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Universities in today's world-between the potential regional growth and market economy absorption

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Abstract. *Recently, various studies have demonstrated the significance and impact of universities on regional development. However, the determinants of their success are either economic performance, student enrolment, or issued patents. It is believed that universities have adopted the utilitarian paradigm too heavily, focusing primarily on the number of students or the students' skills while neglecting individual growth and the university's raison d'etre. Case studies, which depend on various other variables and biases, provide most examples of successful universities. According to scientists, universities became overly dependent on the economic system due to excessive involvement. This study employs a spatial regression model to examine the impact of universities and students on the quality of life and industry specialisation. According to the study, universities affect European regions' quality of life. The number of students at each level of education negatively influences the industry's presence. However, the population's lifelong learning share positively influences the regional economy. The study examines education indicators using a spatial approach, making it more generalisable than earlier case study research.*

Keywords: university, regions, spatial regression, market economy, specialisation, entrepreneurship.

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Introduction

Recently much attention has been given to universities' role in economic, social and regional development (Etzkowitz, 2016). However, the reasons for their implication are not new. This enthusiasm for entrepreneurial universities is primarily motivated by the capitalist economic system's dynamism and inventiveness (Kornai, 2014). But the initial role of universities did not have an economic foundation nor the focus of their training. Initially, observing the Platonic education system, the emphasis is placed on the human person (Murphy, 2015). The meaning of education is to develop human personality as rational and moral beings. Additionally, the educator is considered both a master of his craft and a mentor for young scholars in both the speciality owned and human dimensions. Lee (1994), commenting on Plato, states that a just society can only be established when its components, including labourers, warriors, and politicians, live in harmony. And this peace can only be realised through equal access to qualitative education.

Starting with those mentioned above and the significance of education, Nussbaum (2012) observed that many parents are concerned about whether their children are well educated for financial success. To reject mindless tradition and authority, students must be taught critical thinking through studying the arts and humanities, just as our great educators and nation-builders did. Even though economic progress has a significant impact on people's lives and evolution, failure to promote critical thinking, rational analysis, and empathy for the needs of others can turn all growth into a catastrophe. The danger of obedient communities was also observed by McDonnell-Naughton & Păunescu (2022). Alternatively, in a way, more economic growth does not translate into a better democracy. From a more western perspective, Chomsky (2004) identifies universities as indoctrination and obedience-imposing institutions that played a crucial part in a system of control and coercion. Despite the belief that the argument is overblown, there are instances of international academic freedom standards being broken in the interest of governments and politicians. In the Lex CEU case, for instance, the government altered the modifications to the Higher Education Law such that the Central European University cannot operate in Hungary ("Lex CEU," 2022). The probable causes of this were political misunderstandings.

However, why do senior writers rebuke the school system so harshly? One explanation is that the existing education system has become solely utilitarian, with universities functioning as market supporters. Moreover, if they are part of the market, the system needs to be optimised, with unprofitable components being the first to be eliminated. When they started to remove the elements that did not work, that is where universities started to compete. The competition between universities leads to an ever-increasing pursuit of profit and efficiency at the expense of the institution's raison d'être. This does not imply that colleges and students should not capitalise on their skills and expertise. However, creating institutions with profit as the primary objective and basing educator-student relationships on market principles is not the optimal strategy.

From the notion that universities must connect to the market, new concepts such as academic entrepreneurship Klofsten & Jones-Evans (2000), university start-ups and spin-offs Steffensen et al. (2000), and entrepreneurial universities have emerged (Etzkowitz, 1983). Entrepreneurial knowledge is required to engage in entrepreneurship. Knowledge, it is believed, is both tacit and explicit in that it can be embodied by virtually any actor in the economic system, including universities. It was believed that the more embedded the components of a system are, as well as the higher the level of R&D investment on the part of universities and private companies, the greater the likelihood of knowledge spillover to the overall system (Audretsch & Feldman, 1996). However, it was determined that universities could play a more significant role in innovation and regional growth if they took human capital development, training, and teaching to solve critical community problems more seriously (Anselin et al., 1997; Schlossberg et al., 2018). As a bottom-up approach that brings together the majority of local actors, social innovation can be one of the solutions for reinstating the role of universities in local communities (Păunescu et al., 2022). However, the issues stay in the substance and focus of education rather than the process itself.

This research paper will examine how a university can contribute to a region's development and growth and philosophically determine how not to completely be devoured by the demands of the economic system and lose its educational mission. Moreover, is it a societal necessity for a university to become an entrepreneurial establishment? It will examine the role education indicators have on the quality of life in European regions.

Additionally, the paper will consider how a university can fulfil its role in society without attempting the impossible.

Theoretical background

History and concept of university

The first mention of the university goes back to 1208 in Paris, from the latin word "*universitas"* (Ridder-Symoens & Rüegg, 2003). From Latin, this word means "turned into one" or "whole" (*Ūniversitās in English, Glosbe*, 2022). However, two of the most prominent Latin synonyms for this word are "commune" and "corporation." This may mean living in a corporation. As a result of the urban expansion in the 13th century, new mediaeval cities as universities with their own administration and regulations emerged. And these cities were administered from within by craftsmen or masters ("*magistri")*. The rector was a master himself chosen by masters and students (Ridder-Symoens & Rüegg, 2003). To become a craftsman, pupils were required to undergo rigorous training in their respective fields from masters. Old books by Goethe (1749-1832), such as Wilhelm Meister's Apprenticeship, attest to the fact that teachers have always lived among their students and guided them (Goethe et al., 1995).

Church officials and emperors granted three types of liberties to medieval universities. Primarily financial, legal, and intellectual freedom. Financial by not paying taxes, an infringement by students was handled by the church, and they were free to design their own curricula. Later in the Middle Ages, two learning systems were present: reading of canonical texts and second, disputes over societal or existential problems. These later developed into logic and natural philosophy, moral philosophy, cosmology, psychology, epistemology, and metaphysics. Primarily, philosophical inquiry distinguished between the physical and the metaphysical and introduced the phenomena of inquiry, discovery, experimentation, and speculation into education. Perhaps one of the greatest challenges universities have faced in the past and will face in the future is building an institution of higher education that is focused on helping students acquire qualified knowledge while preventing it from being corrupted by political, economic, religious, or legal forces (Nybom, 2003). Alexander von Humboldt (1769-1859) initially attempted to create a socially cohesive yet self-governed organization that provided qualified scientific instruction. According to the researcher, educational institutions should concentrate on three foundations. First is "personality development" and teaching youngsters how to discover the reality and objective truth. Second, it is a school of freedom, where freedom is utilised for personal development. The final pillar consists of science to create new knowledge (Sorkin, 1983). Furthermore, it was divided into two principles, the "moral" and the "utilitarian" side (Nybom, 2007). According to Newman (1852), a university is not so much a place for academic performance but rather a community of thinkers and an institution that fosters the advancement of individual intellect rather than fostering institutional measurements and narrowly defined competence training.

However, one may argue that the need for education has changed, as have the diversity of students and the reason for graduating from university (Hunt, 2011). Moral and personality development has been sacrificed for the sake of an accidental purpose, a particular trade, profession, study, or research (Pelikan, 1994). However, if universities focus solely on national profits, productivity, and firm growth, discarding skills needed for democracy can lead to dire consequences. Educating useful machines, instead of complete

society members who can evaluate and criticise things individually, endangers the existence of current education institutions (Nussbaum, 2012). We should not overlook the building of brotherhood in universities, which has contributed to several unified campaigns for democracy. The Euromaidan movement in Ukraine, the Free Speech Movement in the United States, the Sunflower Student Movement (Hsu, 2014) in Taiwan, and the Anti-Black Box Movement in Taiwan can be listed here. The COVID-19 pandemic demonstrated how universities' community engagement capacities were constrained and how essential they are for addressing societal issues (McDonnell-Naughton & Păunescu, 2022).

Understanding the function of universities in society requires an appreciation of their role in advancing knowledge. Knowledge is acquired through experience and self-understanding and passed orally or written for thousands of years. The only contrast between humans and other animals, according to Korzybski (1921), is that humans are "time-bound" animals. In terms of knowledge, the new generation can only start where the previous one left off. For centuries, universities served as the social binder, transmitting knowledge from one generation to the next. In contrast, they disregard an essential role: the experimenter and originator of knowledge. In addition to providing an environment conducive to the transmission of knowledge, they should concentrate on fostering the growth of typical creative patterns (Chomsky, 2004).

How universities were forced to enter the market economy

In the 19th century, universities were acknowledged for their contribution to the industrialisation process by supporting new companies with scientific advice and staff training and their role in the medical profession, which improved citizens' quality of life and health. The importance of universities' knowledge transfer to social cohesion was also emphasized by Kaputa et al. (2022). For example, the "land-grant" institutions contributed to the development of mechanical arts and science-based engineering in the USA and prepared thousands of professionals and 'specialists' (Sorber, 2019, p. 16). Now, a transition from the industrial to the knowledge economy can be noticed, in which universities again play a crucial role. However, the marketisation of higher education distanced educational institutions from their obligation towards the local society and their responsibility regarding the individual's value. The recent attempts to transform universities into localised civic organisation comes from their potential to engage in social innovations and the regional knowledge they possess (Goddard & Vallance, 2012). Their participation in cross-border interaction institutions and university missions for society is rarely discussed. However, the urbanisation movement rendered the rurally-socially formed vocational professions less desirable, and students who valued mobility and urban migration shifted their attention to the arts, sciences, and engineering. Progressively the experimenter position has gradually replaced the verbalistic philosopher role of the university.

Additionally, universities have been scrutinised for their critical role in technology transfer and innovation (Gibb, 2002). Inventiveness, innovation, and entrepreneurship are commonly misunderstood and jumbled. Thus, it is necessary first to grasp their meanings. Inventiveness is the capacity to combine knowledge, creativity, experimentation, and design knowledge to create something new. In contrast, innovation implies both inventiveness and the ability to commercialise a new product or service. Entrepreneurial ability refers primarily to bringing a product or idea to market. There is a distinction between knowing how to do something as an academic subject and being capable of doing it.

Academic research necessitates that educators engage in research and innovation. However, this approach contradicts universities' ivory tower' teaching mission. While research is related to technological innovation and knowledge commercialisation, teaching is associated with knowledge sharing, the development of student competencies, as well as civility in discourse and faith in rationality (Etzkowitz, 2019, p. 30). To alleviate these concerns about how universities innovate, commercialise their innovations, and collaborate with other actors in the innovation system, Etzkowitz & Leydesdorff (1995) introduced the Triple Helix to denote the relationship between universities, industry, and government. That framework was intended to harmonise the innovation transfer process from university to industry, with the government legally facilitating this process. Even though Pittaway et al. (2021) argue that universities are critical to the success of their clusters, which have high revenues and a high number of start-ups, the case studies presented in the paper are far too context-specific. And the same do (Varga & Horváth, 2015).

Pelikan (1994) contradicts the claim made by Etzkowitz (2019) that research and teaching are in competition at the same university since the former is motivated by economic interest and the latter by the pursuit of knowledge. According to the research, educators should enhance knowledge by research and extend knowledge through teaching. Instructors sometimes assert that by conducting advanced research, they can also provide students with advanced training. Then, they believed that recombining these activities could make universities entrepreneurial if they could do both functions.

Firms are the main consumers of innovation and basic research, while industries are users of advanced scientific knowledge. When an industry in a region is underdeveloped, and there is insufficient demand, universities' research priorities shift to basic research, which is also irrelevant to industry development. In this case, we obtain excellence in research but lack utility and a weakened industrial sector. Additionally, Lee (2019) notes that only firms lacking R&D capabilities will pursue work together with universities and research institutions. And research topics are chosen based on the journal, or scientific community, personal scientific significance. Thus, the issue is not with less entrepreneurial or inclusive, innovative universities but a lack of innovation demand from industry and businesses. While little is done to harmonise the research paths with local and regional industry needs. Universities may prioritise so-called commercial research over government-defined research to increase firm entry and spin-offs.

In the study of Gregorio & Shane (2003), they mention that what motivates universities to create more start-ups and innovation files is their eminence, enabling them to recruit the most cutting-edge researchers for the job. Additionally, the universities' eminence makes the new inventions more appealing to the industry. When it comes to innovation, it is the result of the interaction of capabilities and knowledge from various actors within an innovation system, though the paths are chosen differently. Despite many universities having innovation centres and research agencies McDonnell-Naughton & Păunescu (2022), what is forgotten is that what drives innovation is an incentive, and they can be financial or metaphysical. The metaphysical type of motivation can be attributed to meaning, the desire to do good, empathy, or working toward social gains. However, these values cannot be extracted from the current economic system primarily focused on individual gains. The present system is described by hard work, competitiveness, and personal gain. Industry capital is less risky in focus than government capital. Thus, when the industry finances research, this results in increased commercialisation. Whereas government funding may or

may not result in applied research and, in the future, unanticipated radical innovation. Here, university specialisation in either research or teaching is critical, as complementarity between them is frequently a lucky coincidence (Arrow, 1962).

Universities are frequently dependent on a small number of donors. As a result, educators and researchers frequently feel pressure not to pursue critical research, which might lead to pressure and dismissing educators with radical ideas.

Universities as knowledge gatekeepers in regional economies

While universities cannot immediately take the lead in regional innovation systems, they can help strengthen regional knowledge integration, resulting in a so-called "constructed advantage" (Leydesdorff, 2012). In their paper, Bedő et al. (2020) mention that entrepreneurial universities differ from traditional universities by having the attributes to be fully engaged in their regional economy and are also capable of utilising and commercialising knowledge. The diffusion of ideas to the market is critical to regional growth, as well as to the well-being and vitality of society (Berger, 2013).

Although companies like Apple, Facebook, and Microsoft are regarded as radical innovations, their technologies were already in place. Considering the science of wind power, the technology was pioneered by the U.S. Department of Energy (DoE) and then spread to customers via universities and national labs (Mazzucato, 2013). Access to new knowledge was not always as difficult as it is now, and patent protection was not always a barrier. To acquire the capabilities to innovate, one must gain access to previously existing knowledge. When patents, countries and individuals protect this knowledge have engaged in industrial espionage and intellectual property theft (Kornai, 2014).

What differentiates an entrepreneurial scholar from a traditional scholar is that they are problem solvers and enablers. They gather resources and create an environment conducive to success (Thorp & Goldstein, 2010). We need not more investment in research and development, though critical, but rather a larger pool of technological knowledge, prototyping, and design skills. Entrepreneurial universities should emphasise creativity training, imitation capabilities, and human capital creation more than inventions (Berger, 2013).

To bring universities closer to emerging technologies and methods, Chesbrough introduced the concept of "open innovation" in 2003. The concept implies that firms should leverage both internal and external ideas. In this case, it would entail collaborating with universities to gain access to new knowledge, technology, and methods (Leydesdorff & Ivanova, 2016). Here, university students will have the opportunity to work on real-world problems. However, firms will still play a central role in defining the innovation framework. The triple helix emphasises innovation as a result of university-industry-government relations and as a result of developing the knowledge infrastructure. In both the triple helix and open innovation systems, there is a basic misconception regarding who will benefit from the created capabilities, intellectual property, and innovation.

Universities can assist businesses in increasing their capacity to absorb local knowledge as knowledge nodes and brokers of knowledge and ideas on a regional scale. They can participate in regional analysis and co-creation of knowledge and collaborate in cooperative groups and hubs to foster learning and creativity (Edwards et al., 2017). Also, we should not exclude their role in teaching STEM disciplines and engaging in interdisciplinary research and innovation. Berger (2013) notes in the book "Making in

America" that innovation is not simply about the accidental discovery of general-purpose technologies and industries that appear overnight but rather the task of fostering the human talent and material resources necessary to develop and sustain those new industries sustainably. Universities can make a significant contribution in this area by educating creative, talented, and skilled workers. However, there is a conundrum here as well: why would the government invest in universities that generate value for the private sector if the benefits of the investment do not accrue in tax revenue?

While scientific knowledge and fundamental research are critical for expanding the pool of innovative ideas and technological opportunities, whether those opportunities are pursued is a function of business firms' business model, adaptability, and capabilities. When we compare Europe to the United States, we see a weaker scientific research system and the presence of smaller, less innovative businesses (Mazzucato, 2013). Additionally, compared to the American picture, Europe exhibits visible signs of weakness in technological innovation and, more importantly, scientific knowledge generation (Dosi et al., 2006).

Universities should take their "third mission" seriously by collaborating with external stakeholders other than those involved in research and teaching and by attempting to identify the commercial value of their knowledge (Adesola & Datta, 2020). Kliewe et al. (2019) note in a systematic review of the literature that the entrepreneurial university concept is associated mostly with subjects such as natural sciences, business, and engineering. At the same time, other specialities lack effective methods for engaging stakeholders or balancing supply and demand in the innovation process (Adesola & Datta, 2020).

These approaches overlook low-income activities, the difficulty of connecting to the business environment in the absence of technological domains, and the fact that these low-tech activities have a limited impact on resolving sectoral and regional disparities. Underfunding and limited access to alternative sources of capital continue to be major impediments to universities conducting advanced research. New departments, laboratories, and specialised units must be established continuously to support knowledge generation (Clark, 1998). However, Reynolds et al. (2014) argue in their book "Production in the Innovation Economy" those new technologies and start-ups require a continuous inflow of significant capital at each stage of product development, including ideation, prototyping, scaling, and commercial production (Locke & Wellhausen, 2014). The same research states that when a system is deprived of "learning by doing" activities, its capacity to accumulate knowledge and acquire capabilities is diminished, thereby reducing its discovery and innovation potential. Recently, the triple helix model composed of "universities", "industry" and "government", considered including the fourth element of "civil society" and the fifth element of "culture and arts" in the system (Frondizi et al., 2019). To achieve innovation, sustainable growth, and development, these fourth and fifth elements of the helix contribute to combining and specializing different sources of knowledge. This is also a component of the bottom-up approach used in the smart specialisation strategy. However, it is considered incorrect to associate arts and culture with parts of creativity, as distinct knowledge components define the type of knowledge used to create options.

In addition to scientific activity, specialization, and alignment of research streams, entrepreneurial universities must provide greater social and economic benefits. The terms engaged university and entrepreneurial university have frequently been used interchangeably. However, the terms have been applied differently; the engaged university

has been considered from a social and civic perspective, whereas the entrepreneurial university has been considered from an economical and innovative perspective (Kliewe et al., 2019). Despite universities' critical role in regions, only one sort of regional innovation system (RIS) integrating universities has been identified as having the greatest regional impact. Where they can commercialise their knowledge, which is primarily technical, via patents, open innovation, problem solving or spin-offs (Trippl et al., 2015).

One issue confronting European universities is the fragility of intellectual property rights systems, which cannot apply universally to different economic systems. While Trippl et al. (2015) assert that universities increased their patenting and licensing activities following the 1980 amendments to the Patent and Trademark Law, this resulted in increased innovation in the United States. Despite widespread support for instruments such as incorporation law and patents as innovation indicators, there is no conclusive evidence of their significance for the industrial revolution (McCloskey, 2010). To compete with developed universities, universities in less developed regions should focus on loosening the IPR systems through small patents that do not require a high level of novelty and enhancing trademarks. This would facilitate technological transfer and increase the number of start-ups (Lee, 2019).

Radosevic (2018) mentions that the low-developed regions of Europe have reasonably little R&D activity. Frequently, they borrow technologies from another country, adapt and improve them for the local market, and then exploit them. This implies that low-developed regions must first develop their industries through technological transfer, as they are far removed from the technological frontier, and then improve their manufacturing capabilities. Whereupon, as they approach the frontier, collaboration with universities becomes critical, as they rely heavily on universities for knowledge. However, industries with many firms and diverse technologies may benefit from university research more than small, specialised industries. The university's advantage is in fundamental research but in a different industry context (Nelson, 1959).

Methodological approach

The current research aims to measure the impact of education on the quality-of-life dimensions of regions but also regional development. The research includes quantitative analysis but also an exploratory data analysis (DEA) on social development indicators. The DEA analysis can aid in understanding the geographical clustering of regions that have similar social development indicators. The method of analysis is a Spatial Lagged Regression Model, mainly this type of model helps to avoid the correlation between the dependent variables of different regions. The geographical unit of analysis of variables uses NUTS 2 classification (Nomenclature of territorial units for statistics), mainly because of data available at this level of analysis. This is also the level of application of regional policies. Most of the data collected are secondary data obtained from Eurostat or data generated by different E.U. projects or technical reports and stored in EPSON or ARDECO database. The sample of regions includes 180 NUTS 2 regions.

Data collection process

The data collection process consisted of five stages. First, it was necessary to identify the dependent variables and the unit of analysis, in this case, regions. As the units of analysis are NUTS 2 regions, the data were collected from different sources in the second step, with the

single condition of matching the regional level. In Table 1, the variables used in the analysis are described in detail, along with the data sources. As part of the third step of the data collection process, the data are cleaned. In this case, if a region does not contain the dependent variable, all the independent variables are eliminated. Data exploration was conducted using the GeoDa Space software. Modelling and interpretation of the data were performed in the R environment. During the data collection process, the fourth and fifth stages are visualisation, description, and modelling of the data. In order to avoid the bias associated with one year, the time unit of analysis is an average of the 2017 and 2019 measurements of the variables. It should be noted, however, that for some variables that are fixed in time (e.g., University Accessibility), a one-time assessment has been made (2018).

Table 1. Variables used to measure the regional impact of universities

Variable	***Description***	***Source***
Early leavers from education and training (ESL)	Percentage of the population aged 18-24 having attained at most lower secondary school and not going further (avg. 2017-2019)	*Eurostat statistics*
Household disposable income (Dispinc)	Disposable income of households per capita (2019)	*Own calculation based on Eurostat data*
Severe material deprivation (Materdep)	The material deprivation rate is an indicator that represents the inability of the population to afford some items considered to be desirable or even necessary to have a decent life (2019)	*Eurostat statistics and* EU-SILC survey
DIGITAL SKILLS	Individuals with above basic overall digital skills	*Regional Innovation Scoreboard*
Lifelong learning	Percentage of population aged 25-64 participating in education and training (last four weeks) (2019)	*Own calculation based on Eurostat data*
University Accessibility	Percentage of population in a NUTS-2 region who can access a main university campus within 45' drive (2018)	*DG REGIO (Poelman and Dijkstra, DG REGIO WP 01/2018). Own calculation for NUTS2 regions*
Bachelor's Students(BA)	Number of students enrolled in tertiary education on Bachelor's level (avg. 2017-2019)	*Eurostat statistics*
Master students(MA)	Number of students enrolled in tertiary education on Master level (avg. 2017-2019)	*Eurostat statistics*
PhD students(PhD)	Number of students enrolled in tertiary education on PhD level (avg. 2017-2019)	*Eurostat statistics*
Compensation per person employed	Compensation of employees at current prices/employed persons	*Own calculation on data from ARDECO database*

Variable	*Description*	*Source*
Territorial Quality of Life Index (TQI)	TQI=TQIGLE+TQIMLD+TQILFD, where: TQIGLE= Good Life Enablers dimension TQIMLD= Life Maintenance dimension TQILFD= Life Flourishing dimension	*Source: ESPON QoL – Quality of Life Measurements and Methodology*
Specialisation in induced manufacturing sectors Specialisation in induced services	These indicators represent the regional specialisation in induced manufacturing sectors and induced services sectors averaged in the period 2008-2016.	*Source: Technological Transformation & Transitioning of Regional Economies project and ESPON db.*
Notes: Some of the variables with large values were log normalised.		

Source: Author's own elaboration.

Special attention must be given to the Territorial Quality of Life Index (TQI) interpretation, as this is the dimension that we are planning to measure in the regression model. Territorial Quality of Life Index is a composite index at the European level. The composite index is compiled from 9 domains and 20 sub-domains. The background indicators can be observed using "TQoL European Dashboard tool" (https:// database.espon.eu/indicator/2060/). The reporting time of the TQoL index is the year 2019. The index composition can be found in Table 2.

Table 2. Decomposition of Territorial Quality of Life Index on subdimensions

Good Life Enablers	***Life Maintenance***	***Life Flourishing***
Personal Enablers	*Personal Health and Safety*	*Personal Flourishing*
Housing & basic utilities	Personal Health	Self-esteem
Healthcare	Personal Safety	Self-actualization
Education		
Socioeconomic Enablers	*Economic and Societal Health*	*Community Flourishing*
Transport	Inclusive Economy	Interpersonal Trust (societal belonging)
Digital connectivity	Healthy Society	Institutional Trust (good governance)
Work opportunities		
Consumption opportunities		
Public spaces		
Cultural assets		
Ecological Enablers	*Ecological Health*	*Ecological Flourishing*
Green infrastructure	Healthy Environment	Ecosystems services and Biodiversity wealth
Protected areas	Climate Change	

Source: Author's own elaboration on TQoL European Dashboard data.

Data analysis and modelling

One of the primary tasks of Ordinary Least Square regression is to identify a good match between the predicted values Xβ and the observed value of the *y* and determine which variables contribute to a linear connection. By minimising the sum of squared prediction errors, we find the estimates for β. To perform the inference about the population regression

estimates, it is necessary to fulfil certain assumptions about the random side of the equation (so that the estimators become BLUE: Best Linear Unbiased Estimator. The central assumption about the error term is that it must be unbiased (a random error has a mean of zero) and efficient (the random error terms are uncorrelated).

$$y= X\beta+\varepsilon \quad (1)$$

These assumptions may be violated in the case of spatial data, as the variables may be geographically dependent. The relation between the spatial observations, also called spatial correlation, will most probably bias the result. To avoid the spatial autocorrelation (error terms are correlated between neighbouring spatial units) and solve the inefficiency assumption, a spatial error specification ρW_{ε} should be introduced in the model's regression error term. Where y and ε are vectors of n × 1 dimension (Smirnov & Anselin, 2001):

$$y=\rho Wy+X\beta+\varepsilon \quad (2)$$

The next step is to perform Lagrange multiplier diagnostics for spatial dependence L.M. Error for error correlation and L.M. Lag test for spatial autoregression of the dependent variable. If only one of the L.M. Error or L.M. Lag tests is significant for $p<0.005$, that model is performed. If none, then an examination of the Robust L.M. for each model type is required. When both tests are significant, it considers the local and global impacts desired to be examined. In the case of global effects, which captures the spatial dependence in the dependent variable and the average effect with which the dependent variable in the "i "region affects other regions, not only neighbours. In this case, we use the SLM model, meaning Spatial Lag Model:

$$TQI=\rho Wy+\beta_1 (\text{Lifelong learning})+\beta_2 (\text{University Accessibility})+ \beta_3 (\log(\text{Number of bachelors students}))+\beta_4 (\log(\text{Number of Master students}))+\beta_5 (\text{ESL})+? \quad (3)$$

While for the other models, an ordinary least square regression was applied to each dimension of the Territorial Quality of Life Index (TQI).

$$TQIGLE = \beta_1 (\text{Lifelong learning})+\beta_2 (\text{University Accessibility})+\beta_3 (\log(\text{Number of bachelors students}))+\beta_4 (\log(\text{Number of Master students}))+\beta_5 (\text{ESL})+? \quad (4)$$

The 4th equation measures the effect of education and lifelong learning, but also different categories of students on the "Good Life Enablers" dimension, which is itself composed of "Personal Enablers", "Socioeconomic Enablers", and "Ecological Enablers".

$$TQIMLD = \beta_1 (\text{Lifelong learning})+\beta_2 (\text{University Accessibility})+ \beta_3 (\log(\text{Number of bachelors students}))+\beta_4 (\log(\text{Number of Master students}))+\beta_5 (\text{ESL})+? \quad (5)$$

On the other hand, the 5th equation measures the effect of education and lifelong learning, but also different categories of students on the "Life Maintenance" dimension, which is itself composed of "Personal Health and Safety", "Economic and Societal Health" , and "Ecological Health".

$$TQILFD = \beta_1 (\text{Lifelong learning})+\beta_2 (\text{University Accessibility})+\beta_3 (\log(\text{Number of bachelors students}))+\beta_4 (\log(\text{Number of Master students}))+\beta_5 (\text{ESL})+\epsilon \quad (6)$$

The last equation, the 6th, looks at how the upper-mentioned variables can explain the "Life Flourishing" dimension.

Specialization in manufacturing or specialisation in services is another important variable that needs to be discussed. In order to determine the specialisation, the Technological Transformation & Transitioning of Regional Economies project members used the Location Quotient (L.Q.). The computation was performed using the following formula $LQ_{r,s} = [(Emp_{r,s} / Emp_r)] / [(Emp_{EU,s} / Emp_{EU})]$ where Emp stands for the number of employees, r the region, s the sector (i.e. 'technology', 'carrier' or 'induced', respectively). In regions with L.Q.s lower or equal to 1, the region is not specialized in a particular sector, whereas in regions with L.Q.s higher than 1, the region is specialized. For the period 2008-2016, Eurostat has provided data on regional sectoral employment at the NACE 2-digit level in SBS (Structural Business Statistics) that was used in this calculation.

Results of the research

This article seeks to examine the variables that cause students to reconsider pursuing a university degree, as well as the impact of education and universities on regional social and economic development. Before proceeding with regression analysis, exploratory data analysis is conducted. In Figure 1. 20 to 25 per cent of 18- to 24-year-olds in the southern regions of Romania, Bulgaria, Italy, and Spain quit school early. Early school dropout means the percentage of the population aged 18-24 having attained at most lower secondary school and not going further. Figure 2 demonstrates that in the cases of Romania and Spain, low compensation levels correlate with low levels of educational involvement. In nations like Poland and Croatia, for example, early school dropout rates are relatively low despite low compensation levels.

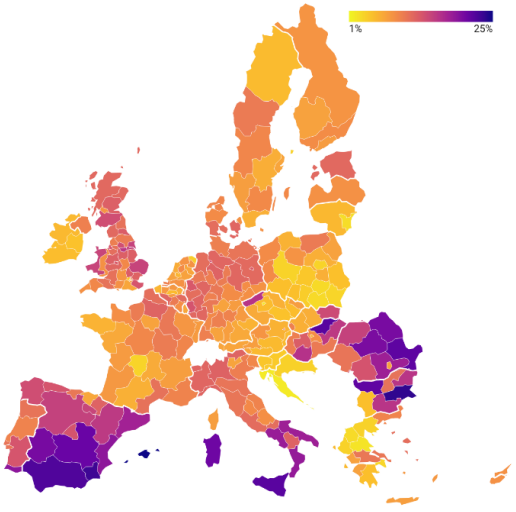


Figure 1. Spatial representation of early leavers from education and training (ESL)
Source: Author's own elaboration on data from Eurostat.

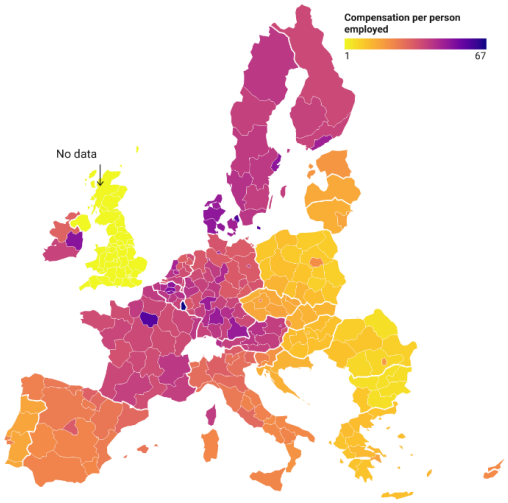


Figure 2. Spatial representation of compensation per person employed
Source: Author's own elaboration on data from Eurostat.

However, visually analysing the spatial correlation of the values is not straightforward. Therefore, Anselin (1995) introduced the LISA indicator of spatial

association. The indicator assesses the significance of the spatial relationship between regions and visually issues an overview of the location of clusters. As shown in Figure 3, there is a regional association between the values of early dropouts from education and training in regions of Romania and Spain, as well as a spatially significant grouping. This indicates that the values in one region are dependent on the values in other regions, which may impact the regression analysis findings. In the case of intensely coloured regions, these values considerably contribute to a positive global spatial autocorrelation result.

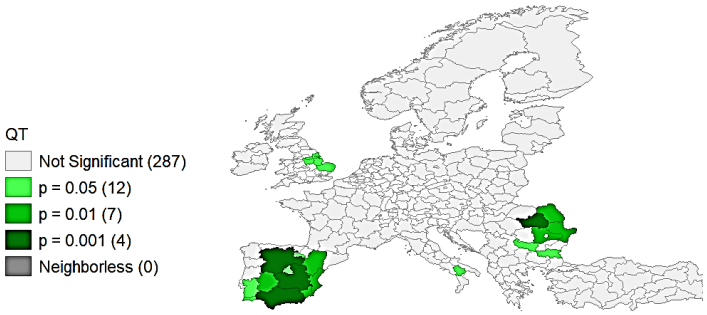


Figure 3. LISA spatial clustering of early leavers from education and training (ESL)
Source: Author's own elaboration on data from Eurostat.

Frequently, poverty and material deprivation directly impact young people's ability to participate in education. Poverty and material deprivation mean the inability of the population to afford some items considered desirable or even necessary to have a decent life. Families without a consistent source of money are frequently compelled to prevent their children from continuing their education, as it is costly. Studies indicated that material and social resources are stress-inducing for young people from childhood to adulthood (Bradley & Corwyn, 2002). Moreover, during the COVID-19 pandemic and online education approach, those children unable to participate in education were frequently the first to abandon it (Chu et al., 2020). As one can observe in Figure 4, the same regions at the risk of poverty and social exclusion are also the ones with the highest rates of school abandonment.

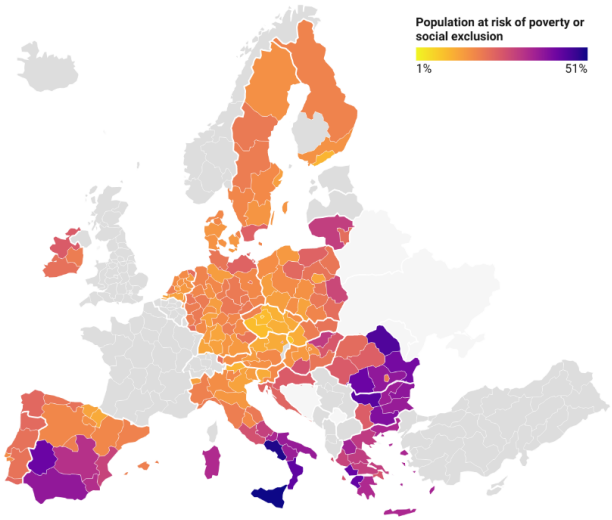


Figure 4. Spatial representation of the population at risk of poverty or social exclusion
Source: Author's own elaboration.

Figure 5 depicts a three-dimensional three-field plot. The first level indicates the share of early dropouts from education and training, the second level represents the average level of compensation in the region, and the third level represents the digital skills possessed by those regions. As expected, locations with a low incidence of early school leavers (ESL) have average compensation rates that are greater than other regions. Generally, the locations with the highest levels of remuneration also have the highest levels of digital proficiency. However, there is also a cluster of regions with a low abandonment rate of higher education with low compensation levels but superior digital abilities.

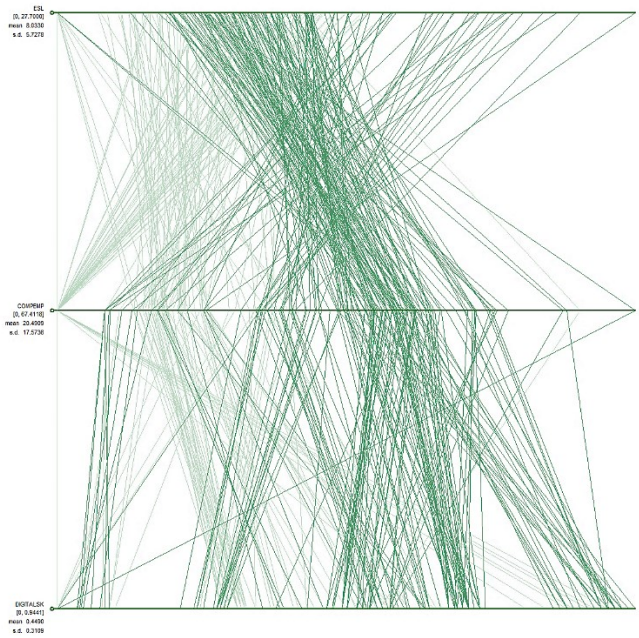


Figure 5. A three-level plot on Early education leavers, Compensation level, and Digital skills capacity

Source: Author's own elaboration.

Typically, a spatial model is employed to observe the geographical dependence between values and to model the data to eliminate the estimators' bias. As the data in one location may depend on nearby regions, this influence must be measured. We utilise the Moran's I plot to measure the geographical autocorrelation of the dataset on early dropouts from school and training. Observing that the objects in Figure 6 are attracted to one another in the present instance indicates that the observations are not independent. This suggests a breach of the assumption of data independence. Moran's I from Anselin (2005) is a technique for measuring spatial autoregression. However, this test does not reveal the type of autocorrelation present. More complex testing, such as L.M. tests for Lag and Error autocorrelation, should be conducted. As seen in Table 3, the Lagrangian multiplier diagnostics reveal a spatial correlation in both the error term and the dependent variable, which is consistent with the low P-values of the test results. It was decided to run only the error autoregressive model for the first model because performing a spatial regression with two types of lags would alter the findings.

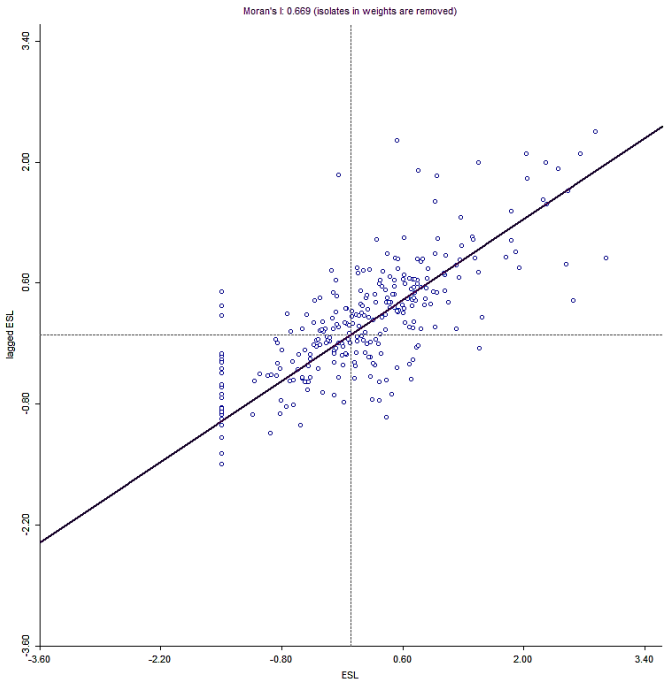


Figure 6. Moran's I spatial correlation plot

Source: Author's own elaboration.

Table 3. Lagrange multiplier diagnostics for spatial dependence

Test	***Value***	***Degrees of freedom***	***P-value***
LMerr	67.393	df = 1	2.22e-16
LMlag	21.413	df = 1	3.702e-06
RLMerr	49.795	df = 1	1.706e-12
RLMlag	3.8161	df = 1	0.05076
SARMA	71.209	df = 2	3.331e-16

Source: Author's own research.

The primary objective of the current study is to determine the extent to which university graduates and university presence in a region affect not just the quality of life but also industry specialisation. This is represented in Table 4. Lifelong learning has a positive, statistically significant impact on all elements of the Quality-of-life indicator. This has a considerable detrimental impact on the specialisation of induced manufacturing, although having a beneficial impact on the specialisation of induced services. This can be explained by the manufacturing industries' preference for specialised, short-cycled knowledge.

Table 4. The effects of education and universities on Territorial Quality of Life and Industry Specialization

Dependent variable	**TQIGLE**	**TQIMLD**	**TQILFD**	**SPECMAN**	**SPECSERV**	**TQI**	**SPECSERV**
	OLS	*OLS*	*OLS*	*OLS*	*OLS*	*SLM*	*OLS*
Constant	0.417***	0.382***	0.324***	2.251***	1.158***	0.382***	1.787***
Lifelong learning	0.005*** t = 7.264	0.009*** t = 11.259	0.008*** t = 8.533	-0.019*** t = -6.386	0.005 t = 1.626	0.008*** t = 14.056	

Dependent variable	TQIGLE	TQIMLD	TQILFD	SPECMAN	SPECSERV	TQI	SPECSERV
University Accessibility	0.001*** t = 3.947	0.001*** t = 4.470	-0.00005 t = -0.152	-0.007*** t = -7.067	0.001 t = 1.215	0.001*** t = 4.424	
Bachelor's students	0.019** t = 2.214	0.021* t = 1.911	0.056*** t = 4.581	-0.076** t = -2.032	0.027 t = 0.747	0.034*** t = 5.017	
Master students	-0.022*** t = -3.149	-0.027*** t = -3.111	-0.054*** t = -5.411	0.041 t = 1.328	-0.070** t = -2.378	-0.035*** t = -6.498	
Early leavers from education (ESL)	-0.003*** t = -3.429	-0.005*** t = -4.381	0.0004 t = 0.280	-0.0002 t = -0.055	0.004 t = 1.020	-0.003*** t = -3.989	
Rho:						-0.07298***	
PhD students							-0.088***, t = -5.700
Observations	180	180	180	178	178	180	180
R^2	0.401	0.567	0.344	0.419	0.065		0.154
Adjusted R^2	0.384	0.555	0.325	0.402	0.038		0.15
Log Likelihood						277.385	
Nagelkerke pseudo-R-squared:						0.64301	
Akaike Inf. Crit.						-538.769	
Residual Std. Error	0.066 (df = 174)	0.083 (df = 174)	0.095 (df = 174)	0.291 (df = 172)	0.28 (df = 172)		0.311 (df = 178)
F Statistic	23.311*** (df = 5; 174)	45.585*** (df = 5; 174)	18.241*** (df = 5; 174)	24.846*** (df = 5; 172)	2.402** (df = 5; 172)		32.493*** (df = 1; 178)
Wald Test						5.037**	
L.R. Test						4.912**	
Note: P-value< 0.0001 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1							

Source: Author's own elaboration.

In the case of university accessibility, a more uniform distribution of universities across a region's territory would boost the quality-of-life indicators and have a negative effect on induced manufacturing, but this would have an insignificant effect on the specialisation of induced services. University accessibility and lifelong learning were also found to impact the entrepreneurial output of the analysed regions positively and significantly. An increase of one per cent in people in lifelong learning would increase the "Good Life Enablers", "Life Maintenance", and "Life Flourishing" dimensions of territorial quality of life by 0.5%, 0.9% and respectively 0.8%. The goodness of fit of the model on "Good Life Enablers "is R squared=0.4. For Life Maintenance, the goodness of fit is 0.5, while for the "Life Flourishing" dimension model, the goodness of fit is 0.34. Also, a positive effect university accessibility indicator (0.1%) while increasing the presence of a university in a region with one unit. However, no significant effect of the Life flourishing dimension was found.

The number of bachelors students in the region would influence the quality-of-life indicators in these locations, but it would have a negative impact (-0.007), with the significance (t=-7.067), on the specialisation in induced manufacturing and an insignificant impact on the specialisation in induced services. The results are accordingly to Baturina (2022), demonstrating how student engagement in their communities benefits social innovation and reduces inequality in Croatian regions. An opposite effect was observed in

the Master student category, meaning that it has a significant negative effect on the specialisation of induced services. However, no significant effect on manufacturing specialisation was observed.

In the case of early leavers from education and training (ESL), we can observe a negative influence of this indicator on the quality of life, but this may also be the result of reverse causality. Therefore, as the quality of life improves, the number of early school dropouts falls. There was no apparent effect of this indicator on the specialisation of these two types of industries. The PhD student number was found to have a significant negative effect only on industry specialisation. This means that PhD students' number in a region depends on whatever region specialises in services. If that region specialises in services, that will demotivate students to pursue a PhD.

A significant negative Rho suggests that neighbouring Territorial quality of life index scores in E.U. regions are distinct.

Conclusion and discussion

Throughout history, universities and educational communities have demonstrated their importance in a variety of situations. It is important to recognize their role in individual training, skill development, community building, and social value setting. In recent times, there has been a tendency to believe that universities should contribute to the economic well-being and material prosperity of the society in which they operate. Nevertheless, by focusing on utilitarian purposes, education systems have undermined their role in developing human character and critical thinking. For modern society to function effectively, these skills are essential. Similarly, a role that has been partially overlooked is the extent to which university students are connected to their local communities and participate in the development of prosperous, democratic societies. A primary focus of this study is to examine how universities have evolved and how they contribute to the economy as well as to the quality of life in European regions.

Policymakers expect universities to act as innovators and technology definers, train specialists, conduct novel and advanced, excellent research, commercialise knowledge, and conduct research that meets the needs of industry. However, such perspectives cannot be carried out by a single institution, much less a centralised one. Moreover, the motivation to become more productive and competitive precludes the facet of human development. University research is influenced not only by the nature of the industry or government funding but also by the industry's level of development and capabilities, as well as the way firms innovate and function. Bramwell & Wolfe (2008) have outlined similar research concerning the importance of universities to industries, in which they demonstrate that universities are essential for attracting talent to regional economies as well as fostering strong ties with local industries by providing formal technical support in addition to non-formal counselling and training for workers. Many university entrepreneurialism terms originate in the United States of America, sometimes only from the best universities with a strong connection to innovative industries.

In the second section of the empirical investigation, we discover that students at one level or another contribute to the dimensions of quality of life, implying that students can contribute to a better society with their skills and knowledge. However, the results in Table 4 are dichotomous when examining the relationship between the number of students and industry specialisation. There is a negative correlation between the number of bachelor's

degree students and Induced manufacturing specialisation and between the number of master's degree students and Induced service specialisation. As anticipated, early education dropouts have a strong negative impact on the quality-of-life index and its components. It was noticed that university accessibility positively affected the socioeconomic development of E.U. regions. These results align with Valero & Van Reenen (2019), which prove the positive effect on university staff and students within regions and in the neighbourhood. Nonetheless, the results regarding the impact of different categories of students (Table 4) on the specialization of employment in manufacturing and services are interesting. They have a negative or insignificant relationship with these sectors, indicating that other categories of individuals may relate to the specialization and not those with a university degree.

It was impossible to assess the content of the results produced by universities. However, data such as university-industry patents, partnership projects, and spin-offs would provide useful insights into the function of universities in the current economic system. The research has several limitations, including the difficulty in obtaining specific measurements concerning university performance. Additionally, we are limited to measuring only quantifiable effects. This is because education is not merely the accumulation of facts and events or dictionaries but rather the development of analytical reasoning, the ability to synthesize, and a critical outlook on the world. Universities should shape us as individuals, influence our value judgments, and give us the ability to interact, the feeling of fraternity and social interaction. However, specialised institutes and professional skills are the economic system's attributes and cannot deliver the upper-mentioned dimensions of individual growth. Adult learning programmes can engage the current education system in the community and aid in the resolution of existing problems. However, it should be tailored to local needs and not follow a global curriculum. As Evans et al. (2016) point out, lifelong learning is important for the development of an individual's personality, although this research discusses how it contributes to a society's quality of life as well. It was examined in this study how universities and lifelong education affect the quality of life in European regions. In the current study, the focus is less on economic effects but rather on several distinct dimensions of quality of life that have not been examined previously.

In conclusion, university accessibility in a region does have a positive relationship with regional quality of life. However, this can be reduced to two dimensions, "Good Life Enablers" and "Life Maintenance". No significant relationship was observed between university accessibility and the "Life flourishing" dimension. This dimension includes characteristics such as "self-esteem", "self-actualization", "interpersonal trust", and "institutional trust", but also harmony with nature through "ecosystem services". A lack of significant relation between this quality of life dimension and university accessibility is consistent with the initial argument of the research of unintegrated university focus on the personal qualities necessary for a symbiotic society. The adult lifelong learning programmes could, on the other hand, reconnect this "Life flourishing" dimension to the university's role in the region, as adult lifelong learning positively impacts all dimensions of quality of life. Taking such actions may however decrease people's desire for specialized jobs, which represents a tradeoff for the development of the economy.

This form of philosophical and empirical research paves the way for a new research path, primarily reinforcing universities to reclaim their role in the individual's development and preventing it from being swallowed by a competitive and profit-maximising system. The question is no longer whether universities should be included in local collaborations to solve

social problems. Their contribution is implicit. Current research confirms the importance of universities and students both for social and economic growth. However, it also highlights the necessity of focusing on the individual's values and capabilities. It is imperative that our educational system shifts its focus from fitting the economic system to one that is more inclusive, ethical, and concerned with the common good. However, universities' contributions to innovation continue to be relevant as innovation is the primary source of growth. Future research should focus on how universities can contribute to the foundation of a more creative and democratic society.

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