

Higher Education Institutions and Development: Missions, Models, and Challenges

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Abstract

Interest in higher education institutions (HEIs) as instruments for development has increased in recent years. The main objective of this paper is to address the contribution of HEIs to development through their missions, models, and challenges. With this purpose, we perform a historical analysis and characterise higher-education systems through the perspective of university models and missions, noticing relevant aspects regarding the evolution of this institution over time, as well as the transformations undergone. We also consider the main challenges that current higher education systems face in the 21st century. As methodological approaches, we carry out a literature review complemented by a comparative analysis based on data from the higher education systems of ten European countries. The findings show that HEIs can contribute to development through their missions, which are related to the models of higher education. Their first mission (teaching) contributes to improving human capital and attracting highly qualified people to their regions; the second mission (research) improves scientific knowledge which can foster innovative activities; and the third mission (community service) acts as a link between research and business, including patents, business incubators, and collaboration agreements. We also conclude that the challenges of higher education in the 21st century can be categorised essentially in three main areas: (1) globalisation and massification of higher education, as well as the internationalisation of HEIs' missions and diversification of the educational supply to attract new students; (2) new technologies related to the digitalisation of teaching and distance learning; and (3) higher education entrepreneurship, showing the importance of university-company relationships. This paper provides a global setting for a reflection on the role of HEIs in the 21st century, given their connection with society and the need for a more effective contribution to socio-economic development.

Key words: *development, higher education systems, knowledge*

Introduction

Interest in HEIs as instruments for development has increased since the mid-1980s, influenced by phenomena such as the globalisation of trade and the growth of intensive knowledge production (Drucker, 2016; Drucker & Goldstein, 2007; Rinaldi et al., 2018). These challenges coupled with government interference and financial constraints (Van Coller, 2016) have contributed to introducing this subject in the current debate, receiving great attention from researchers as well as

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from governments, regional development agencies, and funding agencies through national, regional and institutional policies aimed at strengthening development (Fongwa & Wangenge-Ouma, 2015). The impact of HEIs on regions' economic well-being and innovative potential has also been subject to intense scholarly and policy interest (Uyarra, 2010).

HEIs in the 21st century are being called upon to reflect on their current position in society, leading to substantial transformations, both in their structure and organisation and in redefining their social purposes (Osborne, 2013), balancing academic tradition with social change (Scott, 2006). Many countries have responded positively to this challenge through a social transformation process, with an emphasis on higher education development, research, and innovative capacities (Azman et al., 2014).

Nowadays, it is widely recognised that HEIs are agents for promoting knowledge and transmitting growth impulses to the economic and social context through their teaching, research, and public service missions. However, the present and future of higher education cannot be understood without understanding its past (Byrd, 2001). Knowing what social roles were attributed to it and seeing how it adapted to economic, political, technological, social, cultural, and religious changes throughout its history reveals the causes of the transformations in the university mission over the centuries, as well as its contribution to socio-economic development in each era (Scott, 2006). In this context, the present study seeks to answer the following research question: How are HEIs contributing to development through the missions, models, and challenges of higher education systems?

To answer the research question, namely to study the effects of HEIs missions on development, on the one hand, and the performance of higher education systems concerning current challenges on the other, we carry out a literature review involving a historical analysis, as well as a comparative analysis based on data from the higher education systems of ten European countries. Following the literature about higher education models, the countries selected for this study are France, Spain, Portugal, Italy, Germany, Austria, the Netherlands, Norway, Finland, and the UK. To reach a comprehensive framework, we have considered a set of variables based on the most recent data, which allow us to associate HEIs missions and challenges with development.

To carry out this analysis we start from the concept of 'Development' presented by de Seers (1969) and Sen (1999), which can be understood as society's ability to meet the needs of its population, allowing it to achieve an adequate level of well-being, people's access to goods, services, and

opportunities, which enable them to meet their basic needs, including employment and training, in addition to other goods and essential services such as basic health care, better working conditions, food, and housing. In this way, it appears that the concept of development is multidimensional and presupposes improvements, at both the economic and social level, for all members of society (Nafziger, 2007). One way (perhaps the main one) to measure development is through the Human Development Index (HDI). All ten European countries analysed belong to the group with very high human development, with only small differences. However, some differences are highlighted in the HDI Rank, based on the different living conditions in each country. Statistics for 2017 show that countries in Northern Europe (Norway, Finland, and the United Kingdom) and Central Europe (France, Netherlands, Austria, and Germany) had a higher gross domestic product (GDP) per capita⁴, above EU-28 indices, while countries in Mediterranean Europe (Italy, Spain, and Portugal) had lower indices. This is in line with the HDI ranking⁵, since the countries of Northern and Central Europe also occupy higher positions than those in Mediterranean Europe.

Inequalities between different regions of the European Union (EU) can be associated with a variety of factors, including changes introduced by globalisation, the legacy of former economic systems, previous socio-economic development, geographic remoteness, and the availability of resources, including skilled human resources. These are revealed, for example, in the form of social deprivation, poor-quality housing, weak healthcare, and education or higher unemployment (Eurostat, 2018). Because balanced territorial development is a precondition for a state's efficient performance, reducing differences in regional development is the correct way to achieve a higher level of global development (Živanović & Gatarić, 2017). The Europe 2020 strategy aims to create more employment and ensure better living conditions. It is therefore necessary to improve the quality of education, strengthen research performance, promote innovation, and transfer knowledge throughout the Union (European Commission, 2010).

⁴Source: Statistics Explained (<http://ec.europa.eu/eurostat/statisticsexplained/>)

⁵Source: UNDP, 2018 (<http://hdr.undp.org/en/2018-update>)

The Evolution of HEIs' Missions and the University Models

A historical analysis is made of HEIs' missions to understand their contribution to development over time. To analyse their current effects on development, some indicators are considered.

The birth of the university and its first mission: teaching

The institution that would be known as 'university' was born in the Middle Ages (Caddick, 2008), although there were already older forms of advanced organised studies in the Roman and Byzantium Empires, Islam, and China (Rüegg, 1996). According to Donnelly (2002), Rüegg (1996), and Weik (2014), the medieval university meant a community, corporation or union of scholars with responsibility for higher education. According to these authors, this institution's mission was to search for divine truth and learning, so neither research nor community service was seen as a formal mission. The emphasis was thus on teaching, that is, on the dissemination of knowledge and culture (Shanwei, 2017).

The medieval university made an important contribution to the institutionalisation of higher education. By gathering, creating, and disseminating knowledge, medieval universities marked the beginning of an intellectual revolution that would shape European society in the next millennium, by establishing the foundations of education (Caddick, 2008). In fact, it is now widely recognised that education and training are key factors for the development of any country, contributing to accelerated economic growth (Hanushek, 2013). When investing in education, individuals are expected to be equipped with a range of skills to improve their position in the labour market, as well as their income, notably through higher salaries associated with higher education (Bowen & Qian, 2017).

HEIs are central players in promoting regional economic development, as they can promote human capital improvement through university graduates and attract highly qualified people to the region. The qualification of employees is the main predictor of regional productivity growth (Pink-Harper, 2015).

Table 1
Qualification of population and employment, 2000 and 2017

Country	Graduates as a percentage of the population between 25 and 64 years old			Employment rates of recent graduates			Population, between 30 and 34 years, with higher education (ISCED 5-8)		
	2000 (%)	2017 (%)	Growth rate 2000-2017 (%)	2000 (%)	2017 (%)	Growth rate 2000-2017 (%)	2000 (%)	2017 (%)	Growth rate 2000-2017 (%)
France	21.6	35.2	63.0	78.7	82.9	5.3	27.4	44.3	61.7
Spain	22.7	36.4	60.4	75.1	79.4	5.7	29.2	41.2	41.1
Portugal	8.8	24.0	172.7	89.9	83.5	-7.1	11.1	33.5	201.8
Italy	9.7	18.7	92.8	81.0	78.2	-3.5	11.6	26.9	131.9
Germany	23.8	28.6	20.2	83.0	88.1	6.1	25.7	34.0	32.3
Austria	N.D.	32.4	N.D.	85.8	84.6	-1.4	N.D.	40.8	N.D.
Netherlands	24.0	37.2	55.0	86.2	87.8	1.9	26.5	47.9	80.8
Norway	31.6	43.2	36.7	87.5	87.8	0.3	37.3	49.0	31.4
Finland	32.3	43.7	35.3	84.0	84.4	0.5	40.3	44.6	10.7
UK	28.5	42.8	50.2	87.4	85.0	-2.7	29.0	48.3	66.6

N.D. – No data

Source: Eurostat | UNESCO-UIS | OCDE | National Entities | Pordata

In accordance with Pink-Harper (2015), the data presented in Table 1 show that HEIs contribute to development by improving human capital through university graduates. The percentage of graduates in the population between 25 and 64 years old, in 2017, was higher in countries with higher GDP, such as Finland, Norway, and the UK, while Italy and Portugal presented the lowest figures. Germany appears as an exception because this is a country with a high GDP per capita, one of the best in terms of HDI, but had a low percentage of graduates. Germany's economic growth and development could be associated with factors other than human capital (understood here as being associated with higher education graduates).

According to data from Eurostat⁶, tertiary education increases employment opportunities. The highest employment rates, in 2017, were recorded for those with tertiary education, while those with an upper-secondary or post-secondary non-tertiary education had lower employment rates. In 2017, all the countries analysed had a significant employment rate among recent graduates. However, in countries in Mediterranean Europe, such as Spain and Italy, the graduate employment rate is lower than in Germany, Norway, and the Netherlands. Of course, differences in terms of

⁶Source : Statistics Explained (<http://ec.europa.eu/eurostat/statisticsexplained/>)

employment rates depend on the structures and dynamics of the various economies. A high level of employment among graduates could be an incentive, encouraging the population to attend higher education. Portugal, for example, with a high employment rate of recent graduates, is one of the least developed countries analysed, with a lower percentage of graduates in 2017, but with a great graduate growth rate between 2000 and 2017, the only country with a growth rate above 100%.

Also considering the population aged between 30 and 34 with higher education and taking into account that one of the objectives of the Europe 2020 Strategy for education is to increase to at least 40% the percentage of people in this age group who concluded higher studies, we can observe that countries in Northern and Central Europe, with the exception of Germany, had already reached this goal in 2017. Southern European countries require further efforts to achieve this.

The first university reform and its second mission: research

During the Renaissance, universities became institutions belonging to the State. A University Reform emerged in order to ensure institutional autonomy and freedom from religious and political principles (Moncada, 2008).

In the nineteenth century, two classic models were born: the Napoleonic model, which aimed to prepare professionals for the public sector, and the Humboldtian model, aiming to promote research and respect for academic freedom (Lacatus, 2013; Moncada, 2008).

The university devised by Napoleon Bonaparte, initially implemented in France and subsequently adopted by other Mediterranean countries such as Spain, Portugal (Dobbins et al., 2011), and Italy (Kickert, 2007), was a public service, aimed at training professionals and the development of technologies, to create better and more prepared public employees. This institution may have been the precursor of contemporary polytechnic higher education (Lacatus, 2013; Moulinier, 2017).

The Humboldtian model arose with the creation of the University of Berlin, based on the Von Humboldt brothers' report, in 1810, and on the premise that the basis of truth for teaching in colleges should be scientific research (Bertilsson, 1992; Brunner, 2014; Yefimov, 2017). This initially appeared in Germany and was subsequently extended to Austria, Central Europe (Dobbins et al., 2011), the Netherlands, Norway, and Finland (Sam & Van Der Sijde, 2014). In the Humboldtian university model, education and research were interconnected (Harland, 2016; Robertson & Bond, 2005). This model advocated academic freedom, as knowledge needed a field

of freedom because otherwise it would not be possible to make science. The Humboldtian reform meant universities could be involved in producing science, since at that time, in many countries, the production of systematic knowledge was happening outside the universities (Moncada, 2008). Differently from the previous models, a third classic model was born at the same time – the Anglo-Saxon model – of British origin (Dobbins et al., 2011), which emerged in the nineteenth century at Oxford and Cambridge universities (Lacatus, 2013). This model has the basic feature of personality development through ‘liberal education’, concentrating on developing a person’s personality or character, rather than technical knowledge, vocational skills, and preparing students for a specific profession after graduation (Sam & Van Der Sijde, 2014).

Nowadays, scientific research, alongside education, is an important element of economic and social development. At the highest levels of knowledge, research and education are inseparable and mutually reinforcing (Adshead & Quillinan, 2017). A country’s level of development is strongly related to the levels of education and research (R&D) it provides. In other words, developed countries usually present a higher level of education or spend relatively more on education and research. Conversely, any weakness in this area represents an obstacle to development (Cinnirella & Streb, 2017). Scientific research results in knowledge, which can foster innovative activities in companies or create knowledge spillovers within the regional environment, leading to an improvement in territorial economies (Culkin, 2016).

HEIs’ research mission can contribute to development through public expenditure on higher education and R&D expenditure in the higher education sector. According to Sarrico et al. (2017), the expansion of higher education inevitably implies substantial investment in this level of education. However, spending varies greatly between countries, and the relationship between countries’ relative wealth and their level of expenditure also varies. R&D activities can account for a significant proportion of expenditure on higher education. Table 2 shows the figures for public expenditure on higher education for the ten selected countries.

Table 2
Public expenditure on higher education, 2000 and 2015

Country	Public expenditure on higher education			R&D expenditure in higher education sector		
	2000 (PPS-Million)	2015 (PPS-Million)	Growth rate 2000-2015 (%)	2000 (PPS-Million)	2015 (PPS-Million)	Growth rate 2000-2015(%)
France	16 254.2	31 117.4	91.4	5 466.0	9 207.8	68.5
Spain	6 952.2	15 712.1	126.0	2 005.8	4 143.2	106.6
Portugal	1 493.3	3 042.2	103.7	460.5	1 301.4	182.6
Italy	10 266.7	15 959.4	55.4	4 204.9	5 803.3	38.0
Germany	19 973.6	38 180.1	91.2	7 566.5	14 809.6	95.7
Austria	2 577.3	5 688.3	120.7	N.D.	2 313.0	N.D.
Netherlands	5 646.3	11 386.6	101.7	2 541.1	4 069.4	60.1
Norway	2 357.9	N.D.	N.D.	N.D.	1 442.6	N.D.
Finland	2 316.3	3 003.9	29.7	702.7	1 222.1	73.9
UK	10 050.0	40 271.1	300.7	4 536.0	8 685.8	91.5

N.D. – No data

Source: Eurostat | UNESCO-UIS | OCDE | National Entities | Pordata

Central European countries, such as France, Germany, and the United Kingdom, had the highest expenditure on higher education in 2015. The United Kingdom stands out with a growth rate of up to 300%. In absolute terms, these countries also have higher expenditure on R&D in the higher education sector. This is in line with Cinnirella and Streb (2017), as these countries also have a higher GDP per capita within the group of countries studied. They are also the three countries where the classical European models were born: Napoleonic, Humboldtian, and Anglo-Saxon, respectively.

Southern European countries such as Portugal, Spain, and Italy are the least developed and also those with lower expenditure on higher education and R&D in the higher education sector. Although they have a worse performance than Northern and Central European countries, it is interesting to highlight the cases of Portugal and Spain, which had significant growth rates – above 100% in these variables – in the period from 2000 to 2015, which reflects their effort to make improvements. This determination to increase public investment in higher education over time has consequences, both in increasing the number of graduates (contributing to development through increased human capital) and in growing investment in R&D.

It is interesting to highlight that more developed countries, such as Finland, Austria, and the Netherlands, presented, in absolute terms, low expenditure on higher education and R&D, but when comparing this investment in proportion to each country's GDP⁷, the percentage is higher in these countries than, for example, in Spain or Italy.

The second university reform and its third mission: community service

The contemporary university has faced different requests, bringing the need for further reform in order to rethink and redefine its role in search of a 'model' that takes into account its missions, as well as the expectations of society. This leads to the idea of a third mission (Rinaldi et al., 2018). Together with teaching (first mission) and research (second mission), the concept of the third mission was suggested to identify interactions between universities and society to contribute to socio-economic development (Rinaldi et al., 2018).

Today, universities are involved in increasingly diverse tasks that go beyond teaching and research, including community service, cooperation with industry, technology transfer, and the creation of new companies. In this way, they try to achieve major interaction with society by building a link between research and business, including patents, business incubators, and collaboration agreements (Kesting et al., 2018), licensing, and spin-out training based on the results of continuous professional research and development (Sam & Van Der Sijde, 2014).

As higher education is increasingly associated with social evolution, and in particular, with the economy, R&D activities in universities can no longer be regarded as purely academic but should also be seen as strongly related to the business environment and society (Miller et al., 2016). This context promoted the emergence of a new model of higher education – the Anglo-American model – which arose in the United States of America, although originally derived from European models and later imported back into Europe (Sam & Van Der Sijde, 2014). This can be referred to as a 'hybrid model', integrating elements of all three European models, but with its own unique features, such as market orientation.

One way of analysing the community service mission's contribution to development is through patent requests by the higher education sector (Table 3).

⁷Source: [https://www.pordata.pt/Europa/Produto+Interno+Bruto+\(PPS\)-1531](https://www.pordata.pt/Europa/Produto+Interno+Bruto+(PPS)-1531)

Table 3
Patent requests by the higher-education sector, 2000 and 2012

Patent requests to the European Patent Organisation (EPO) by the higher education sector				
Country	2000 (N.º)	2012 (N.º)	Variation 2000-2012 (N.º)	Growth rate 2000-2012 (%)
France	53.0	41.2	-11.8	-22.3
Spain	23.7	18.6	-5.1	-21.5
Portugal	1.5	1.3	-0.2	-13.3
Italy	36.6	13.5	-23.1	-63.1
Germany	78.4	176.0	97.6	124.5
Austria	1.2	23.7	22.5	1 875.0
Netherlands	78.0	24.6	-53.4	-68.5
Norway	0.9	0.2	-0.7	-77.8
Finland	4.3	0.5	-3.8	-88.4
UK	260.7	7.2	-253.5	-97.2

Source: Eurostat | UNESCO-UIS | OCDE | National Entities | Pordata

The Europe 2020 strategy set a target in relation to R&D intensity, namely that expenditure on R&D should be equivalent to at least 3% of the EU28's GDP. The innovation union scoreboard tracks a broad range of innovation indicators, including educational standards, R&D expenditure, patent production, and business innovation (Eurostat, 2018).

Germany has a good performance in the university–industry relationship, shown by the highest number of patent requests to the European Patent Organisation (EPO) by the higher-education sector. Other Central European countries also present a significant number of patent requests, albeit lower than Germany's, such as France, the Netherlands, and Austria. Southern European countries, such as Portugal, Italy, and Spain, have a lower performance, but still higher than those of the Nordic countries of Norway and Finland. Except for Austria and Germany, all countries show a decrease in patents requested from 2000 to 2012. This negative behaviour could be associated with several causes, partly resulting from the 2008-2011 crisis, but it is not a good indicator of these countries' development.

A Current View of the Main Challenges for Higher Education Systems

A general framework was formed with the purpose of understanding the environment in which all HEIs are currently working, i.e., the main challenges and potential tensions they face in the 21st

century. Statistical evidence related to these challenges is analysed through related performance indicators for higher education systems.

Entrepreneurship of higher education

The 1980s brought neo-liberal transformation with the ideology of free markets and the idea that reduced State funding could be compensated for by creation of the university market (Amirault, 2012). Clark (1998) suggests that all universities should adapt and become more entrepreneurial, meaning that universities should become more financially independent. Thus, universities are encouraged to act entrepreneurially, finding new sources of income through their activities.

In fact, now, universities have to do more with less. The underlying, fundamental idea is the need for greater organisational and financial autonomy, better quality, improved strategic vision, more connection to society, and greater entrepreneurial dynamism, making teaching a commercial product like any other (Hassan, 2017). In this context, the entrepreneurial university, as a multidimensional institution, has direct mechanisms to support the transfer of technology from academia to industry (Etzkowitz et al., 2021; Kesting et al., 2018). It is a promoter of regional economic and social development, mainly because it generates knowledge spillovers as business opportunities (Culkin, 2016), as described by the Triple Helix Model (Etzkowitz & Leydesdorff, 2000).

The first reference to the concept of the ‘entrepreneurial university’ appears in Etzkowitz (1983), where the university, once viewed by companies as a source of training, came to be seen as a factor of production, with the transfer of research to companies, allowing the creation of value at a lower cost than if it were done internally in the company itself. On the other hand, universities receive income from the companies they help with continuing research. This new way of thinking and acting by universities contributed to opening the doors to society, as well as to diversifying their sources of revenue, making them more independent of state funding (Etzkowitz & Klofsten, 2005). This challenge is related to the third mission, showing the importance of the university–industry relationship, marked by growing entrepreneurship in higher education, in order to provide a better service to the community, from the perspective of social entrepreneurship (Roslan et al., 2020). There are several ways to analyse this relationship, including cooperation with industry, technology transfer, and the creation of new companies, patents, business incubators and collaboration agreements, licensing, and spin-out training, which are based on the results of

continuous professional research and development. When analysing patent applications at the higher education level, this university–industry relationship appears to be more visible in Central European countries, notably Germany. This is one of the analysed countries with higher expenditure on higher education, which is reflected in the high expenditure on R&D, as stated before. In turn, this becomes a spillover of knowledge, with the transfer of technology to society reflected in a larger number of patent requests.

Globalisation and emergence of mass higher education

The challenges faced by higher education in the new millennium cannot be understood without considering the phenomenon of globalisation. In this context, the university is challenged to incorporate modernity and to transcend its spatial borders more actively (Scott, 2000). Thus, the postmodern university tends to internationalise its teaching, research, and community service missions in the global “Information Age” (Scott, 2006). Internationalisation strategies contribute to the development of individuals, institutions, nations, and the world in general, bringing various benefits. Their supporters see them as an opportunity to expand and diversify the education supply and the ways of transmitting it. This opportunity translates into increased mobility of students, teachers and programmes (Bound et al., 2021; Knight, 2013), such as the Erasmus + Programme. The globalisation of higher education is reflected in an increasing number of foreign students enrolled in higher education in the countries under review, particularly in Germany, France, and the Netherlands (Table 4).

Another phenomenon observed, from the 1960s, was the emergence of mass higher education. The university was no longer considered an elite institution, open only to a minority of high-class students, and became open to all kinds of people (Geuna, 1998; Trow, 2000). Sarrico et al. (2017) pointed out that higher education grew quickly from an elite to a mass system. Due to the phenomenon of mass education, current students represent great diversity in terms of age, socio-economic status, gender, and ethnicity. Today’s higher-education students include older people returning to college and a growing number of individuals from diverse backgrounds, as well as a higher number of women. Therefore, HEIs have to deal with a more diverse population, shown by a new generation of multicultural students, promoted by mobility in the context of globalisation and the dominance of new technologies. These students’ expectations in relation to higher education, teaching, and learning in the classroom are different from those of traditional students,

so the HEIs of the twenty-first century should define strategies for teaching, research, and service to the community, in order to respond to these challenges (Varnava-Marouchou, 2004).

Table 4
Foreign students enrolled in higher education, 2000 and 2012

Country	Foreign Students enrolled in higher education		
	2000 (N.º)	2012 (N.º)	Growth rate 2000-2012 (%)
France	137 085	271 399	98.0
Spain	25 502	97 825	283.6
Portugal	11 177	28 656	156.4
Italy	24 929	N.D.	N.D.
Germany	187 033	296 989	58.8
Austria	30 382	76 680	152.4
Netherlands	14 012	168 520	1 102.7
Norway	8 699	18 454	112.1
Finland	5 570	17 636	216.6
UK	222 936	N.D.	N.D.

N.D. – No data

Source: Eurostat | UNESCO-UIS | OCDE | National Entities | Pordata

Participation in higher education by people of active age (from 25 to 64 years) has increased over time generally in the countries under review, as shown in Table 5. This variable is also related to another challenge – lifelong learning – implying that people of active age need to return to the education system to acquire new skills required by their employers.

In all the countries analysed, it is young people (25–34 years) who attend higher education the most. With the exception of Germany, women are the majority in higher education (Table 5). In almost all OECD and partner countries, the proportion of younger adults (25–34 years) with tertiary qualifications is larger than that of older adults (55–64 years). In OECD countries on average, 54% of new entrants into tertiary education are women, and 82% are under the age of 25.

Table 5
Higher education by sex and age, 2000 and 2016

Country	Students enrolled in tertiary education by sex				Population with higher education as a percentage of the population between 25 and 64 years old							
	Males		Females		25-34		35-44		45-54		55-64	
	2000 (%)	2016 (%)	2000 (%)	2016 (%)	2000 (%)	2016 (%)	2000 (%)	2016 (%)	2000 (%)	2016 (%)	2000 (%)	2016 (%)
France	45.8	45.6	54.2	54.4	31.4	44.0	21.1	43.5	18.0	29.3	12.9	22.1
Spain	47.1	46.7	52.9	53.3	33.9	41.0	24.3	44.1	16.0	32.6	9.8	23.2
Portugal	43.5	46.9	56.5	53.1	12.8	35.0	9.2	30.5	7.0	18.0	4.7	13.2
Italy	44.5	44.0	55.5	56.0	10.6	25.6	11.0	20.5	10.1	14.0	6.0	12.4
Germany	51.9	51.8	48.1	48.2	22.4	30.5	26.6	29.8	25.4	27.1	20.5	26.3
Austria	49.0	47.0	51.0	53.0	N.D.	39.7	N.D.	35.1	N.D.	28.0	N.D.	22.9
Netherlands	50.0	48.1	50.0	51.9	26.9	45.2	25.3	40.9	23.1	31.9	18.7	27.4
Norway	41.6	41.8	58.4	58.2	38.6	49.2	32.6	48.8	29.6	40.4	21.9	33.0
Finland	46.3	46.7	53.7	53.3	37.8	40.7	37.0	50.4	29.6	45.1	23.3	36.9
UK	46.1	43.6	53.9	56.4	31.5	47.2	29.2	48.1	28.2	39.2	21.9	34.3

N.D. – No data

Source: Eurostat | UNESCO-UIS | OCDE | National Entities | Porda

New technologies and higher education

Given that in the 21st century most countries' economies are based on knowledge, information and communication technology (ICT) is another significant challenge to consider (Andresen, 2006; Cabezas-González et al., 2021; Fernández-Prados & Lozano-Díaz, 2021; Sukmayadi & Yahya, 2020). According to data from Eurostat⁸, there will be increased demand for highly skilled people. Driven by digital technology, jobs are becoming both more flexible and complex. This has resulted in a growing number of employers looking for employees who are able to manage complex information, think autonomously, be creative, use resources in a smart, efficient manner, and communicate effectively.

The evolution to a knowledge society has become a challenge not only for science but also for education. Traditional universities and colleges must address these changes to remain competitive

⁸Source: https://ec.europa.eu/eurostat/statistics-explained/index.php/Tertiary_education_statistics

(Etherington, 2019; Solas & Sutton, 2018). Indeed, information technology is a new opportunity as it provides different approaches to the dissemination and application of knowledge. The mechanisms to obtain and translate knowledge are now conditioned by the digitalisation of education and the fourth industrial revolution. Currently, the majority of European institutions offer combined online learning courses. Less frequent, but also on the rise, are other forms of provision, such as joint inter-institutional collaborations and online undergraduate courses. The massive open online courses are also of major interest in European universities (Gapsalamov et al., 2020). Since 2020, in HEIs, many of the constraints to mobility related to the COVID 19 pandemic have been partially overcome by incorporating digital tools into HE activities that traditionally only worked on a face-to-face basis.

Higher education is becoming more accessible, with a tendency to move away from buildings and campuses (Byrd, 2001). Distance learning (e-learning systems) and the leaders of educational technology are in an excellent position to leverage this change and improve higher education, promoting self-apprenticeship (Amirault, 2012). ICT has also facilitated the creation of a network society, contributing to greater collaboration inside institutions and among organisations, overcoming the limits of traditional forms of cooperation. The network society encourages HEIs to strengthen relationships with core stakeholders and engage in interactions with partners, including other universities and industry partners.

Discussion

Although the previous models do not show an explicit role for HEIs, they give some clues that allow them to be associated with the development process. Improvements in the quality of education and research, as well as the promotion of innovation and knowledge transfer are essential issues for countries' development, in which universities play a central role (Azman et al., 2014). HEIs emerge as a knowledge spillover channel through their missions and they transmit growth impulses to the economic and social context by training human resources, and through spreading knowledge, information and innovation. They are therefore key actors on which the new development process should be based (Drucker & Goldstein, 2007; Goldstein & Drucker, 2006; Lendel & Qian, 2017).

The present study confirms this thesis, showing that HEIs have been central players in promoting development over time - and answers the research question -, showing that HEIs have been influencing development through their three missions, which are related to the three classic models of higher education. Table 6 synthesises this information theoretically, presenting the models of higher education that have emerged, their main characteristics and the higher education missions with which each one relates. Additionally, Table 6 shows the impacts of each mission (associated with higher education models) on development. Summing up, the teaching mission promotes improved human capital, through university graduates and by attracting highly qualified people to the region. It influences, on the one hand, accelerated economic growth (Hanushek, 2013), and on the other hand, a decrease in social inequalities (Horowitz, 2018). The research mission enables improved scientific research that results in knowledge, often materialised in scientific publications, which can foster innovative activities in companies or create knowledge spillovers within the regional environment, leading to an improvement in regional economies. The community service mission identifies interactions between universities and society, including cooperation with industry, technology transfer, and the creation of new companies, patents, business incubators and collaboration agreements, licensing, and spin-out training based on the results of continuous professional research and development.

In practical terms, based on analysis of the indicators, the study showed that countries in Mediterranean Europe (Portugal, Spain, and Italy), with a lower GDP per capita, have lower public expenditure on higher education and therefore a smaller number of graduates, less expenditure on higher education R&D and a weak university–industry relationship, while countries in Northern and Central Europe, with a higher GDP per capita, have better performance in these variables.

Table 6

Higher education models, HEI missions, basic characteristics and impacts on development

HEIs Model	Napoleonic Model	Humboldtian Model	Anglo-Saxon Model	Anglo-American Model
Basic characteristics	-High-level vocational training -Professional education -Centralised system of governance -Vocational and technical training becoming crucial to prepare students for the rapidly changing labour markets	-Research-based learning -Academic freedom, research and learning -Centralised system of governance -Research becoming a central area of study in modern higher education	-Personality development through liberal education -Professionalism -Institutional autonomy or self-governing institutions -Soft skills being emphasised in modern higher education to enable students to act flexibly and intelligently in a changing and challenging environment	-Integrates all the basic features of the European models -Decentralised system of governance -Massification of higher education -Research, technical training and professionalism being incorporated in contemporary higher education worldwide -Entrepreneurialism model of higher education institutions becoming critical for the competitive academic marketplace
HEIs Mission	Teaching	Research + Teaching	Teaching	Research + Teaching + Community service
	Teaching mission		Research mission	Community service mission
Impacts on development	Its teaching mission allows the HEIs to contribute, through university graduates, to appreciation of regional human capital. That mission represents individuals' level of knowledge, and has thus been used to measure the knowledge of both a country's general population and its workforce.		The research mission contributes to development through knowledge transfer. Greater investment in higher education and R&D contributes to its further development.	The community service mission contributes to the development of higher education through the university–industry and community service relationships, building a link between research and companies, including patents, business incubators and collaboration agreements, among others.

Source: Own elaboration

Although the Mediterranean countries have some weaknesses, it is interesting to highlight that they have shown a greater effort to improve, with higher growth rates, both in public expenditure in higher education and in the number of graduates, as well as in expenditure on R&D. This behaviour puts them on the right path, helping them to achieve the goals of the Europe 2020 strategy. The country with the highest proportion of students attending higher education⁹ is Germany, followed by France, and the UK, which are coincidentally the countries where the three

⁹ Source: <https://www.pordata.pt/DB/Europa/Ambiente+de+Consulta/Tabela>

classical models of higher education (Humboldtian, Napoleonic, and Anglo-Saxon, respectively) originated. This reflects an improvement in the population's qualifications in these countries, thus creating the conditions to promote economic competitiveness as well as global well-being.

HEIs need to reflect on their position in society, to become more effective, efficient, and autonomous. They have to deal with challenges, such as the globalisation of higher education, which imply the adoption of internationalisation strategies for teaching and research that can attract foreign students, as well as the mobility of members from the academic and scientific community to acquire new knowledge and experiences, faced with competition from HEIs worldwide. This is reflected in an increasing number of foreign students enrolled in higher education in the countries analysed, particularly in Germany, France, and the Netherlands.

The massification of higher education has also meant that it is open to an increasingly broad range of people, with different expectations, which HEIs must seek to meet fully, diversifying their offerings of educational levels and curricula to attract new students. A greater proportion of younger adults than older ones have tertiary qualifications in all the countries analysed, and women outnumber men in higher education.

The technological potential of the 21st century related to the fourth industrial revolution, the network society, and the digitalisation of teaching also challenges higher education, which needs to reinvent itself and adjust to such changes to take full advantage of that potential. This challenge is being exacerbated in the current context of the coronavirus pandemic, where higher education has sought to exploit to the fullest extent the advantages of digital distance learning.

Furthermore, financial constraints lead to the need for HEIs to have a market orientation and to promote higher education entrepreneurship. Analysing this factor through patent requests at the higher education level, it appears that a university–industry relationship is more visible in Central European countries, notably Germany.

Conclusion

Based on theoretical references, this paper considers how higher education systems are contributing to development through their missions, as well as how they have been responding to current challenges in the 21st century. A succinct characterisation of the higher education systems

of ten selected countries has been performed, with data based on statistics, reports and other publications from official institutions.

The study showed that the countries with best results in the indicators relating higher education to development are those with the highest GDP and with better development indices. Therefore, the study concluded that one of the ways to promote development is through greater investment in higher education. This is important information for policy-makers and reinforces a correlation already well documented in the literature, as was evident in this study. In fact, HEIs contribute to development through their teaching, research, and community service missions. These, in turn, have been developed in response to the specific needs of societies and territories throughout the centuries. The particular features of HEIs in each era can be associated with different models of higher education.

The study showed that higher education systems today seek to respond to several challenges according to various demands from society. Therefore, university missions must be discussed and redefined to meet these challenges, namely the globalisation and massification of higher education, the digitalisation of teaching and distance learning, and higher education entrepreneurship.

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