in distance-mode courses may have reduced the need to physically travel to university locations, thus contributing to the slight decline in the Attractiveness Index (AI) observed in some traditionally attractive regions in the North-Central region. On the other hand, the ability to access university courses remotely may have mitigated student emigration from southern regions, contributing-at least in part-to the slight improvement in the Attractiveness Index observed in some of them between 2016/17 and 2022/23.

4. Analysis of some determinants of university attractiveness in Italy: the role of distance learning and student support policies before and after Covid-19

The results of the estimated regressions for the academic years 2016/17 and 2022/23 (Figure 3) allow us to analyze the evolution of the determinants of spatial attractiveness of universities and interregional mobility of university students. The increase in distance learning educational offerings, introduced in a massive way following the pandemic, profoundly reconfigures the geography of higher education in Italy.

In the pre-pandemic period, the Attractiveness Index (AI) of university regions is mainly determined by structural and contextual factors. Prominent among these is the TEHA Index, which summarizes the ability of a territory to attract qualified human capital (students, workers, professionals), based on dimensions such as employment opportunities, quality of life, access to services, infrastructure, and economic incentives (Ambrosetti, 2021). The estimated regression coefficient for TEHA in a.y. 2016/17 is high and statistically significant ($\beta = 2.455$; $p < 0.001$), indicating a strong link between university attractiveness and general conditions of territorial competitiveness.

At this stage, universities' own characteristics — such as offering courses in traditional or distance learning modes or activating student support measures — do not show significant effects on the attractiveness index. Interregional mobility follows well-established trajectories, directed toward major academic hubs in the North-Center, and reflects a logic of concentration of educational and professional opportunities (Bonaccorsi *et al.*, 2014; Triventi and Panichella, 2016).

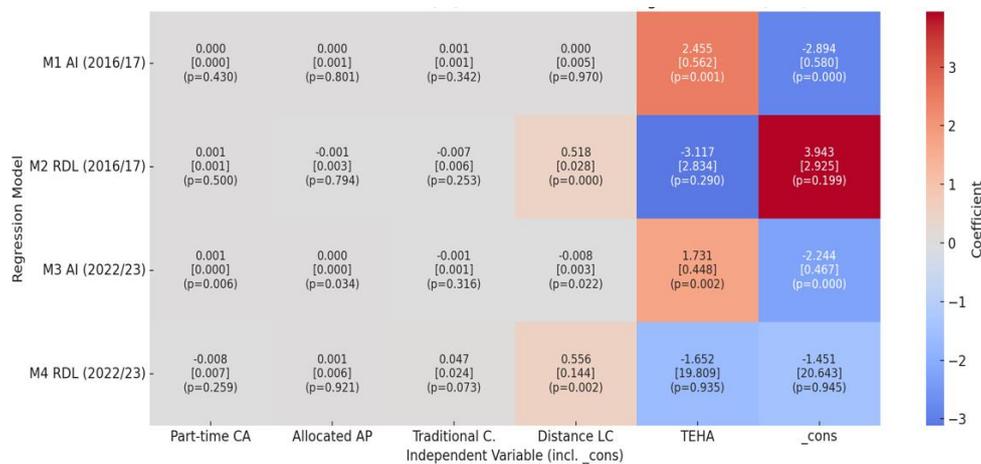
With the Covid-19 pandemic, these dynamics undergo a structural change. The massive and structured introduction of distance learning profoundly changes the behavior of student movers. Data referring to a.y. 2022/23 show a significant increase in enrollment rates in distance education courses, with marked differentials between regions and a direct impact on spatial attractiveness. The post-pandemic regression estimates a negative coefficient for the Distance Learning Course variable on AI ($\beta = -0.008$; $p = 0.022$), signaling that as online offerings increase, the physical attractiveness of regions decreases. This pattern is clearly illustrated in Figure 3, which provides a comparative heatmap of estimated coefficients and their statistical significance across models. A substitution effect of interregional mobility is observed, consistent with international evidence on the anchoring effect of educational digitization (Marginson, 2020).

At the same time, there is a new centrality of university policies on the right to study, particularly part-time collaborative activities ($\beta = 0.001$; $p = 0.006$). These show a significant correlation with attractiveness, suggesting that student mobility becomes more sensitive to the presence of economic instruments for the

sustainability of the university pathway. This shift reflects students' greater attention to the opportunity cost dimension and the possibility of self-financing. In parallel, the rate of enrollment in distance learning courses (RDL) appears to be increasingly influenced by the presence of distance education offerings. The model estimated for 2022/23 (M4) shows a strong positive effect of the Distance Learning Course variable on RDL ($\beta = 0.556$; $p = 0.002$), confirming that the availability of digital education pathways is now the main determinant of virtual university mobility. Conversely, structural variables such as TEHA, which were significant for territorial attractiveness, lose relevance in the context of online education, indicating a growing disconnection between the physical geography of academic offerings and student decision-making.

Overall, these results suggest that the post-pandemic period redefines the logics of university mobility. Physical student mobility declines, partly offset by a growth in virtual mobility (Panarello, 2022). Some regions gain attractiveness due to the increased flexibility and accessibility of online courses, while others—while maintaining a high academic presence—see their attractiveness weaken due to a reduced capacity to adapt to the evolving landscape of higher education delivery.

Figure 3 - Comparative Heatmap of Regression Coefficients and P-values for Attractiveness Index and Distance Learning Enrollment (a.y. 2016/17 and 2022/23)*.



* Each cell reports the regression coefficient and p-value; colors indicate direction and strength of the effect (red = positive, blue = negative). Emphasis is placed on statistically significant variables ($p < 0.05$).

5. Final remarks

This paper offers an updated reading of interregional university mobility processes in Italy, in light of pandemic-induced transformations and the expansion of distance learning. The analysis confirms that the increase in educational offerings in digital mode has introduced new balances in the geography of university attractiveness, reducing the relevance of traditional territorial factors and favoring more flexible access that is less constrained by physical presence (Education and Training Monitor, 2024; MIUR, 2023).

Methodologically, the work is distinguished by the use of an original, purpose-built dataset, which integrates heterogeneous institutional sources (ANS, MUR, educational supply database, GII - Ambrosetti), some of which have so far been poorly explored in the literature on university mobility (ISTAT, 2023). The use of separate OLS models for each academic year makes it possible to capture temporal discontinuities and to estimate the marginal impact of independent variables with high precision.

The results show a substantial change in the determinants of attractiveness: in the pre-pandemic period, the spatial context (as measured by the TEHA Index) is the main driver of mobility, while in the post-pandemic period the substitution effect of distance learning courses and the centrality of study policies, such as part-time collaborations, emerge strongly. This suggests that university attractiveness is progressively shifting from a logic of concentration of spatial opportunities to one based on personalization of supply and affordability and digital accessibility.

In conclusion, the research contributes significantly to the scholarly debate on the transition to hybrid and inclusive university models by providing empirical tools for understanding new student choice strategies. It also lays the groundwork for future reflections on territorial cohesion policies and equity in access to higher education, in a context increasingly marked by virtual mobility and competition among universities on a national and global scale.

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