Are research projects by Flemish universities tackling societal challenges more interdisciplinary?

Evidence from Horizon 2020

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Abstract

This research note draws on the funded research projects in Horizon 2020 as recorded in the CORDIS database. Our emphasis lies in positioning the Flemish universities with respect to interdisciplinary research. The assumption is that the need for interdisciplinary research will be the most outspoken in the programme part on societal challenges compared to the other two major programme parts on excellent science and industrial leadership.

We compare various measures of interdisciplinarity of the research projects by the Flemish universities to the other higher education institutes. Next, we position the Flemish universities to those of the French Community. Finally, we compare the Flemish higher education institutes to other European countries: the four most important European trade partners and five knowledge-intensive small open economies.

Introduction

Policymakers see universities as key enablers of socio-technical changes, including their contribution to achieving socio-economic goals such as health issues, the digital transition, and the green transition.

The paper presents findings from an exploratory empirical study on the participation of Flemish universities in Belgium to the European Framework Programme of Horizon 2020 (H2020) which ran between 2014 and 2020. Many papers focused on different aspects of H2020 applications. Enger and Castellaci (2016) look at the success rates of applications, while Wanzenböck et al. (2020) narrow the acceptance rate problematic down by looking at the consortium features. Varga and Seberstyén (2016) zoom in on the effects of participation on regional innovation; and Young (2015) emphasises the policy shifts in Horizon 2020 when compared to earlier Framework programmes. Lepori et al. (2015), however, consider the participation of higher education institutes in European Framework Programmes.

Yet, empirical research on universities' involvement in the context of addressing societal challenges – which cover a major turn in innovation policy (Kuhlman and Rip, 2018; Schot and Steinmuller, 2018; Uyarra et al. 2019) – is still in its infancy. At theoretical level, the first papers are beginning to see the light (Cohen et al., 2022). A similar remark can be made in the context of universities' commitment to interdisciplinary research, where Leahey and Barringer (2020) demonstrated that the pressure to address societal challenges urges universities to adapt their organisational structure in the direction of increased interdisciplinary research and, as a result, show higher grant activities.

The research note investigates the claim made by policymakers and researchers alike, that tackling societal challenges demands the input of various scientific disciplines (Mutz et al., 2015).

We look into this claim using several measures of interdisciplinarity applied to the funded European research projects between 2014 and 2020.

The CORDIS database: Horizon 2020 and its programme parts

The Community Research and Development Information Service (CORDIS) is a database run by the European Commission that shares information about research and innovation projects funded by the European Union, including those carried out under the Framework Programmes for Research and Innovation. CORDIS provides details on project objectives, participants, budgets, and results.

The CORDIS database contains several unique programme parts, even though some might belong to more than one legal basis division. The reason is to ensure mutually exclusive programme parts to avoid double counting. Therefore, the attribution to a specific programme part uses the share of the budget to identify a topic's principal programme part. Our analysis of Horizon 2020 focuses on its three most prominent programme parts, in which the theme of societal challenges takes centre stage and will be compared to that of excellent science and industrial leadership.

The theme of societal challenges covers the following seven topics: (i) health, demographic change and wellbeing; (ii) food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy; (iii) secure, clean and efficient energy; (iv) smart, green and integrated transport; (v) climate action, environment, resource efficiency and raw materials; (vi) Europe in a changing world – inclusive, innovative and reflective societies; and (vii) secure societies – protecting freedom and security of Europe and its citizens. In addition to these seven topics, we include two more programme parts with societal relevance: spreading excellence and widening participation and science with and for society.

Our analyses compare research projects funded in the programme part of societal challenges to those of excellent science that target scientific progress and to those of industrial leadership, which target the application and commercialisation of newly developed scientific insights. Excellent science thus covers research executed in the context of the European Research Council (ERC), Future and Emerging Technologies (FET), the Marie-Sklodowska-Curie Actions (MSCA), and Research infrastructures. Industrial leadership includes research on six economic sectors (ICT, nanotechnology, advanced materials, biotechnology, advanced manufacturing and processing, and space) and access to risk finance and innovation in SMEs.

The analysis does not consider smaller programme parts such as non-nuclear direct actions of the Joint Research Centre (JRC), the European Institute of Innovation and Technology (EIT), and Euratom.

One notable feature of the CORDIS database is its automated categorization of research proposals into Fields of Science, using a Semi-Automatic Classification System (SACS) that combines classification through natural language processing (NLP) and manual validation (Publications Office of the European Union, 2021). SACS results in a hierarchical structure of Europe's Scientific taxonomy vocabulary, dubbed EuroSciVoc, for each research proposal, which facilitates searching for projects in specific fields and highlights interdisciplinary research that overlaps multiple fields.

Main fields of science in Horizon 2020

Following the Frascati Manual (OECD, 2015), there are six main fields of science: natural sciences, engineering and technology, medical and health sciences, agricultural sciences, social sciences, and humanities. Table 1 distributes these six fields of science over the three programme parts to describe their presence in each of them.

Table 1 – Involvement of fields of science in research projects (in column %)

Field of science	**Programme part**			**All programmes (N=33,786)**
	Societal challenges (N=7,510)	**Excellent science (N=19,947)**	**Industrial leadership (N=6,329)**	
Natural sciences	57.2	76.7	67.9	70.7
Engineering and technology	58.7	29.1	58.9	41.3
Medical and health sciences	22.6	30.2	22.6	27.1
Agricultural sciences	13.1	5.1	8.0	7.4
Social sciences	50.5	23.7	50.4	34.6
Humanities	3.8	12.9	3.9	9.2

Source: CORDIS, own calculations.

Natural sciences are involved in most funded research projects (70.7%). Engineering and technology (41.3%), social sciences (34.6%) and medical and health sciences (27.1%) are involved between half and a quarter of all research projects. Agricultural sciences and humanities are the least involved in funded research programmes.

These percentages differ across the three programme parts. In the case of research projects addressing societal challenges, some fields of sciences are relatively more (engineering and technology, social sciences, and agricultural sciences) or relatively less (natural sciences, medical and health sciences, humanities) present than the share in all programmes. Focussing on research projects within excellent science this relative presence of the fields of science is reversed. Research projects aimed at industrial leadership display the same pattern as those funded within the programme part on societal challenges.

Table 1 also demonstrates that there are many overlaps in these fields of science to the different programme parts, pointing to the existence of interdisciplinarity, even at this level of aggregation. On average, there are 1.9 main fields of science per research project. One-third (11,567 or 34.2%) of the research projects is monodisciplinary, and the remaining two-thirds (65.8%) are labelled as interdisciplinary.

Interdisciplinary measures

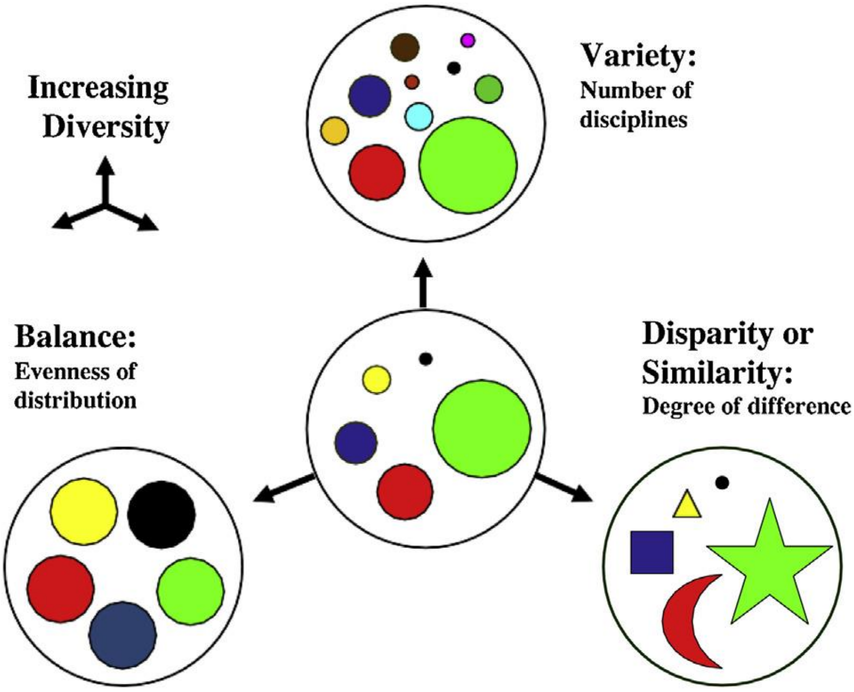
Interdisciplinarity covers integrating knowledge from different origins (Rafols and Meyer, 2010). The concept stems from an often-cited definition by the US National Academy of Sciences: "Interdisciplinary research is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice." (National Academy of Sciences, 2004, p. 26).

Interdisciplinary research (IDR) is heralded by science policymakers as a necessary but insufficient requirement to tackle societal challenges (e.g., Wang et al., 2015 OECD, 2020).

However, as IDR is a multidimensional concept, its measurement is not without problems, and the topic is thus much debated in academic circles (e.g., Huutoniemi et al., 2010). Bibliometric research increasingly converges into using three dimensions of IDR: variety, balance, and disparity (e.g., Stirling, 2007; Zhang et al., 2016; Leydesdroff et al., 2019). In addition, some dimensions can be combined into diversity such as variety and balance (Zhang et al., 2018; Leydesdorff et al., 2019; D'Este et al., 2023).

Alternative approaches, not pursued here, use latent class analysis (Mutz et al., 2015), or topic modelling (Schiebel et al., 2013; Bonaccorsi et al., 2021). Our research note focuses on research projects but draws on the measurement of interdisciplinarity in the existing literature using metadata from publications such as citations and subject field classifications from indexed academic databases (Web of Science, Scopus, etc.). As such we use measurements such as variety, balance and disparity, with respect to research projects. Figure 1 highlights the different dimensions of these measures.

Figure 1 – Schematic representation of interdisciplinary measures



Source: Rafols and Meyer (2010, p. 266), based on Stirling (1998, p. 41).

Variety: counting the numbers

The concept of variety refers to the number of scientific disciplines the EU assign to research projects. Due to the existence of a similar attribution of scientific disciplines in research projects, this concept is applicable. Variety is also known as 'richness' in ecology (Hanley-Cook et al., 2022) or 'breadth' in innovation studies (Salter and Laursen, 2004).

CORDIS uses an automated categorisation of research proposals into fields of science. The EU administration applies a Semi-Automatic Classification System (SACS) that combines classification through natural language processing (NLP) and manual validation (Publications Office of the European Union, 2021). SACS results in a hierarchical structure of Europe's Scientific taxonomy vocabulary, dubbed EuroSciVoc, for each research proposal, which facilitates searching for projects in specific fields and highlights interdisciplinary research that overlaps multiple fields.

There are a maximum of seven different hierarchical levels, but not all of these levels are used in the assignment of scientific discipline in a project. Our analysis sums all disciplines that fall into the six main fields of science as defined by the most recent version of the OECD Frascati Manual (OECD, 2015).

Two related versions of variety exist. Absolute variety, *VAR*, captures the sum of the number of scientific disciplines (SD) in each of the six fields of science (fos=1,2,…,n, where n=6) for a research project (rp).

$$VAR_{rp} = \sum_{fos=1}^{n} SD_{fos,rp}$$

The relative variety divides this score by the total number, thus yielding a score ranging between 0 and 1.

Balance: evenness revisited

Balance reflects the pattern of the fields of science for each research project. The indicator is similar to 'equality' in economics (e.g., Giorgi and Gigliarano, 2017) or to 'evenness' in ecology (e.g., Hanley-Cook et al. (2022), but it has been applied to bibliometric research (e.g., Gauffriau, 2021). The Gini coefficient, G, is a well-known and often used measure to capture (in)equality. It ranges from 0 (total equality) to 1 (total inequality).

Our analysis uses the following formula to calculate the Gini coefficient for each project, G_{rp}.

$$G_{rp} = \frac{n+1}{n} - \frac{2\sum_{fos=1}^{n}(n+1-fos)\,SD_{fos,rp}}{n\sum_{fos=1}^{n}SD_{fos,rp}}$$

The balance of a research project, B_{rp}, measure uses the Gini coefficient in the following way.

$$B_{rp} = 1 - G_{rp}$$

As such the balance is a measure of evenness of the distribution of disciplines in a research project (Leydesdorff et al., 2019). A higher score on balance means that scientific disciplines are equally present in the research project.

Diversity: combining variety and balance

The Shannon diversity index, or Shannon entropy index (D'Este et al., 2023), is an information statistic index and provides an estimate of diversity by including all fields of science in its calculation (Wang et al., 2015; Zhang et al., 2016). Its score hinges on the number of scientific disciplines in a research project and the evenness in the distribution of these scientific disciplines. We use this diversity index to assess the different fields of science used in a research project and their equal presence in this project.

The Shannon diversity index, *SDI*, is given by the following formula.

$$SDI_{rp} = -\sum_{fos=1}^{n} p_{fos}\, ln(p_{fos})$$

In the Shannon diversity index, p_{fos}, is the proportion (sd/SD) of scientific disciplines in one particular field of science (sd) divided by the total number of scientific disciplines in that research project (SD). Higher scores reflect a wide range of scientific disciplines.

Disparity: screening for differences

Disparity captures the degree to which elements in a population may be distinguished (Wang et al., 2015). In our case, the disparity of a research project reflects the degree to which scientific disciplines of a research project differ from those involved in an average research project. Disparity, D_{rpmp}, is the opposite of similarity, s_{rpmp}, which is calculated as the cosine similarity, S_{rpmp}, which measures the similarity between the field of science categories of a research project compared to that of the median research project in Horizon 2020.

$$S_{rp,mp} = \frac{\sum_{fos=1}^{n} rp_{fos} mp_{fos}}{\sqrt{\sum_{fos=1}^{n} rp^2}\sqrt{\sum_{fos=1}^{n} mp^2}}$$

And the dissimilarity of a research project compared to a median research project is given by the following formula.

$$D_{rp,mp} = 1 - S_{rp,mp}$$

High scores of disparities imply that the degree of difference between the fields of science drawn on in a research project differs more from those used in a median research project in Horizon 2020.

Interdisciplinarity by programme part: an introductory overview

The CORDIS database on Horizon 2020 contains a total of 35,381 research projects of which 34,098 have one or more scientific disciplines attributed to them. When focusing on the three main programme parts – societal challenges, excellent science, and industrial leadership – a majority of 33,786 research projects are included in our final database. Table 2 presents the four measures of interdisciplinarity of these research projects by programme part.

Table 2 – Interdisciplinary measures of funded research projects in higher education by programme part

Programme part	Interdisciplinarity measure	Mean	St. dev.	Minimum	Maximum
Societal challenges (n=7,510)					
	Variety	2.059	0.849	1	5
	Balance	0.297	0.116	0.167	0.833
	Diversity	0.577	0.417	0	1.609
	Disparity	0.633	0.246	0.018	1
Excellent science (n=19,947)					
	Variety	1.777	0.744	1	5
	Balance	0.260	0.099	0.167	0.833
	Diversity	0.440	0.392	0	1.609
	Disparity	0.575	0.250	0.018	1
Industrial leadership (n=6,329)					
	Variety	2.114	0.835	1	5
	Balance	0.304	0.115	0.167	0.833
	Diversity	0.607	0.409	0	1.609
	Disparity	0.618	0.244	0.018	1

Source: CORDIS, own calculations.

Table 2 shows that most research projects, 59%, are in the programme part dedicated to stimulating excellent science, i.e., creating new knowledge and insights. Research projects classified as addressing societal challenges cover 22.2% of all funded research projects, and those funded in the programme part of industrial leadership cover 18.8%.

For each programme part, four different interdisciplinary measures have been calculated. The variety, i.e. the number of different main fields of science in a research project, is, with on average over two fields of science, the highest in the case of projects funded in the context of the industrial leadership programme. Research projects in societal challenges also require, on average, insights from more than two main fields of science but to a significantly less extent (the difference is statistically significant at 0.1% level).

With an average of 1.777 main fields of science, the research projects formulated in the programme part are excellent science are the most monodisciplinary.

A similar picture emerges when interdisciplinarity is captured through the balance of these main research fields in research projects (also significant at 0.1% level). Again, the projects funded in industrial leadership are the ones in which the fields of science are the most evenly spread, followed by those in societal challenges and finally those in excellent science.

As both variety and balance display the same ranking, it is reassuring that the Shannon diversity index follows suit as this captures the mix of variety and balance.

The disparity index, as a measure of the likeliness of the main fields of science of a research project compared to that of a median research project, shows that research projects in societal challenges are the most interdisciplinary, followed by those on industrial leadership and those in excellent science.

Higher education institutes

The sector of higher education institutes consists of all higher or secondary education establishments. In the case of the 33,786 research projects recorded in the CORDIS database, these higher education institutes are prominently present as they are involved in 66.5% of cases.

Table 3 yields more insights into the involvement of higher education institutes in the three main programme parts of Horizon 2020.

Table 3 – Involvement of higher education institutes compared to other stakeholders (in %)

Type of organisation	Programme part			All programmes (N=33,786)
	Societal challenges (N=7,510)	Excellent science (N=19,947)	Industrial leadership (N=6,923)	
Higher education	58.6	80.3	32.1	66.5
Research centres	58.3	31.5	33.1	37.8
Public agencies	16.1	2.9	10.7	9.5
Private companies	85.2	13.1	95.3	44.5
Other organisations	35.3	5.1	18.4	14.3

Source: CORDIS, own calculations.

Table 3 shows that higher education institutes are, as expected, mostly involved in the programme part directed to excellent science (80.3%) and least involved in those on industrial leadership (32.1%). After all, the programme part on excellent science explicitly targets the development of new (basic or fundamental) knowledge. It aims to promote science beyond frontier research and to stimulate methodical rigour and limitations of error (Mutz et al., 2015; Woelert and Millar, 2013). The programme part on industrial leadership, aims to provide scientific insights that have the potential to be commercialised, explaining the heavy involvement of private companies (95.3%).

The programme part on societal challenges, surprisingly, also includes the cooperation of many private companies. This is probably related to the rise of corporate social responsibility as a driving force behind research investments. Research centres (e.g., IMEC in Belgium; Fraunhofer institutes in Germany, TNO in the Netherlands, or CNRS in

France) are often mission-oriented and expected to address societal challenges, but are also focussed on industrial applications.

Interdisciplinarity of the Horizon 2020 programme parts in higher education institutes

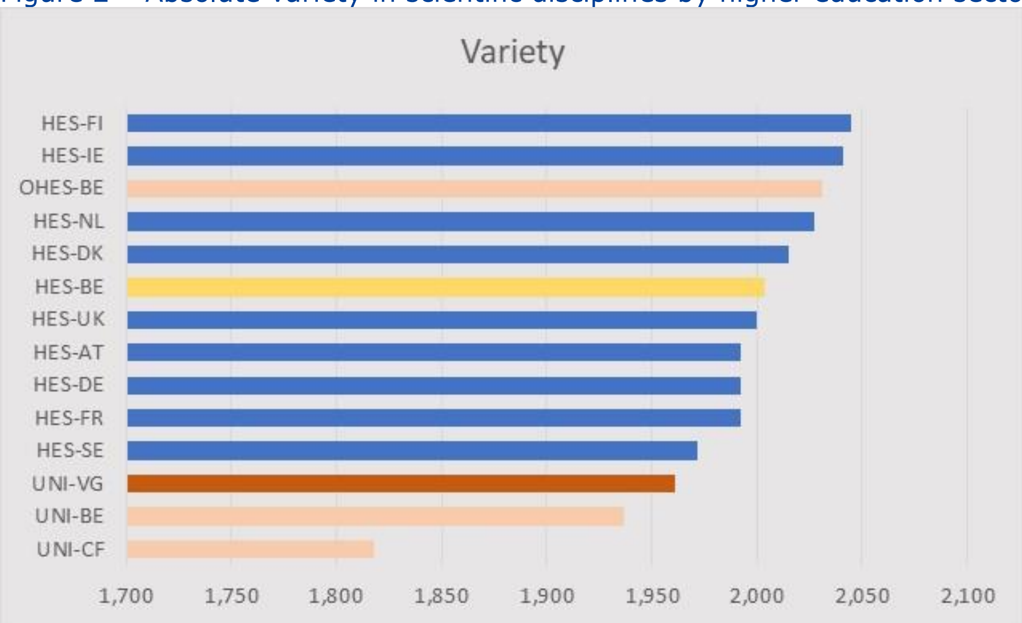
This section zooms in on the various interdisciplinarity measures for higher education institutes in a selection of countries. We compare the higher education institutes in Belgium (HES-BE) to the ones in the four most important trade partners – Netherlands (HES-NL), Germany (HES-DE), France (HES-FR) and the United Kingdom (HES-UK) – and the ones in five similar small open knowledge-intensive economies – Denmark (HES-DK), Ireland (HES-IE), Austria (HES-AT), Finland (HES-FI) and Sweden (HES-SE).

Next, we look inside the higher institutes in Belgium and picture the results for the universities in the Flemish Community (UNI-VG), the French-speaking community (UNI-CF) and Belgium as a whole (UNI-BE) as well as the non-university higher education institutes (OHES-BE).

Absolute variety in Horizon 2020 research projects by higher education

Figure 2 looks at the absolute variety – the number of scientific disciplines per research project – in higher education institutes for a selection of countries and regions.

Figure 2 – Absolute variety in scientific disciplines by higher education sector



Source: European Commission, CORDIS (accessed on 20 January 2023)

Figure 2 makes it clear that universities are less involved in interdisciplinarity compared to other higher education institutes when it comes to the variety of scientific disciplines. On average the Flemish universities (UNI-VG) draw on 1.9 different main fields of science, which is more than universities of the French-speaking community (UNI-CF). The other higher education institutes in Belgium (OHER-BE) seem to have a higher interdisciplinarity in terms of absolute variety than the universities in Belgium, positioning the Belgian higher education institutes in the middle of the benchmark countries. Obviously, many higher education institutes in small open economies (Finland, Ireland, the Netherlands and Denmark) are more interdisciplinary than those in large countries (United Kingdom, Germany and France).

Table 4 focuses on the difference between the three programme parts of Horizon 2020 putting those on societal challenges centre stage. It compares the average scores of absolute variety of projects classified as tackling societal challenges to that of research projects formulated in the other two programme parts – excellent science and industrial leadership – by means of a t-test with unequal variance.

Table 4 – Comparing programme parts using the absolute variety in scientific disciplines by higher education sector

	Societal challenges vs Excellent science				Societal challenges vs Industrial leadership		
	Difference	s.e.	sig.		Difference	s.e.	sig.
UNI-VG	0,107	0,047	*		-0,107	0,081	
UNI-CF	0,074	0,089			0,061	0,145	
UNI-BE	0,110	0,042	**		-0,063	0,072	
OHES-BE	0,048	0,053			-0,034	0,040	
HES-BE	0,141	0,029	***		-0,046	0,035	
HES-NL	0,182	0,025	***		-0,056	0,036	
HES-DE	0,171	0,020	***		-0,076	0,025	*
HES-FR	0,189	0,024	***		-0,039	0,029	
HES-UK	0,206	0,020	***		-0,061	0,030	*
HES-DK	0,168	0,037	***		-0,106	0,056	
HES-IE	0,153	0,047	**		-0,048	0,054	
HES-AT	0,165	0,036	***		-0,074	0,043	
HES-FI	0,171	0,044	***		-0,055	0,054	
HES-SE	0,116	0,034	**		-0,156	0,046	**

Source: European Commission, CORDIS (accessed on 20 January 2023).
*Note: The symbols *,**,*** indicate statistically significance at 5%, 1%, and 0.1%.*

Table 4 shows that, when Flemish universities are involved, the interdisciplinarity measuring variety is higher in the case of research projects under societal challenges than for those catalogued under excellent science (and even more significantly so in the case of all universities in Belgium). There is no difference if the comparison is with research projects that are in the programme part on industrial leadership.

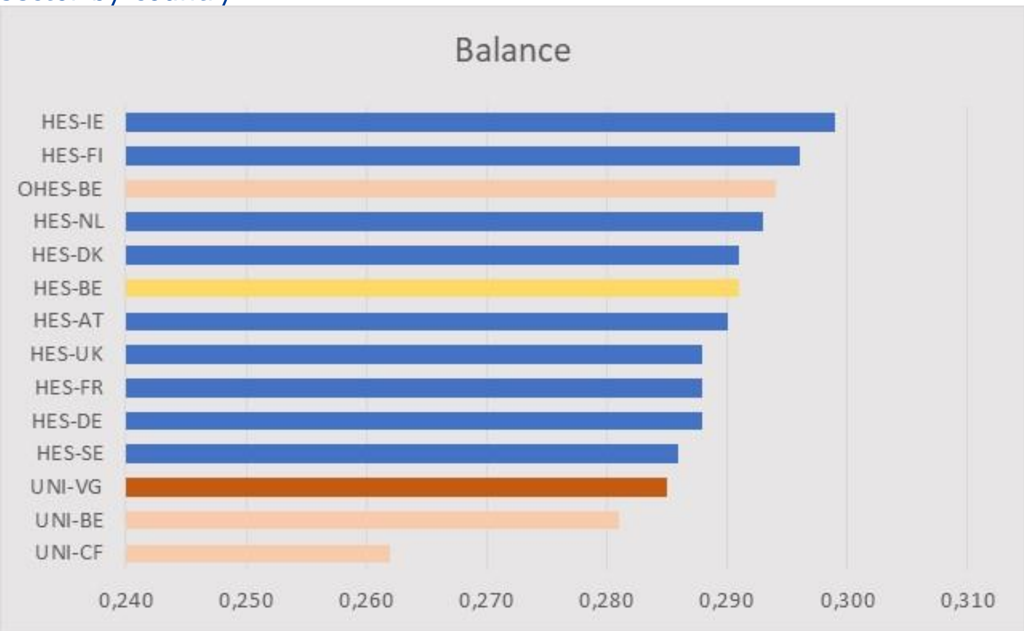
Taking the entire higher education sector together, all countries show that the variety of science disciplines of research projects is significantly higher when addressing societal challenges than for excellent science. Only three countries – Germany, the United Kingdom and Sweden – record a significant lower variety when research projects in societal challenges are compared to those in industrial leadership.

Overall, we conclude that – when interdisciplinarity is measured in terms of variety – research projects tackling societal challenges are significantly more interdisciplinary than those focussing on excellent science. This is expected as funded research projects aimed to contribute to science (reduce errors, driven by methodical rigour, …) needs to be focused on the scientific achievements (ref).

Balance in Horizon 2020 research projects by higher education

Balance measures the evenness of scientific disciplines in research projects. Figure 3 looks at this dimension of interdisciplinarity for research projects involving higher education institutes for a selection of countries and regions.

Figure 3 – Balance of scientific disciplines in research projects involving higher education sector by country



Source: European Commission, CORDIS (accessed on 20 January 2023)

Like variety, the dimension for interdisciplinarity capturing the balance of scientific disciplines in research projects is the lowest for universities. The focus on Belgium reveals that research projects by Flemish universities are more interdisciplinary – in terms of balance – than those involving universities in the French-speaking community.

The country results at the level of the total higher education sector are also very much the same as for those on the variety dimension.

Table 5 zooms in on the differences between the programme parts.

Table 5 – Comparing programme parts using the balance of scientific disciplines by higher education sector

	Societal challenges vs Excellent science			Societal challenges vs Industrial leadership		
	Difference	s.e.	sig.	Difference	s.e.	sig.
UNI-VG	0,014	0,006	*	-0,011	0,001	
UNI-CF	0,007	0,011		0,009	0,018	
UNI-BE	0,014	0,006	**	-0,006	0,010	
OHES-BE	0,009	0,007		-0,002	0,006	
HES-BE	0,019	0,004	***	-0,004	0,005	
HES-NL	0,024	0,003	***	-0,004	0,005	
HES-DE	0,024	0,003	***	-0,008	0,003	*
HES-FR	0,026	0,003	***	-0,005	0,004	
HES-UK	0,027	0,003	***	-0,007	0,004	
HES-DK	0,026	0,005	***	-0,013	0,008	
HES-IE	0,023	0,006	**	0,002	0,007	
HES-AT	0,024	0,003	***	-0,008	0,006	
HES-FI	0,024	0,006	***	-0,007	0,007	
HES-SE	0,017	0,005	**	-0,016	0,006	*

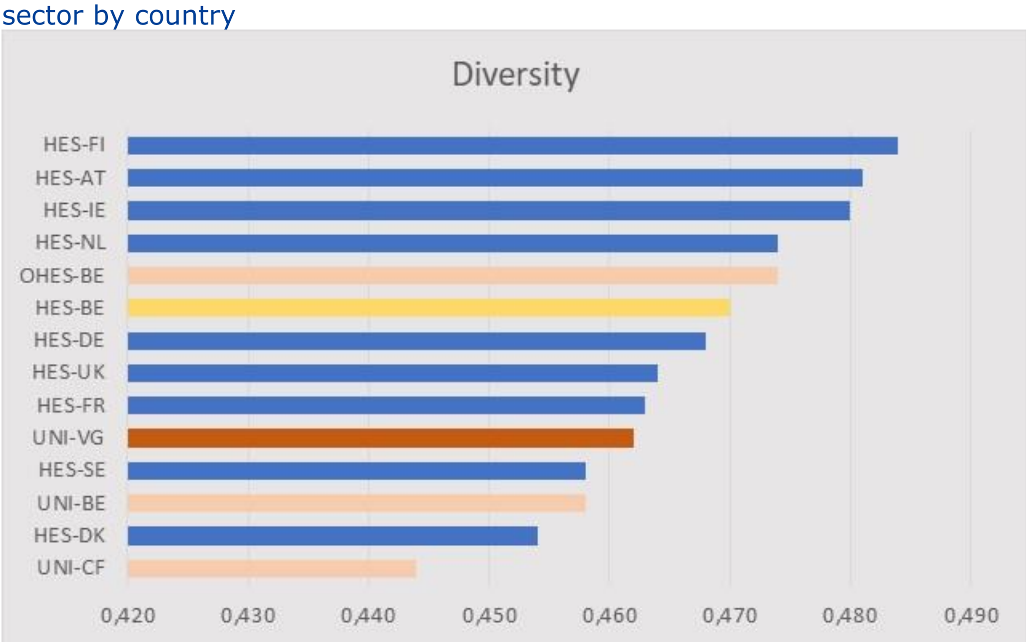
Source: European Commission, CORDIS (accessed on 20 January 2023).
*Note: The symbols *,**,*** indicate statistically significance at 5%, 1%, and 0.1%.*

The results with respect to balance are very much in line with those using variety: research projects are significantly more interdisciplinary in the case of funding under societal challenges than under excellent science; while these do not differ from those funded under industrial leadership (except for Germany and Sweden).

Diversity in Horizon 2020 research projects by higher education

The Shannon diversity index captures two dimensions of interdisciplinarity – variety and balance. Figure 4 ranks the diversity scores for the higher education sector in several countries and the linguistic communities in Belgium.

Figure 4 – Diversity of scientific disciplines in research projects involving higher education sector by country



Source: European Commission, CORDIS (accessed on 20 January 2023)

Although the Shannon diversity index is capturing both the variety and balance – both dimensions show a large similarity when it comes to the ranking of countries' IDR –, it differs substantially from them. IDR in Austrian research projects by higher education institutes are now ranked in the second place, while IDR in Danish research proposals rank much lower.

Table 6 focuses on the differences between programme parts when it comes to the diversity of scientific disciplines in research projects involving the higher education sector.

Table 6 – Comparing programme parts using the diversity of scientific disciplines by higher education sector

	Societal challenges vs Excellent science			Societal challenges vs Industrial leadership		
	Difference	s.e.	sig.	Difference	s.e.	sig.
UNI-VG	0,026	0,156		-0,034	0,025	
UNI-CF	0,045	0,029		0,067	0,046	
UNI-BE	0,032	0,014	*	-0,014	0,022	
OHES-BE	0,010	0,017		-0,002	0,013	
HES-BE	0,035	0,010	**	-0,005	0,011	
HES-NL	0,035	0,008	***	-0,009	0,011	
HES-DE	0,041	0,007	***	-0,014	0,008	
HES-FR	0,045	0,008	***	-0,015	0,009	
HES-UK	0,043	0,006	***	-0,009	0,009	
HES-DK	0,032	0,012	**	-0,042	0,017	*
HES-IE	0,036	0,015	*	-0,002	0,017	
HES-AT	0,059	0,012	***	-0,014	0,014	
HES-FI	0,041	0,014	**	-0,009	0,017	
HES-SE	0,025	0,011	*	-0,030	0,015	*

Source: European Commission, CORDIS (accessed on 20 January 2023).
*Note: The symbols *,**,*** indicate statistically significance at 5%, 1%, and 0.1%.*

In line with Table 4 on the variety dimension of IDR and Table 5 on the balance dimension, research projects funded under the umbrella of societal challenges differ significantly from those funded in the programme part on excellent science. The only difference is that this no longer applies to the Flemish universities.

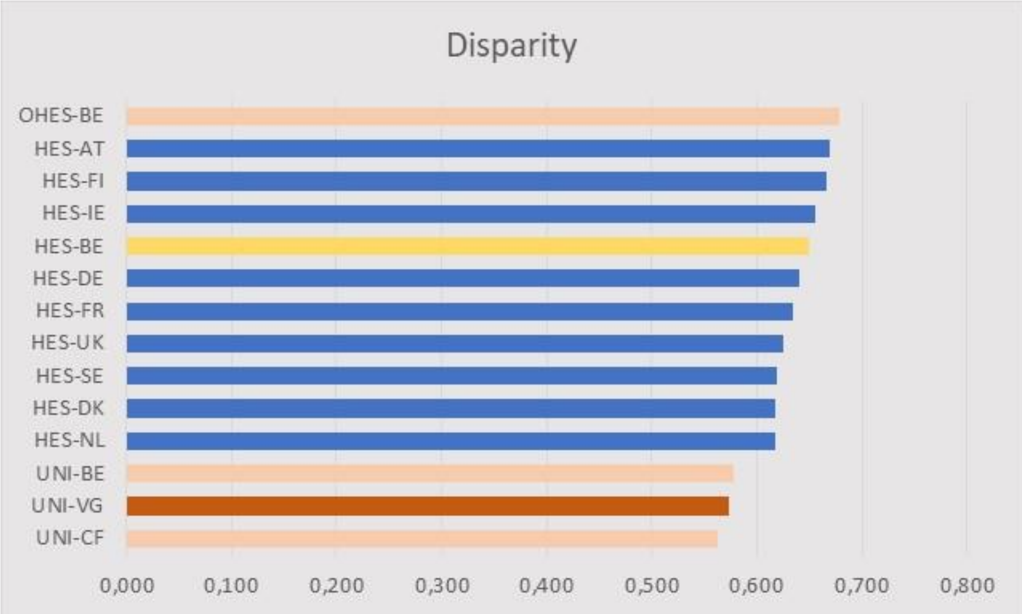
When research projects in societal challenges are compared to those in industrial leadership, there are hardly any significant differences in interdisciplinarity. Only research projects by higher education institutes in Denmark and Sweden are less interdisciplinary in societal challenges than in industrial leadership.

Disparity in Horizon 2020 research projects by higher education

The disparity measure of interdisciplinarity captures the degree in which scientific disciplines in research projects can be distinguished from the scientific disciplines in the median research project of Horizon 2020.

Figure 5 demonstrates where the higher education institutes have a higher disparity, i.e. a higher heterogeneity of fields of science in research projects than that in a median research project.

Figure 5 – Disparity of scientific disciplines in research projects involving higher education sector by country



Source: European Commission, CORDIS (accessed on 20 January 2023)

Figure 5 suggests that there is a marked difference – at least in the case of Belgium – between universities and the other types of higher education institutes (university colleges, polytechnics, secondary education, etc.). It seems that universities are less interdisciplinary according to this dimension. This topic is worth studying for the other countries but requires additional cleaning of the CORDIS database.

Overall, the funded research projects of higher education institutes in smaller knowledge-intensive open economies are either more interdisciplinary (Austria, Finland, Ireland and Belgium) or less interdisciplinary (Sweden, Denmark and the Netherlands) than those in the large trade partners of Belgium.

Table 6 compares the programme part of societal challenges to the other two.

Table 6 – Comparing programme parts using the disparity of scientific disciplines by higher education sector

	Societal challenges vs Excellent science				Societal challenges vs Industrial leadership		
	Difference	s.e.	sig.		Difference	s.e.	sig.
UNI-VG	-0,007	0,017			-0,052	0,023	*
UNI-CF	-0,049	0,033			-0,060	0,052	
UNI-BE	-0,009	0,015			-0,051	0,021	*
OHES-BE	0,107	0,017	***		0,007	0,009	
HES-BE	0,066	0,009	***		-0,013	0,009	
HES-NL	0,050	0,008	***		-0,013	0,009	**
HES-DE	0,068	0,006	***		-0,009	0,007	
HES-FR	0,042	0,007	***		-0,023	0,007	**
HES-UK	0,031	0,006	***		-0,025	0,008	**
HES-DK	0,026	0,011	*		-0,038	0,014	**
HES-IE	0,099	0,015	***		0,003	0,015	
HES-AT	0,074	0,011	***		0,014	0,011	
HES-FI	0,076	0,014	***		0,010	0,014	
HES-SE	0,064	0,011	***		-0,034	0,012	**

Source: European Commission, CORDIS (accessed on 20 January 2023).
*Note: The symbols *,**,*** indicate statistically significance at 5%, 1%, and 0.1%.*

The tendency with respect to the disparity dimension of interdisciplinarity is in line with the other dimensions: research projects framed in societal challenges are significantly more interdisciplinary than those in excellent science; where the opposite is the case with respect to the research projects framed in the programme part on industrial leadership. Although the latter is less outspoken for some countries.

At the Belgian level, only research projects under societal challenges from non-university higher education institutes are more interdisciplinary than those in the programme part of excellent science. On the other hand, funded research projects in societal challenges of the Flemish universities are less interdisciplinary than those funded under industrial leadership.

Conclusions

This research note offers some descriptive statistics on various measures of interdisciplinarity in the context of research projects funded by the European Union. The focus is on positioning the Flemish universities against the universities of the French-speaking community in Belgium, the non-university higher education institutes in Belgium, the higher education institutions of the four most important trade partners and five small open knowledge-intensive economies.

First, higher education institutes are involved in most research projects (66.5%). We have, however, no information on the extent and content of this involvement. The preliminary findings further point to a substantial difference between universities and non-university higher education institutions as classified by the administration of the European framework programme. Classifying all higher education institutes into universities and non-universities must be done in future work.

Our preliminary findings suggest that (Flemish) universities are far less inclined to engage in funded research projects involving interdisciplinarity than overall higher education institutes. This squares with the focus of university research on promoting science and scientific output. A second finding suggests that the interdisciplinarity of funded research projects in the programme part tackling societal challenges is higher than those projects aimed at excellent science. On the other hand, research projects focusing on industrial leadership are equally interdisciplinary as those in societal challenges in the case of the variety and balance dimensions but are overall more interdisciplinary than those in societal challenges in the case of diversity and disparity dimensions. The often-heard claim that societal challenges warrant more interdisciplinarity only holds when compared to the bulk of funded research projects which fall under the programme part of excellent science, but not when the research projects are aimed at more economic and commercial targets.

This begs the question to the nature of the research network or research consortia in which higher education institutes are involved. Some research networks are driven by industry-science linkages; while other are driven by society-science networks.

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