

A white line-art map of the Nordic region (Norway, Sweden, Finland, Denmark) and the United Kingdom is overlaid on a solid blue background. The map is centered around the text.

Nordic-UK R&D statistics



NordForsk

Foreword

On June 16, 2016 the UK population voted in favour of leaving the European Union. The full implications of this vote will not be clear for a long time to come, but we do know that the future of UK relations with the rest of Europe will be different from what it has been the last decades. This concerns all sectors, including research and innovation.

The Heads of Nordic Research Councils (NordHorcs) asked NordForsk to set up a group of representatives from the national research funding organisations to discuss and exchange information and experiences in relation to Brexit. The group quickly concluded that it would be useful to have a basic set of statistics on UK-Nordic relations in research of innovation.

In the spring of 2018, a small group of Nordic national experts on R&D statistics gathered to set out how this could be achieved, and the result is this collection of central statistics. The focus has been to see the Nordics as a region in its relations with the UK in the area of research and innovation. It is our hope that it can provide some good background information for anyone interested in the UK-Nordic relations in this area.

NordForsk wishes to thank Jonas Gurell for heading the expert group, and Stig Slipersæther, Josephine Them Parnas, Elisabet Andresdottir and Otto Auranen for their contribution to the group.

Oslo, October 2018

Arne Flåøyen

Director, NordForsk

Introduction

This report consists of a number of statistical graphs illustrating different aspects of the existing UK-Nordic R&D collaboration with a focus on Horizon 2020. The graphs are reproduced for each Nordic country as well as for the Nordic as a whole and the report is therefore divided into one section per country. The conclusions of this report are presented below, figure by figure, along with a closer description of each graph.

Explanation of figures and conclusions

Figure X-1 – Selection of OECD main science and technology indicators

Description

The figure gives an overview of the R&D expenditure in each Nordic country as well as for the Nordic as a whole in comparison with the UK, divided on sector of performance. The included indicators are *Business and enterprise expenditure on R&D (BERD) as percentage of GDP*, *Gross domestic expenditure on R&D (GERD) as percentage of GDP*, *Government expenditure on R&D (GOVERD) as percentage of GDP* and *Higher education expenditure on R&D (HERD as percentage of GDP)*.

Data source

OECD stat, main science and technology indicators

Conclusions

The United Kingdom is recognized as one of the global leaders in terms of research. They are not, however, one of the top spending countries in terms of research funding as share of their GDP. The individual Nordic countries as well as the Nordic as a whole is investing a larger amount of funding in relation to their GDP compared to the UK. This is true for the business enterprise sector as well as for the higher education sector. Several of the Nordic countries also show an increasing trend over time when it comes to annual expenditure on R&D within higher education institutions. In international comparisons the Nordic countries also have a large share of their work force involved in the R&D sector as shown by other indicators from OECD stat, main science and technology indicators.

Figure X-2 – Number of bilateral fractioned publications

Description

The figure shows the number of bilaterally co-authored publications between each Nordic country as well as for the Nordic regarded as one entity and the UK. The publications are distributed on research subjects. The bibliometric data is fractionized on countries and research subjects. The numbers are for the time period 2006-2017.

Data source

Bibliometry performed by the Swedish Research Council based on Web of science data

Conclusions

Between 2006 and 2017, more than 20 000 scientific publications arose from bilateral co-authorships between the UK and one of the Nordic countries. To compare different research areas solely based on number of publications is not trivial since each research area has a publication tradition of its own. However, it is clear that the Nordic countries have a broad collaboration with the UK covering a range of different subjects. The extent of the collaboration varies from country to country but in general clinical medicine, biomedicine, molecular science and geosciences are the areas in which the largest share of articles are produced.

Figure X-3 – Proportion of highly cited publications (top 10%)

Description

The figure shows the proportion of highly cited publications for each country's total production as well as for bilateral and multilateral production together with the UK. Highly cited means the globally top 10% most cited publications implying that a proportion of highly cited publications above 10% is above the world average. The figure indicates the increased impact, relative to the country total, of co-authored publications from both a Nordic as well as from a UK perspective.

Data source

Bibliometry performed by the Swedish Research Council based on Web of science data

Conclusions

The proportion of highly cited publications is sometimes referred to as the citation impact. The data show that for each Nordic country as well as for the UK the citation impact of a UK-Nordic co-authored bilateral publication has a higher citation impact than the country average. This indicates that these collaborations in general are fruitful and result in a large portion of highly cited publications. When looking at multilaterally co-authored scientific publications involving the UK as well as Nordic authors the positive effect is even clearer. In many cases the citation impact of multilaterally co-authored publications exceeds 0.2 meaning that the fraction of highly cited papers exceeds twice the world average.

Figure X-4 Horizon 2020 key figures

Description

The figure shows the number of Horizon 2020 projects for each Nordic country in comparison with the UK as well as how many common projects the countries are or have been involved in during H2020. It also shows the number of participants from each country in H2020 projects and the total number of participants from the Nordic countries and the UK involved in joint projects.

Data source

eCorda data, data from June 2018

Conclusions

The Nordic as well as the UK involvement in Horizon 2020 projects is to a large extent based on mutual cooperation. 29% of the H2020 projects in which the UK is involved also involves one or more Nordic country. 33% of the projects with Nordic involvement involves the UK. These numbers are even larger when looking at individual project participants. Around 3700 UK researchers are involved in or have during H2020 been involved in a collaboration with a Nordic participant and around 3800 Nordic researchers have been involved in a UK collaboration during the same time period. This corresponds to 40% of the UK participants involved in H2020 and 50% of the Nordic participants.

Figure X-5 Number of collaborations in Horizon 2020

Description

The figure shows the number of collaborative links between each country and the rest of the involved countries in Horizon 2020 projects. A collaborative link is defined between each pair of participants in each contract.

Data source

h2020viz.vinnova.se based on eCorda data, March 2018

Conclusions

Germany is the most common H2020 partner both for the UK and for the Nordics. The UK is number two when it comes to the most commonly used project partners for the Nordic countries, intra-Nordic collaborations excluded. From a UK perspective Germany is the most common H2020 collaborator followed by Spain, Italy, the Nordics and France if the Nordics is considered as one entity. The UK collaborations with Spain, Italy, the Nordics and France are very similar when considering the extent of the collaborations even though the population of the Nordic countries is less than half of the Italian and French population and about 60% of the Spanish. If the amount of collaborations relative to the collaborator's population is considered the Nordic-UK collaboration is closer to that of the Netherlands-UK collaboration.

Figure X-6 Distribution of Horizon 2020 participation on pillars

Description

The figure shows the amount of financial contribution from the EU to each country divided on the Horizon 2020 objectives: Excellent science, Societal challenges and Industrial leadership. The UK numbers are also displayed for comparisons.

Data source

h2020viz.vinnova.se based on eCorda data, March 2018

Conclusion

For long the UK has been identified as one of the strongest defenders of excellence in science within the European Union. This in combination with several world leading research institutions within the country is reflected in the very large share of EU funding granted to the UK within the Excellent science pillar. In general the Nordic participation have a slightly larger part of its funding originating from the Societal challenges or Industrial leadership pillars of the Horizon 2020 program. The national variations between the Nordic countries are however relatively large when this distribution is investigated.

Figure X-7 Participation in excellent science objectives

Description

The figure shows the amount of financial contribution within the Excellent science objective from the EU to each country divided on: European Research Council (ERC), Future & emerging technologies (FET), Marie Skłodowska-Curie actions (MSCA) and Research infrastructures. The UK numbers are also displayed for comparisons.

Data source

h2020viz.vinnova.se based on eCorda data, March 2018

Conclusions

Within the Excellent science objective none of the Nordic countries can show such a high fraction of its funding as the UK originating from the European Research Council (ERC). The Nordics instead have in general a higher share of their excellent science funding coming from the Marie Skłodowska-Curie actions (MSCA). Both ERC and MSCA-grants are closely related to the mobility of researchers which commonly is identified as one important aspect of educating and developing excellent researchers.

Figure X-8 Participation in industrial leadership objectives

Description

The figure shows the amount of financial contribution within the Industrial leadership objective from the EU to each country divided on: Advanced manufacturing and processes (AMP), Biotechnology

(Bio), Information and communication technologies (ICT), Advanced materials (Materials), Nanotechnologies (Nano), Innovation in small and medium sized enterprises (SME) and Space. The UK numbers are also displayed for comparisons.

Data source

h2020viz.vinnova.se based on eCorda data, March 2018

Conclusions

Considering the Nordic as a whole the participation in Horizon 2020's Industrial leadership objective is quite similar to the UK involvement. There are, however, variations between the Nordic countries. In general Information and communication technologies is the dominating area especially for the UK. The Nordics have a larger share of their commitment within Advanced manufacturing and processes as well as within biotechnologies.

Figure X-9 Participation in societal challenges objectives

Description

The figure shows the amount of financial contribution within the Societal challenges objective from the EU to each country divided on: Climate action, environment, resource efficiency and raw materials (Climate), Secure, clean and efficient energy (Energy), Europe in a changing world, Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy (Food), Health, demographic change and wellbeing (Health), Secure societies – Protecting freedom and security of Europe and its citizens (Security) and Smart, green and integrated transport (Transport). The UK numbers are also displayed for comparisons.

Data source

h2020viz.vinnova.se based on eCorda data, March 2018

Conclusions

Considering societal challenges, the UK is strongly positioned within Health, demographic change and wellbeing which is also reflected in the amount of UK-Nordic co-authored publications within this field. In general the Nordic countries also have a strong focus on Secure, clean and efficient energy as well as on Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy. The countries' respective strengths are also well reflected in *e.g.* the UK Science and innovation network which has identified life science, digital/ICT, low carbon technologies and arctic research as prioritized strategy areas for collaboration with the Nordic countries.

Summary

The United Kingdom as well as the Nordic countries are important actors in the European and as well as in the global research landscape. The UK-Nordic collaboration is broad and extensive and it constitutes a clear example of a win-win situation in terms of research impact. The research profiles of the Nordics and the UK are similar yet also complementary which has resulted in a large amount of collaborative projects and many thousands of individual researchers working actively together to achieve common goals. This clear ambition and will to collaborate internationally is important to recognize and facilitate in order to ensure that common goals can be reached within applied as well as in fundamental science.

1. Nordics

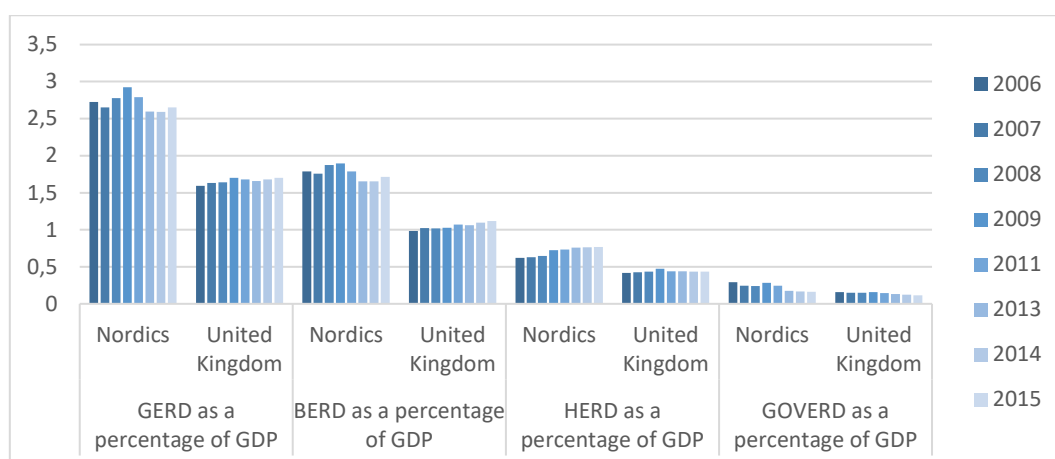


Figure 1-1. Selection of OECD main science and technology indicators, for further description see Explanation of figures and conclusions

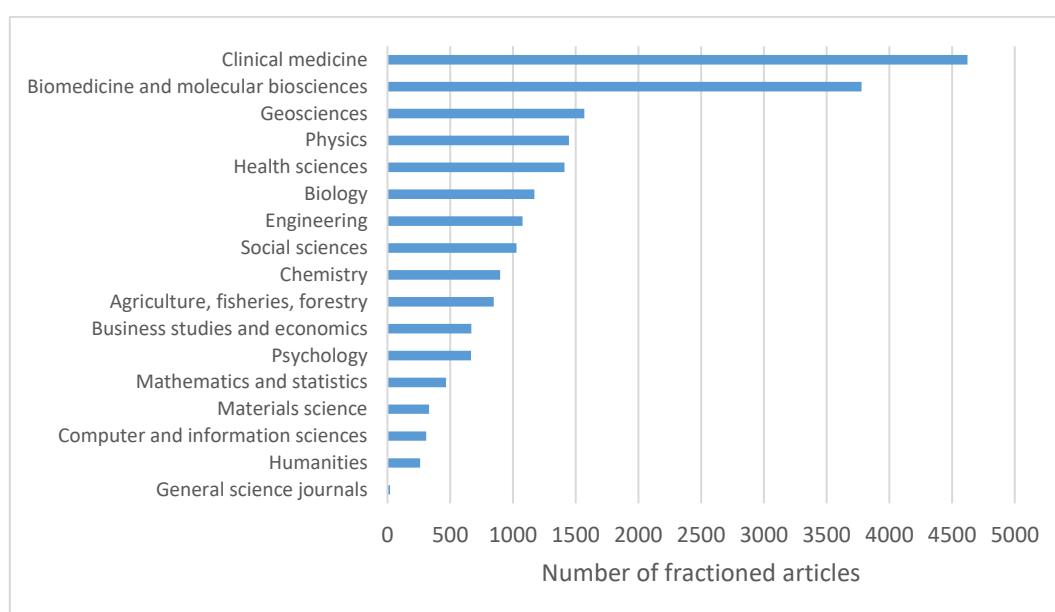


Figure 1-2. Number of bilateral fractioned publications co-authored with the UK, for further description see Explanation of figures and conclusions

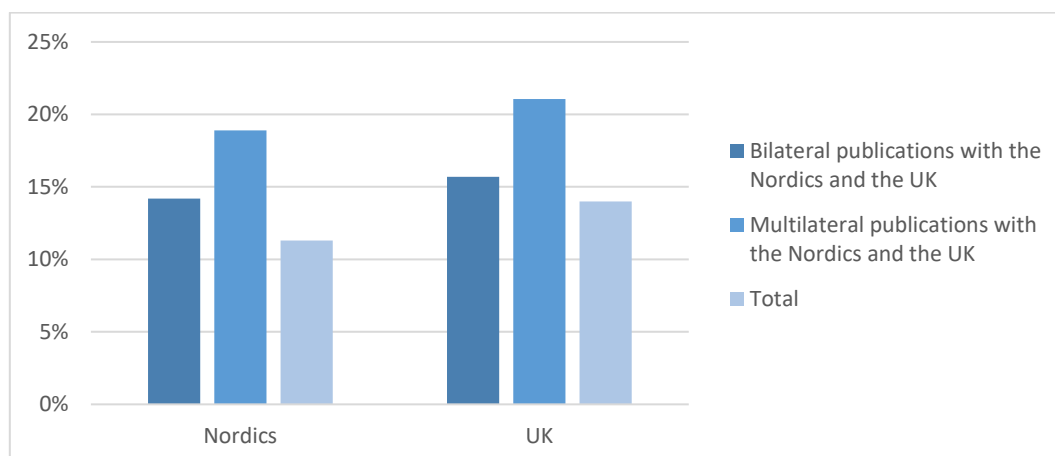


Figure 1-3. Proportion of highly cited publications, for further description see Explanation of figures and conclusions

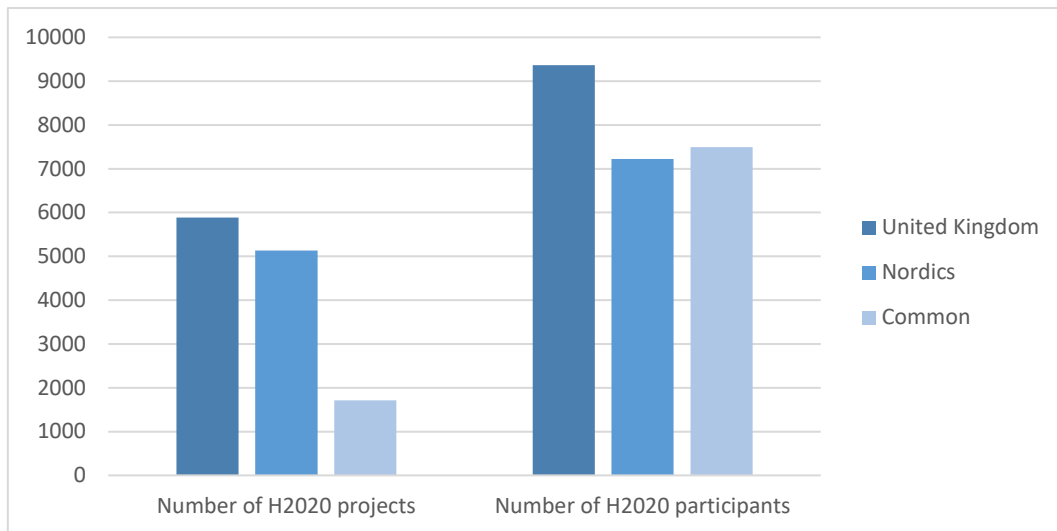


Figure 1-4. Horizon 2020 key figures, for further description see Explanation of figures and conclusions

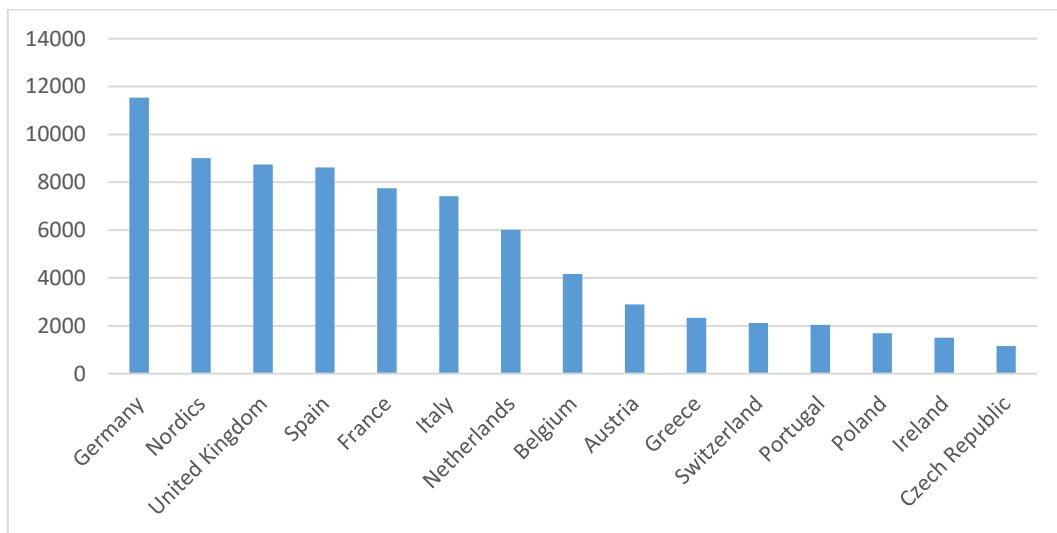


Figure 1-5. Number of collaborations in Horizon 2020, for further description see Explanation of figures and conclusions

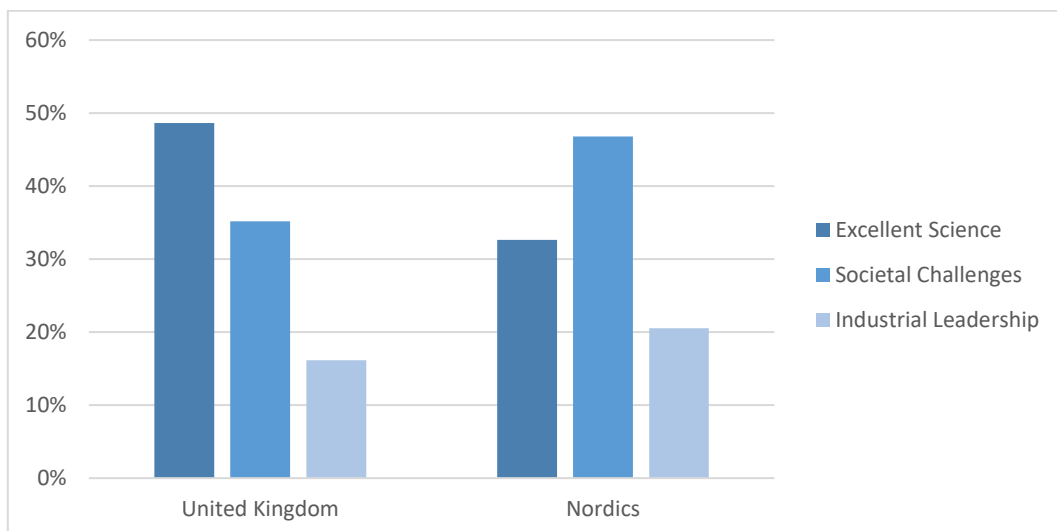


Figure 1-6. Distribution of Horizon 2020 participation on pillars, for further description see Explanation of figures and conclusions

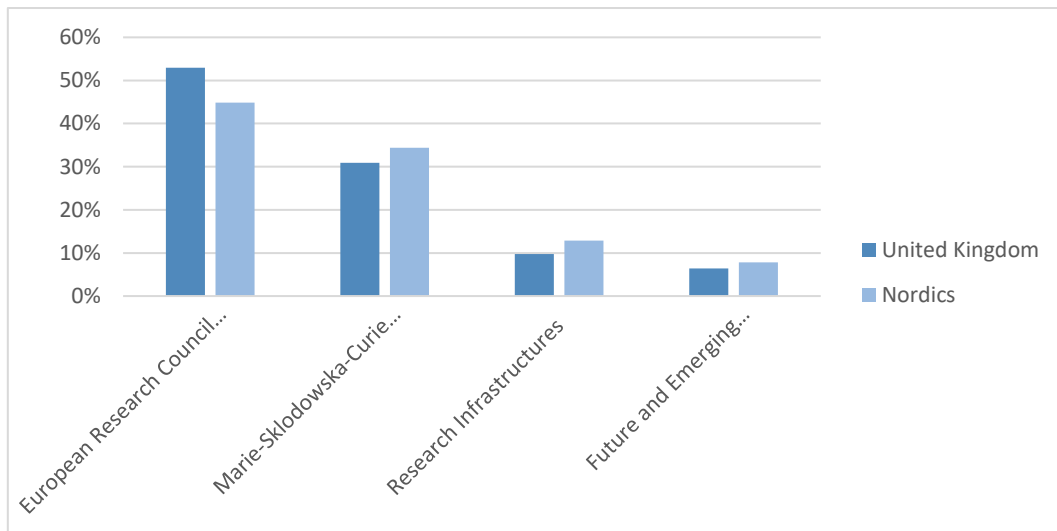


Figure 1-7. Participation in excellent science objectives, for further description see *Explanation of figures and conclusions*

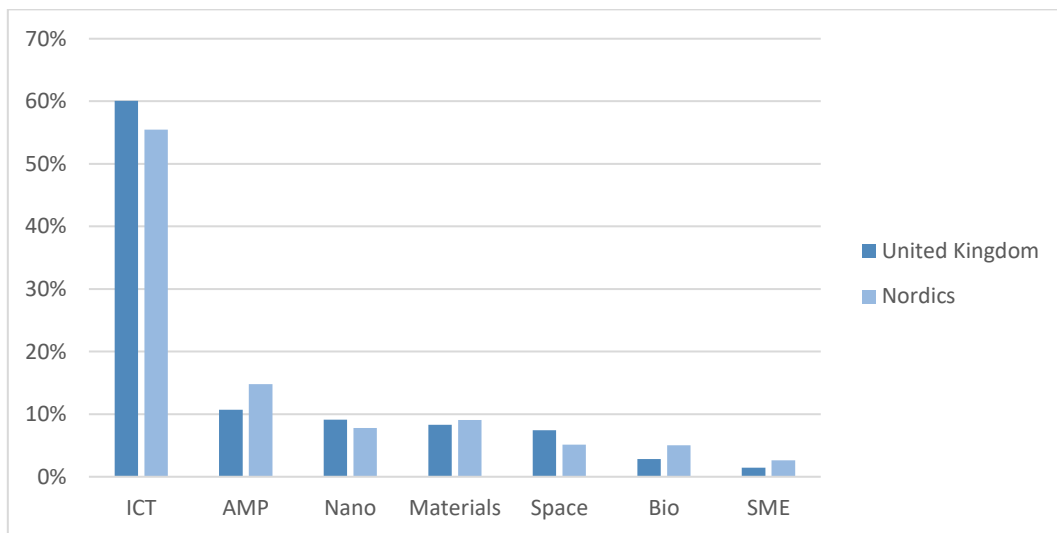


Figure 1-8. Participation in industrial leadership objectives, for further description see *Explanation of figures and conclusions*

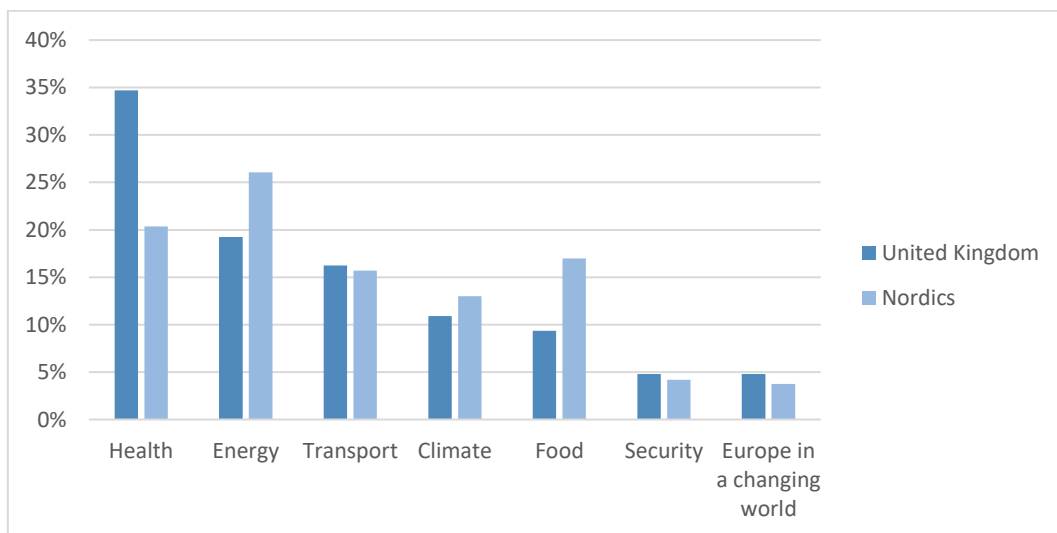


Figure 1-9. Participation in societal challenges objectives, for further description see *Explanation of figures and conclusions*

2. Denmark

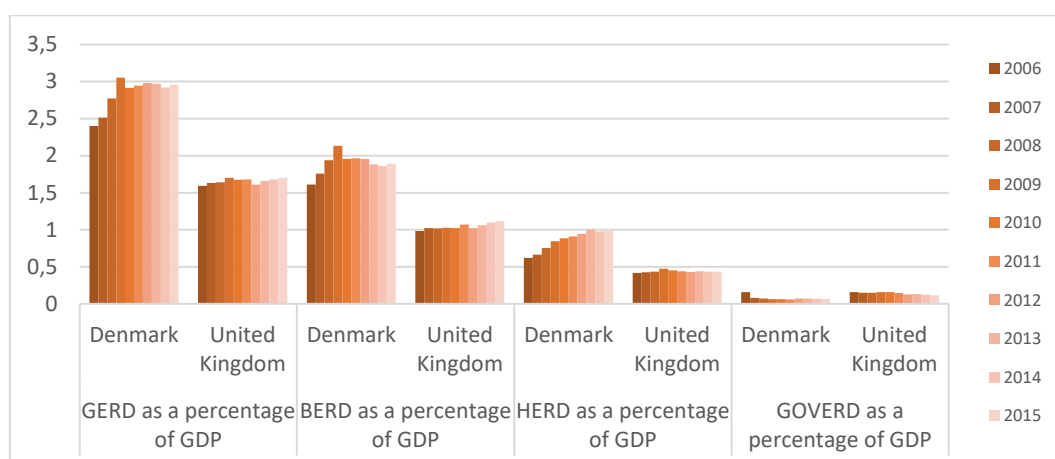


Figure 2-1. Selection of OECD main science and technology indicators, for further description see Explanation of figures and conclusions

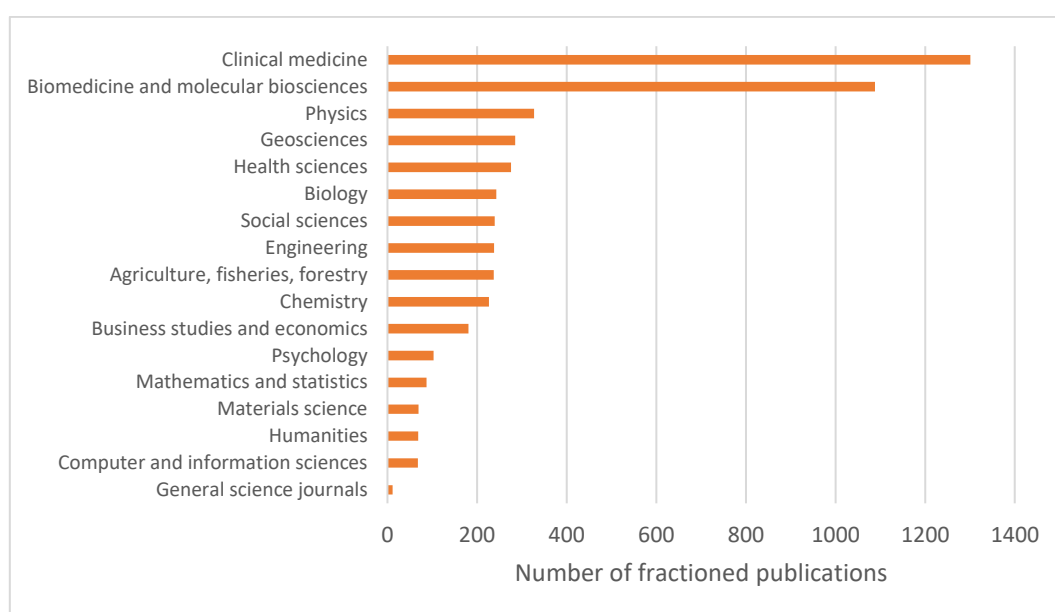


Figure 2-2. Number of bilateral fractioned publications co-authored with the UK, for further description see Explanation of figures and conclusions

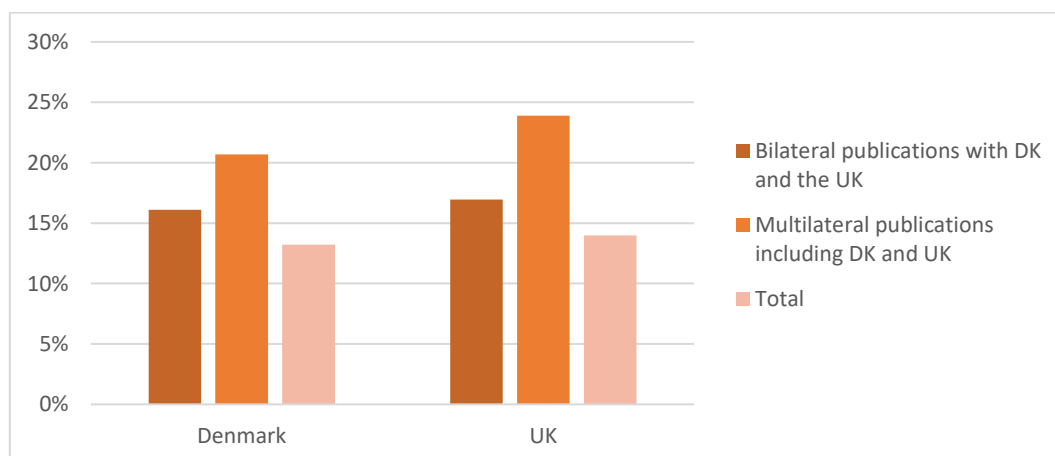


Figure 2-3. Proportion of highly cited publications, for further description see Explanation of figures and conclusions

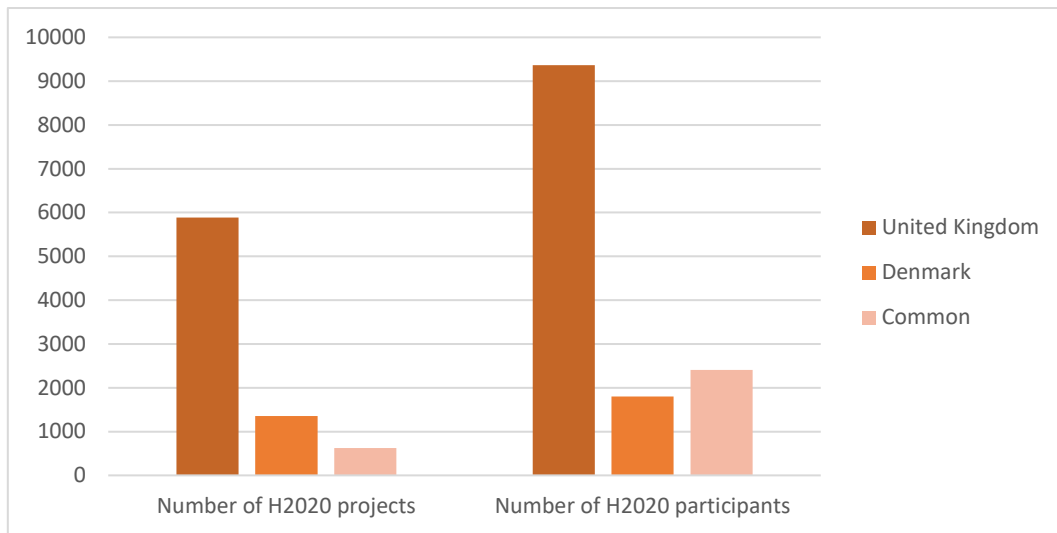


Figure 2-4. Horizon 2020 key figures, for further description see Explanation of figures and conclusions

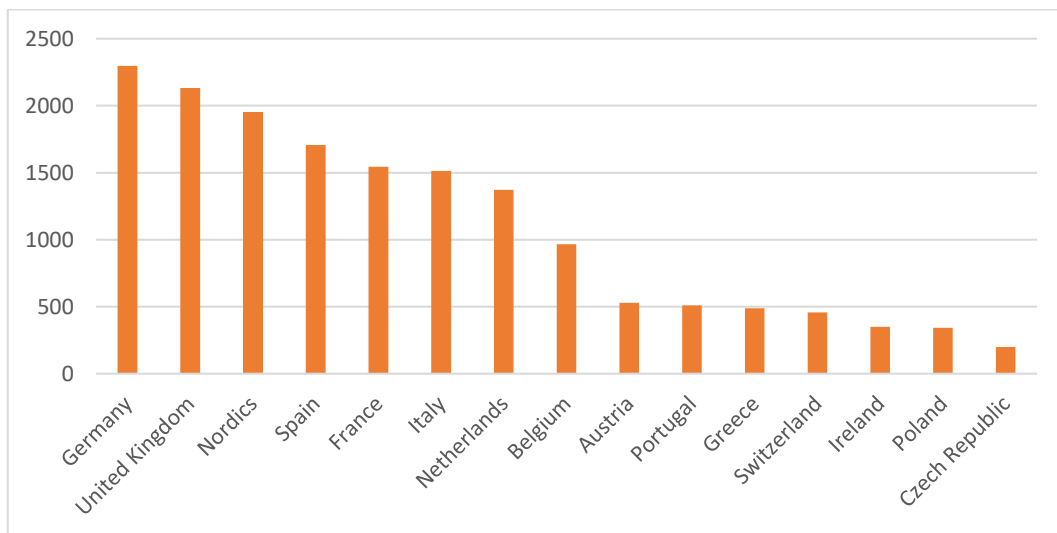


Figure 2-5. Number of collaborations in Horizon 2020, for further description see Explanation of figures and conclusions

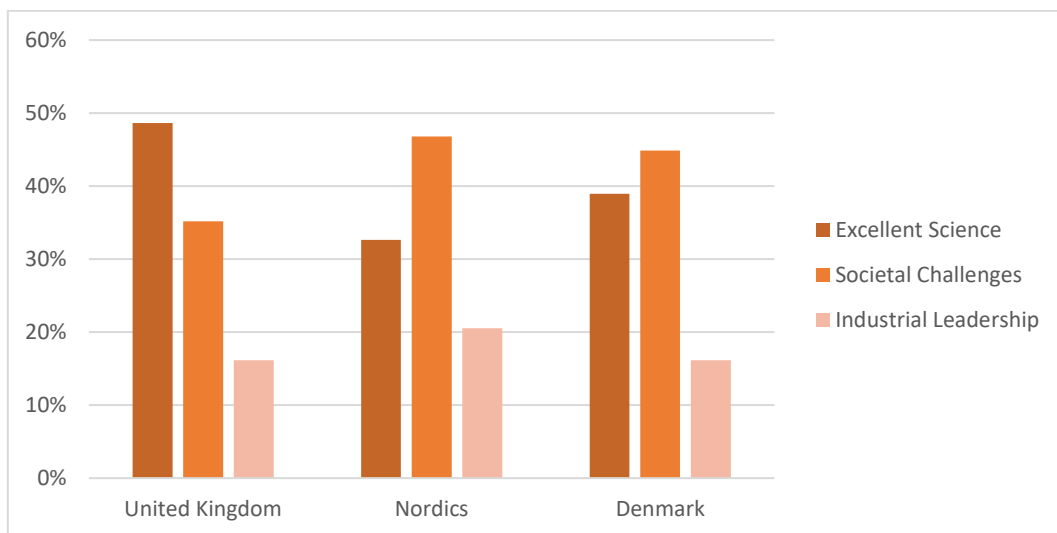


Figure 2-6. Distribution of Horizon 2020 participation on pillars, for further description see Explanation of figures and conclusions

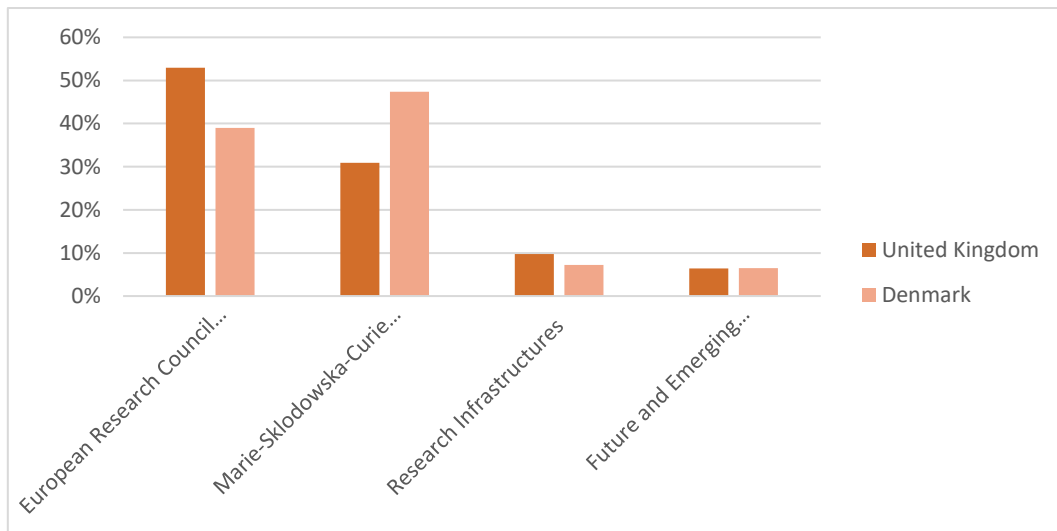


Figure 2-7. Participation in excellent science objectives, for further description see *Explanation of figures and conclusions*

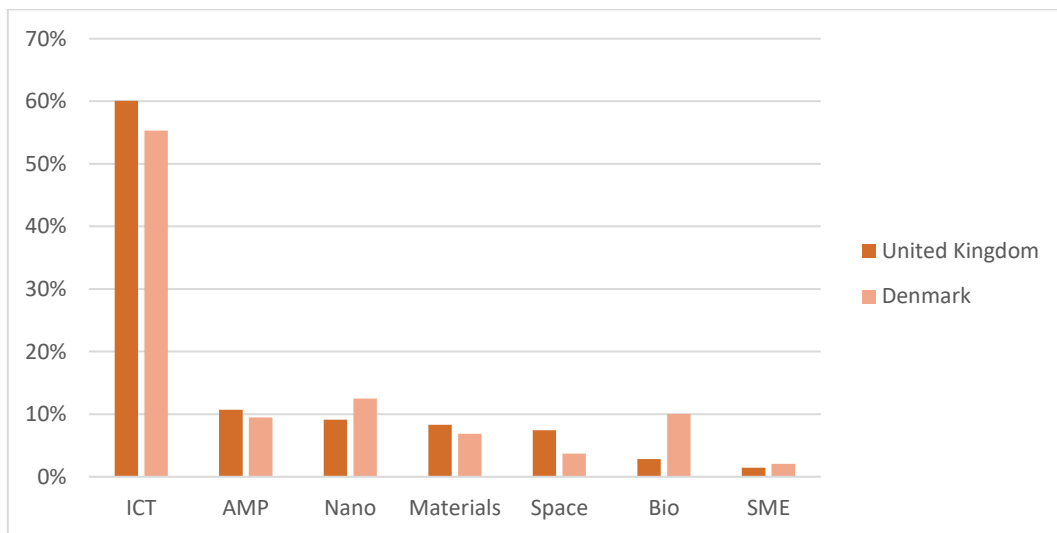


Figure 2-8. Participation in industrial leadership objectives, for further description see *Explanation of figures and conclusions*

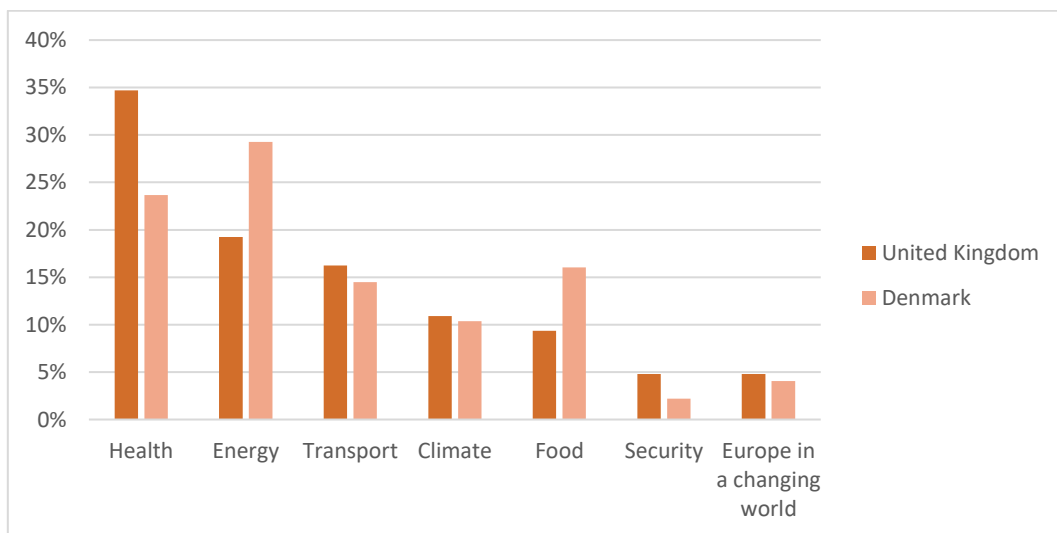


Figure 2-9. Participation in societal challenges objectives, for further description see *Explanation of figures and conclusions*

3. Finland

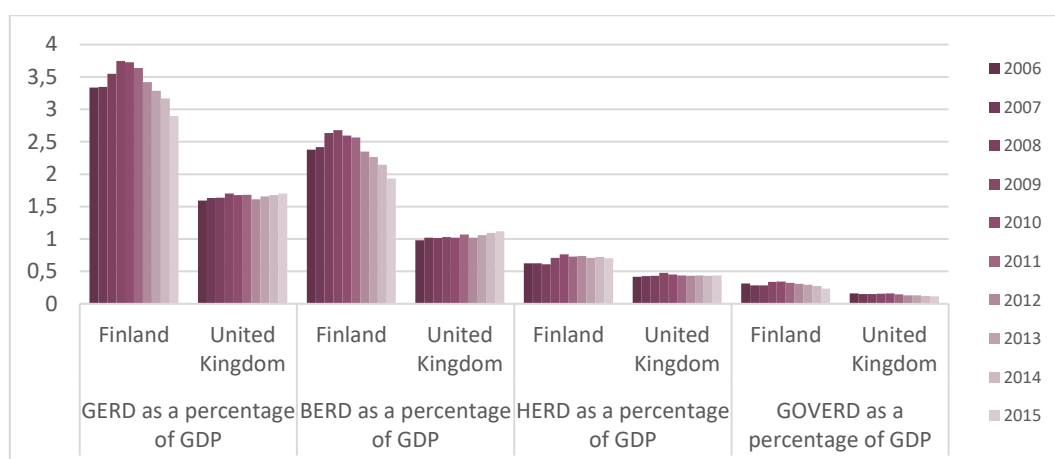


Figure 3-1. Selection of OECD main science and technology indicators, for further description see Explanation of figures and conclusions

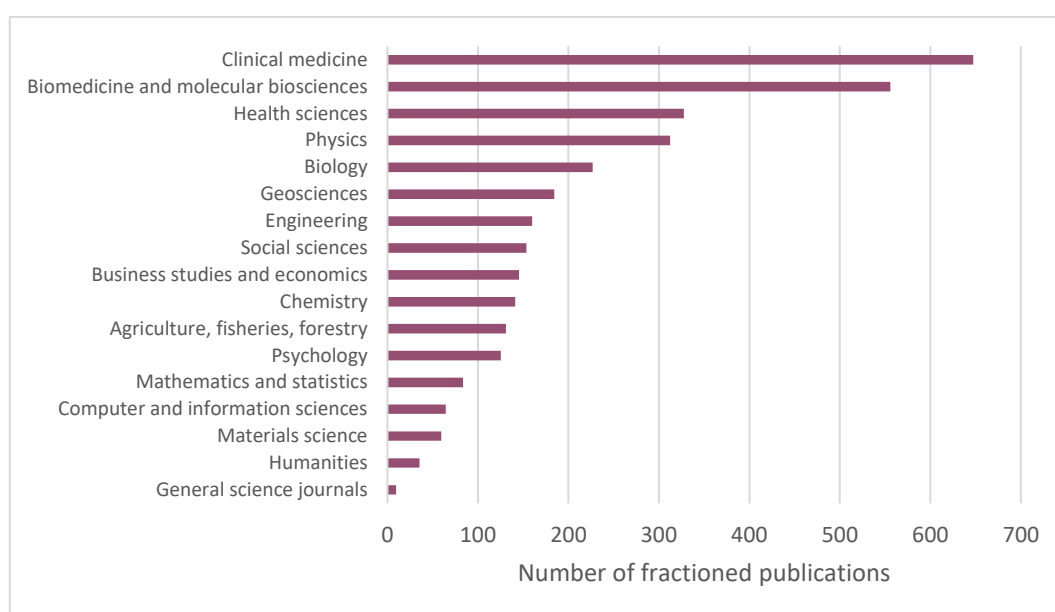


Figure 3-2. Number of bilateral fractioned publications co-authored with the UK, for further description see Explanation of figures and conclusions

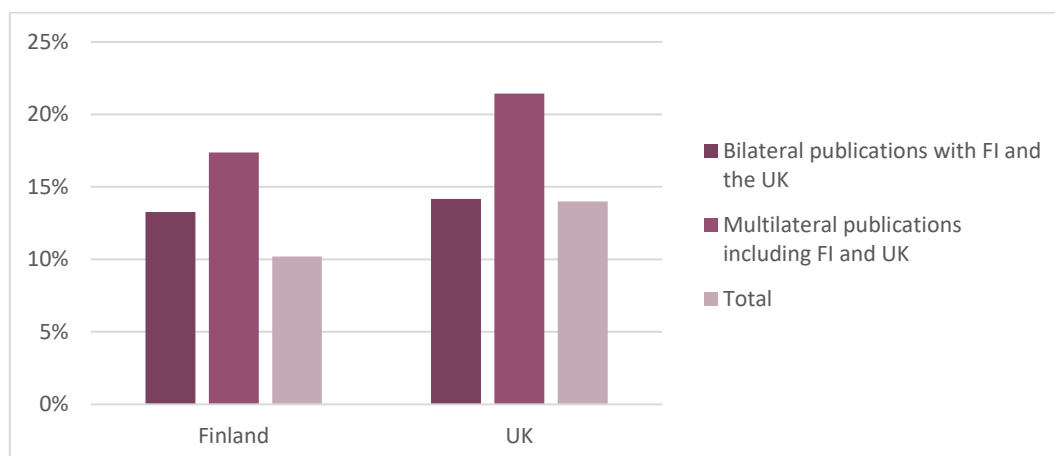


Figure 3-3. Proportion of highly cited publications, for further description see Explanation of figures and conclusions

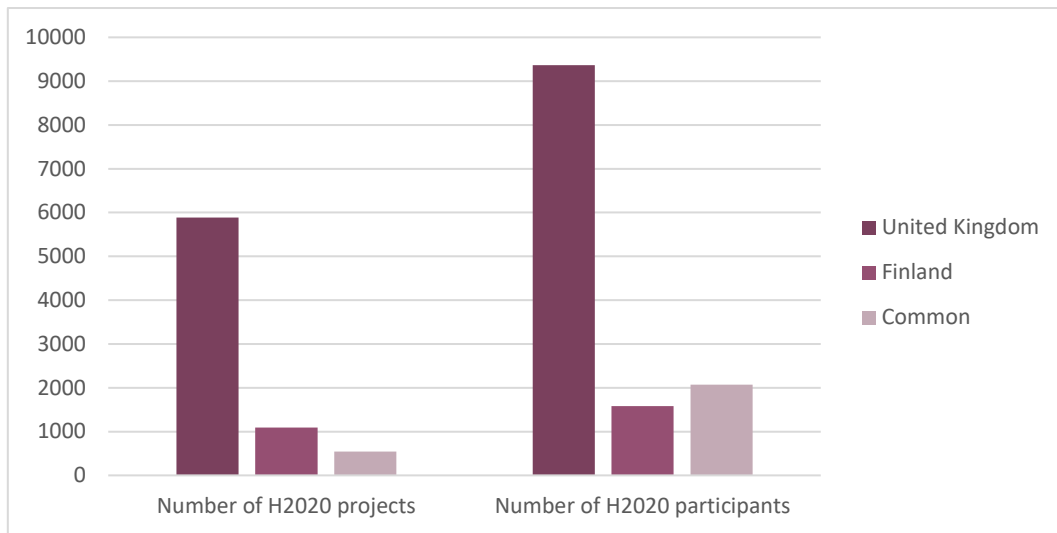


Figure 3-4. Horizon 2020 key figures, for further description see Explanation of figures and conclusions

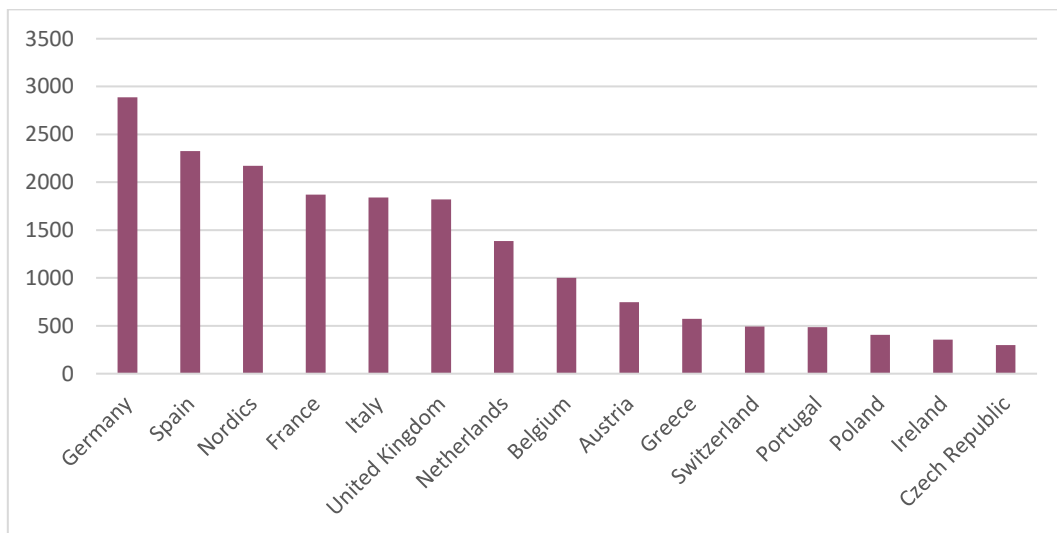


Figure 3-5. Number of collaborations in Horizon 2020, for further description see Explanation of figures and conclusions

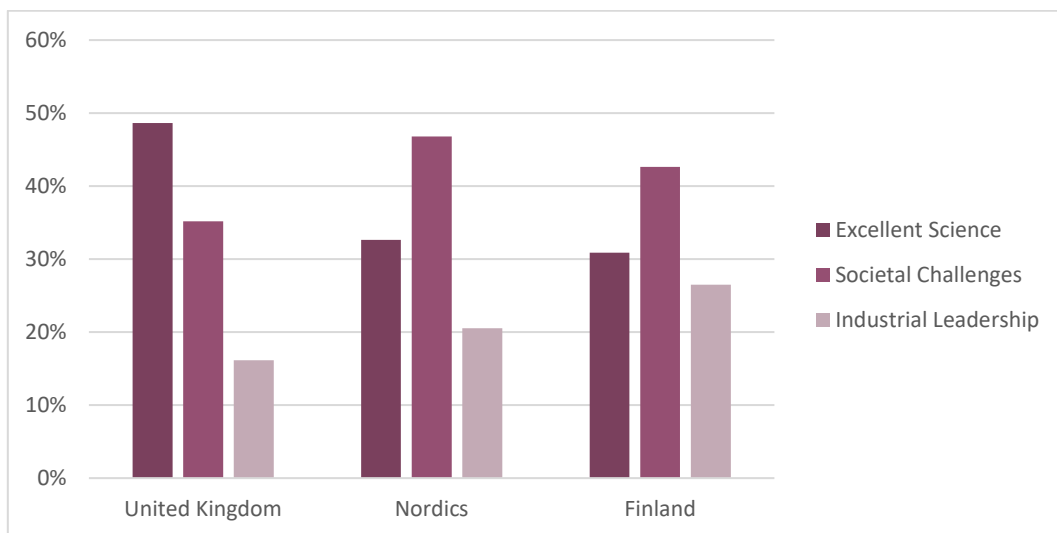


Figure 3-6. Distribution of Horizon 2020 participation on pillars, for further description see Explanation of figures and conclusions

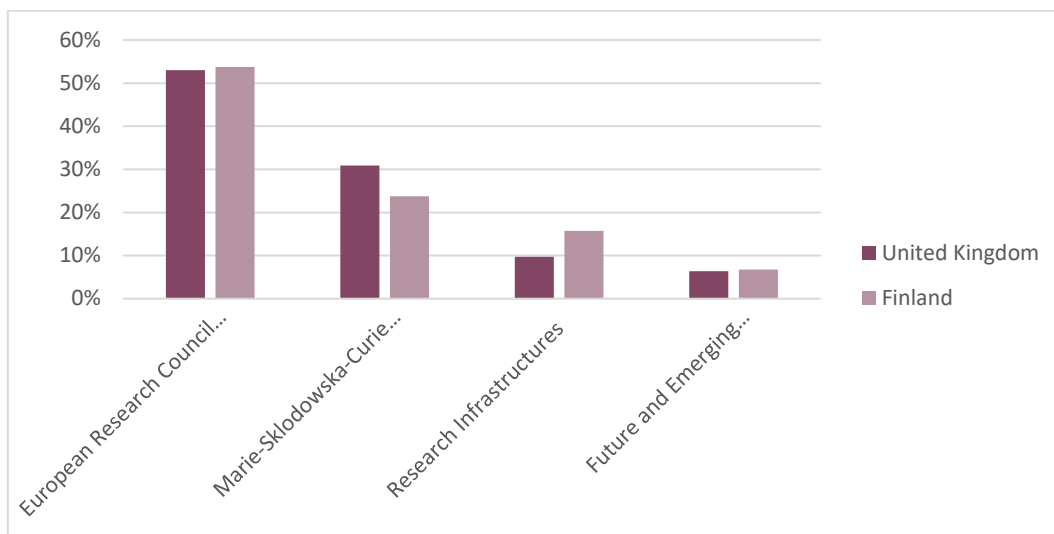


Figure 3-7. Participation in excellent science objectives, for further description see Explanation of figures and conclusions

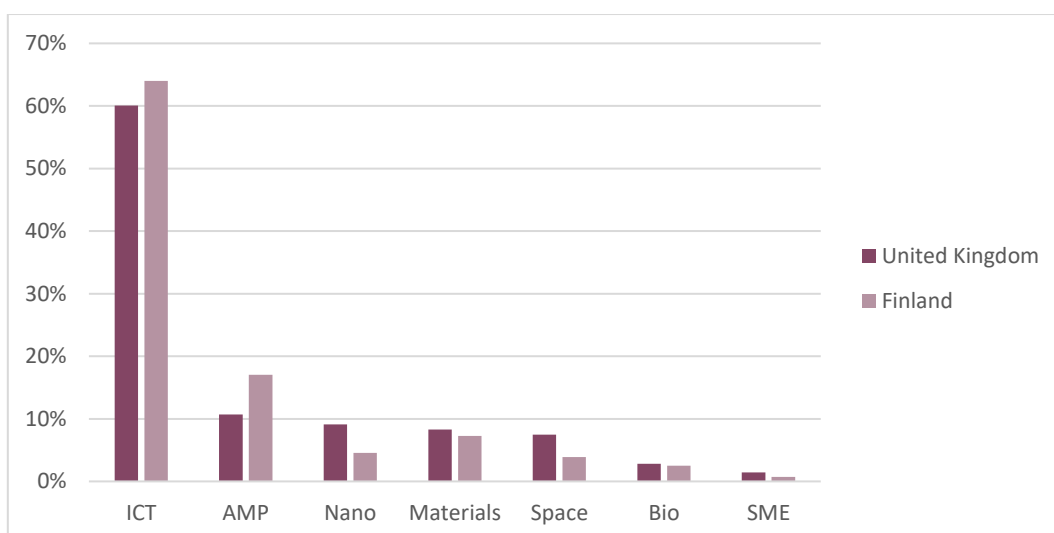


Figure 3-8. Participation in industrial leadership objectives, for further description see Explanation of figures and conclusions

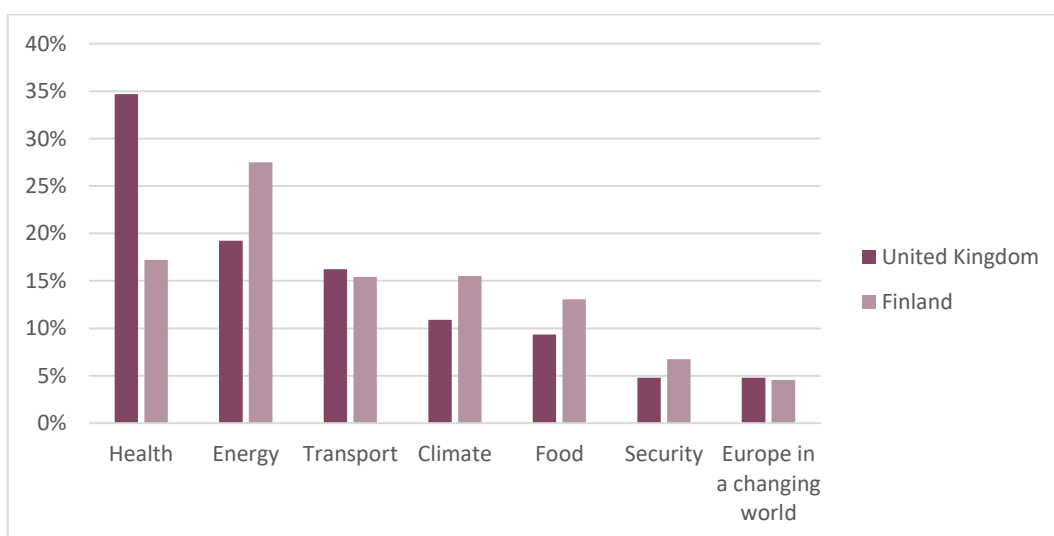


Figure 3-9. Participation in societal challenges objectives, for further description see Explanation of figures and conclusions

4. Iceland

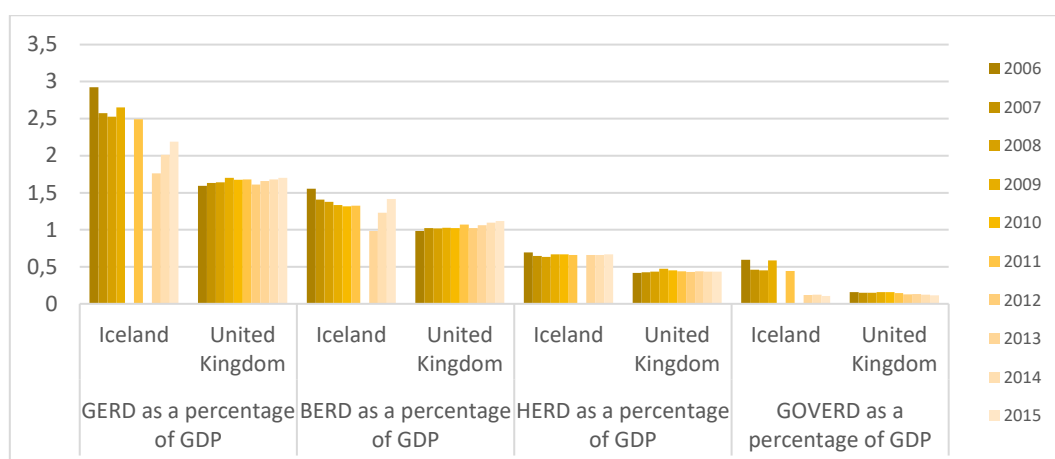


Figure 4-1. Selection of OECD main science and technology indicators, for further description see Explanation of figures and conclusions

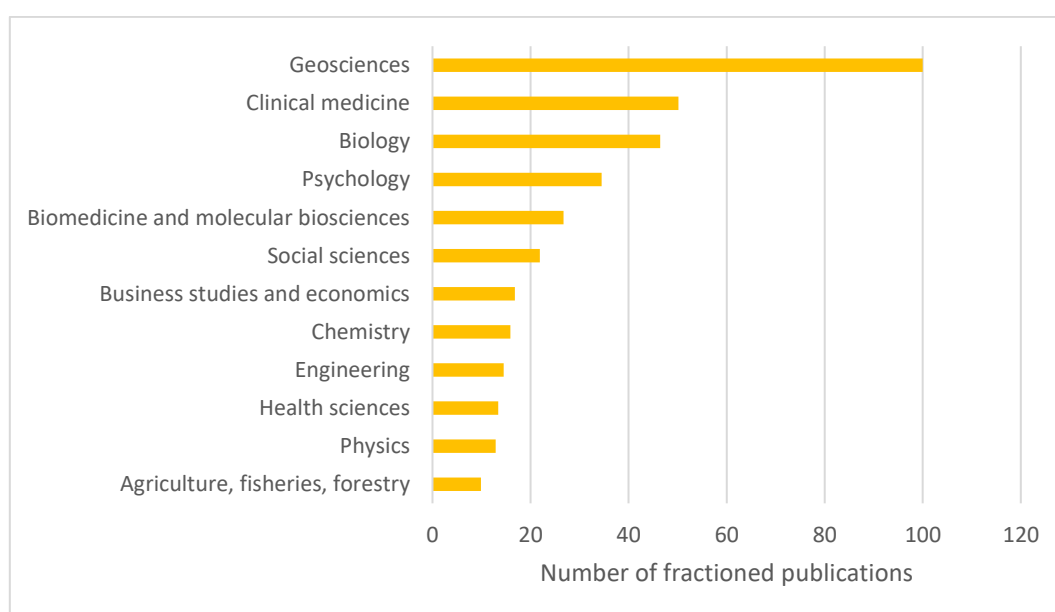


Figure 4-2. Number of bilateral fractioned publications co-authored with the UK, for further description see Explanation of figures and conclusions

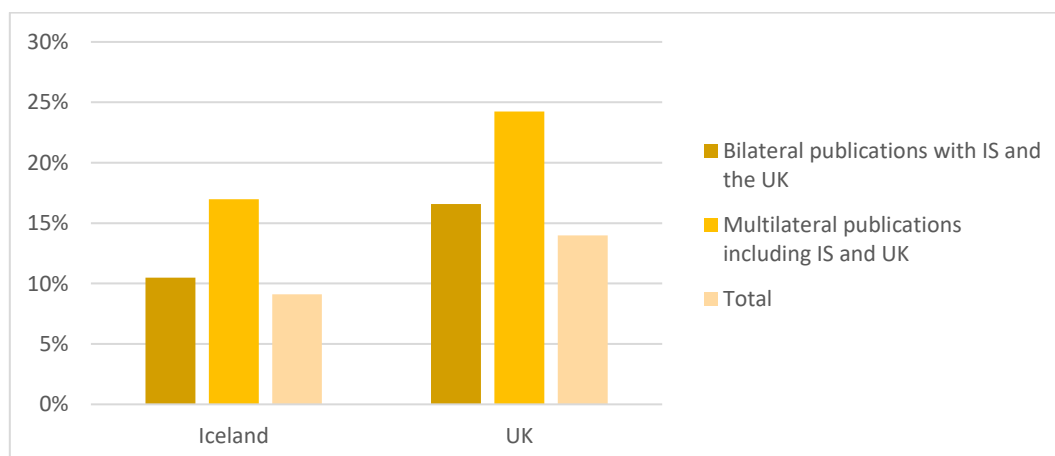


Figure 4-3. Proportion of highly cited publications, for further description see Explanation of figures and conclusions

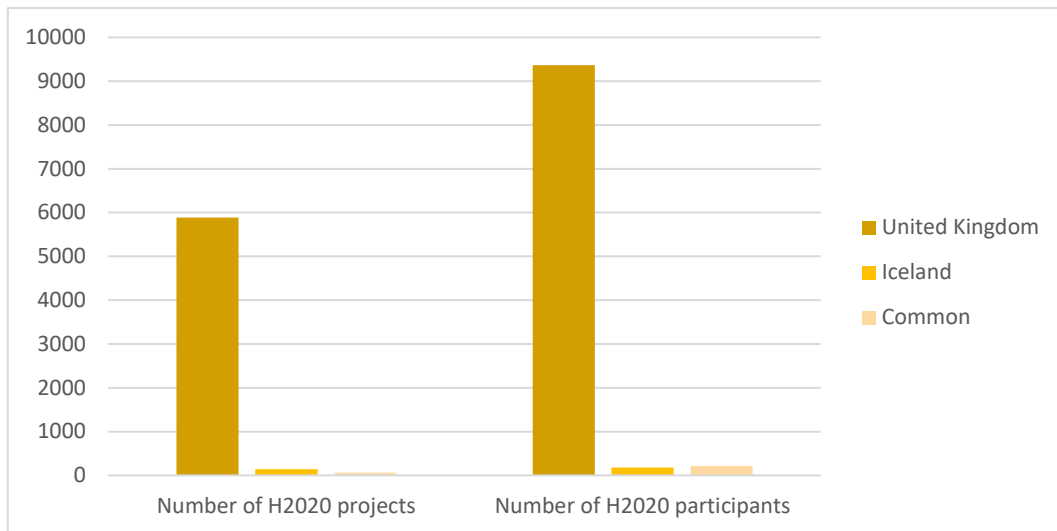


Figure 4-4. Horizon 2020 key figures, for further description see Explanation of figures and conclusions

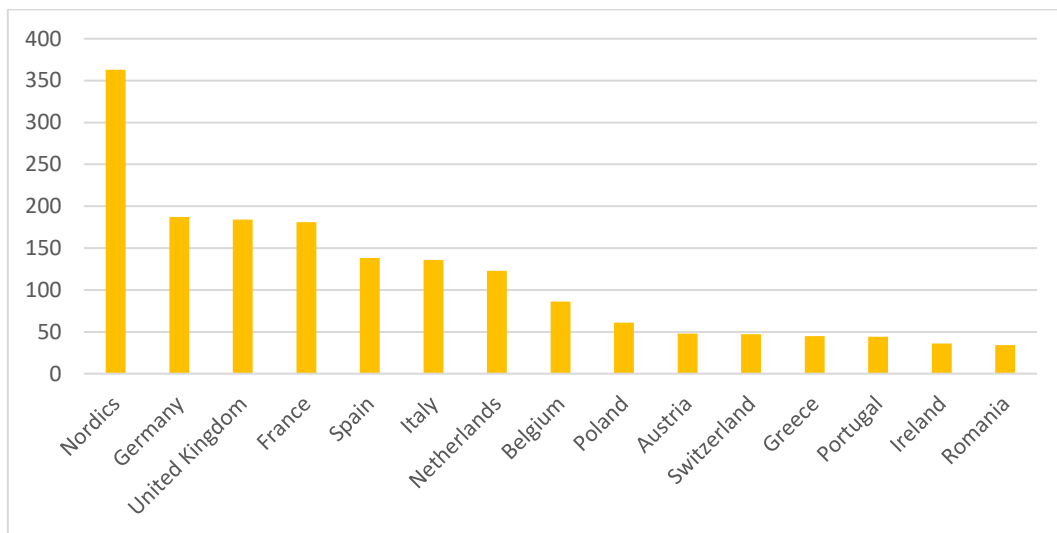


Figure 4-5. Number of collaborations in Horizon 2020, for further description see Explanation of figures and conclusions

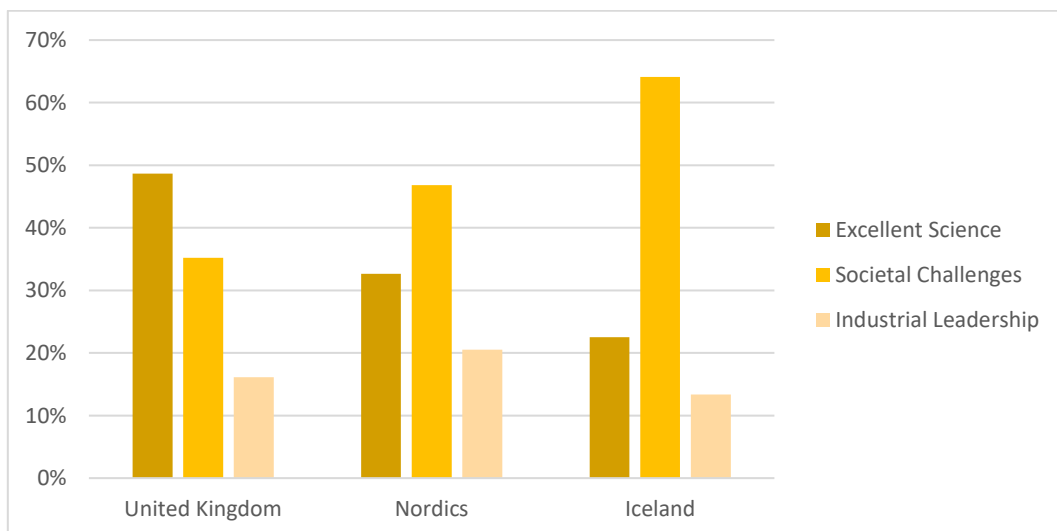


Figure 4-6. Distribution of Horizon 2020 participation on pillars, for further description see Explanation of figures and conclusions

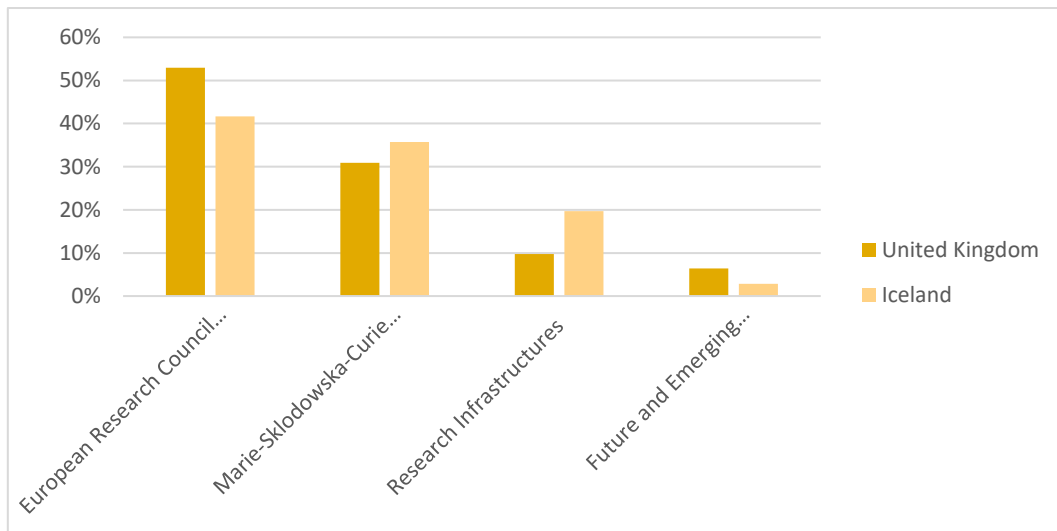


Figure 4-7. Participation in excellent science objectives, for further description see *Explanation of figures and conclusions*

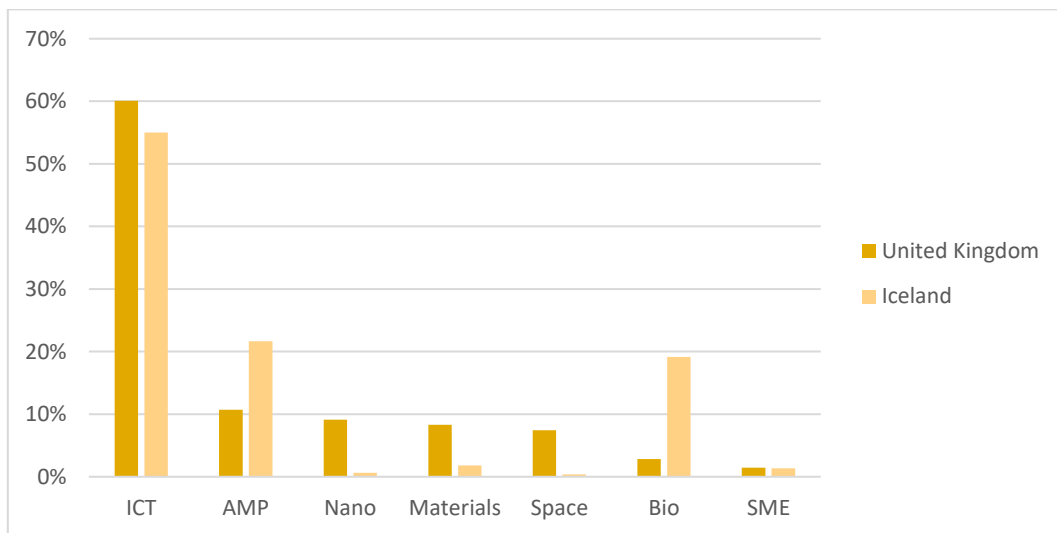


Figure 4-8. Participation in industrial leadership objectives, for further description see *Explanation of figures and conclusions*

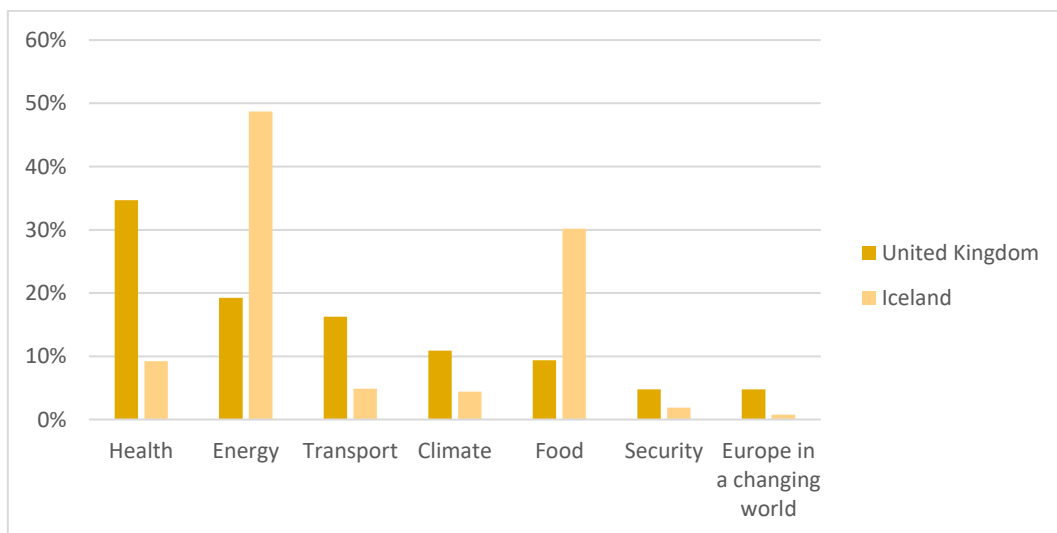


Figure 4-9. Participation in societal challenges objectives, for further description see *Explanation of figures and conclusions*

5. Norway

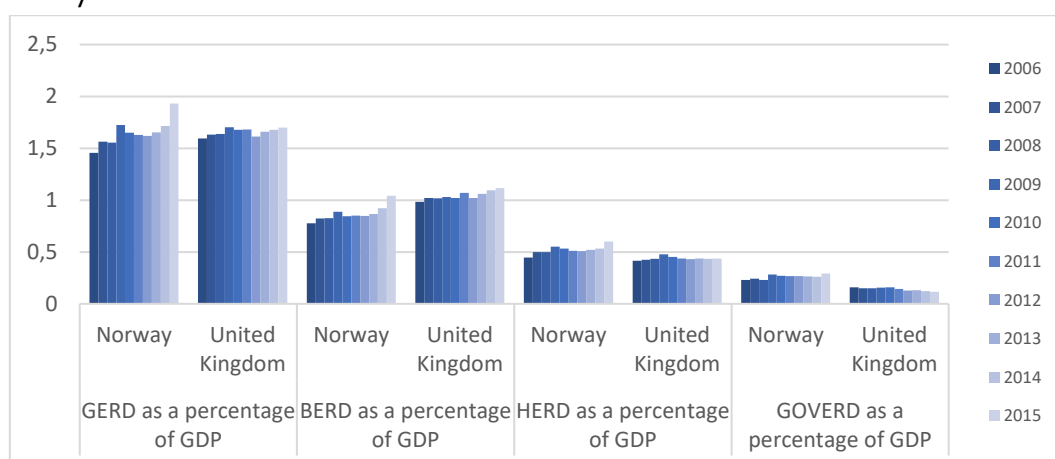


Figure 5-1. Selection of OECD main science and technology indicators, for further description see Explanation of figures and conclusions

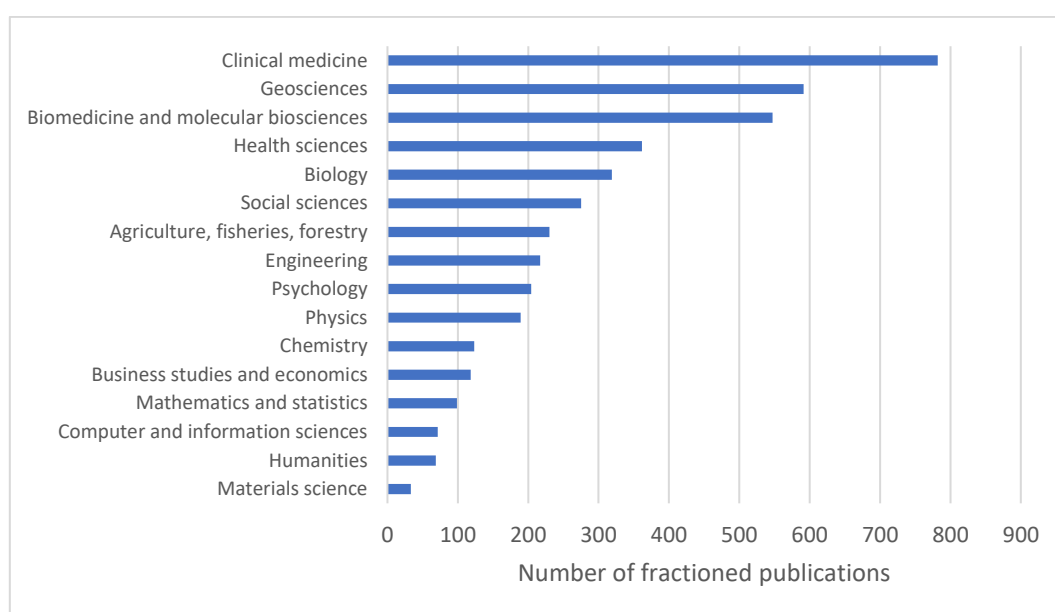


Figure 5-2. Number of bilateral fractioned publications co-authored with the UK, for further description see Explanation of figures and conclusions

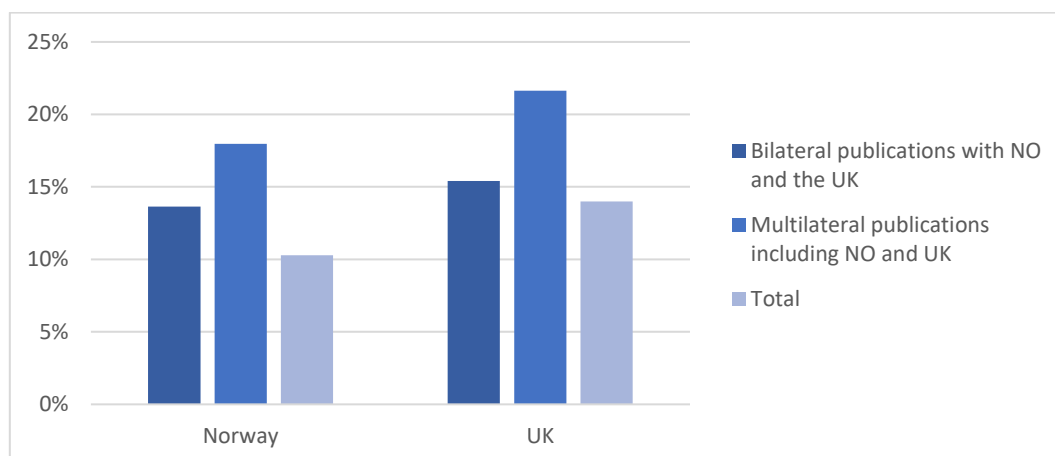


Figure 5-3. Proportion of highly cited publications, for further description see Explanation of figures and conclusions

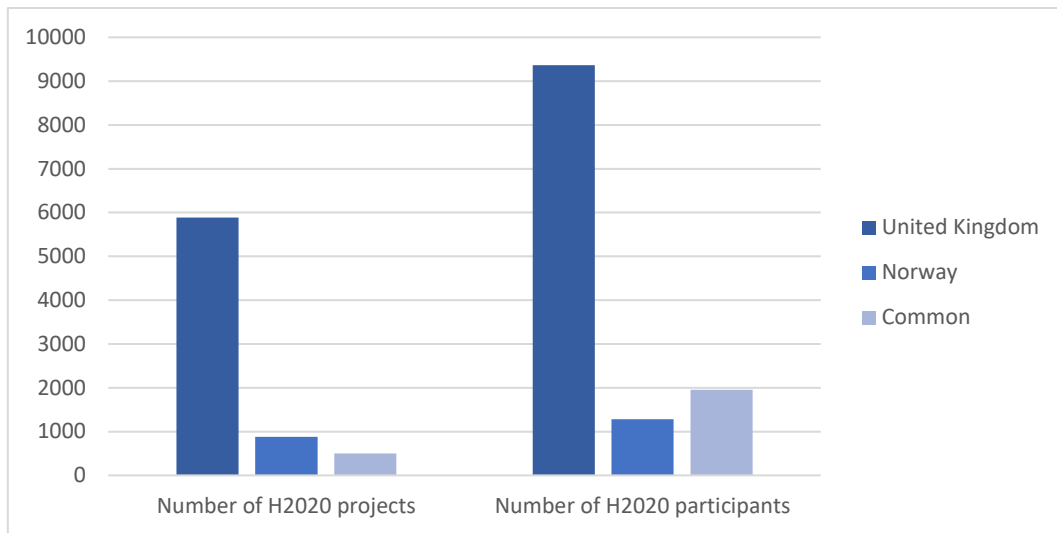


Figure 5-4. Horizon 2020 key figures, for further description see Explanation of figures and conclusions

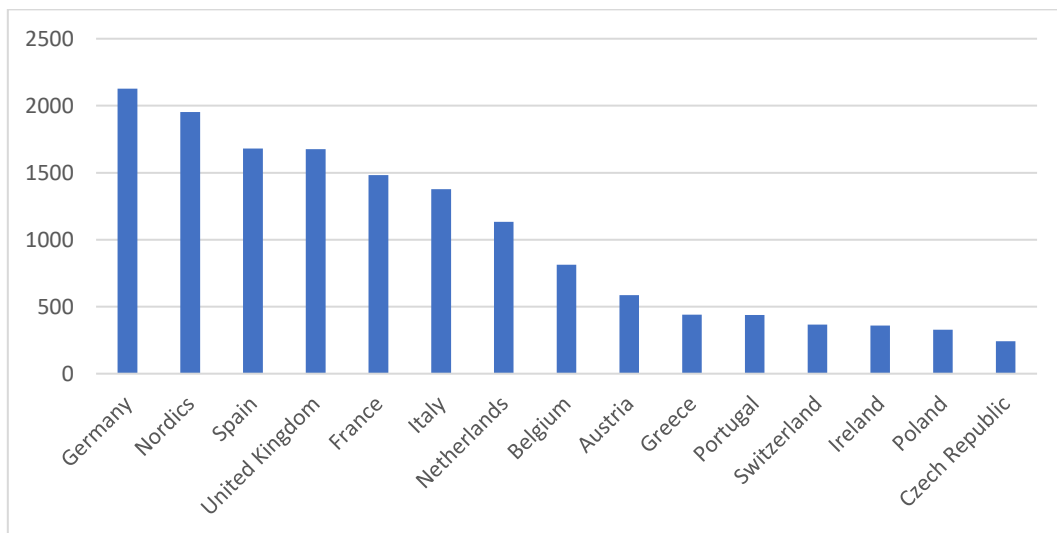


Figure 5-5. Number of collaborations in Horizon 2020, for further description see Explanation of figures and conclusions

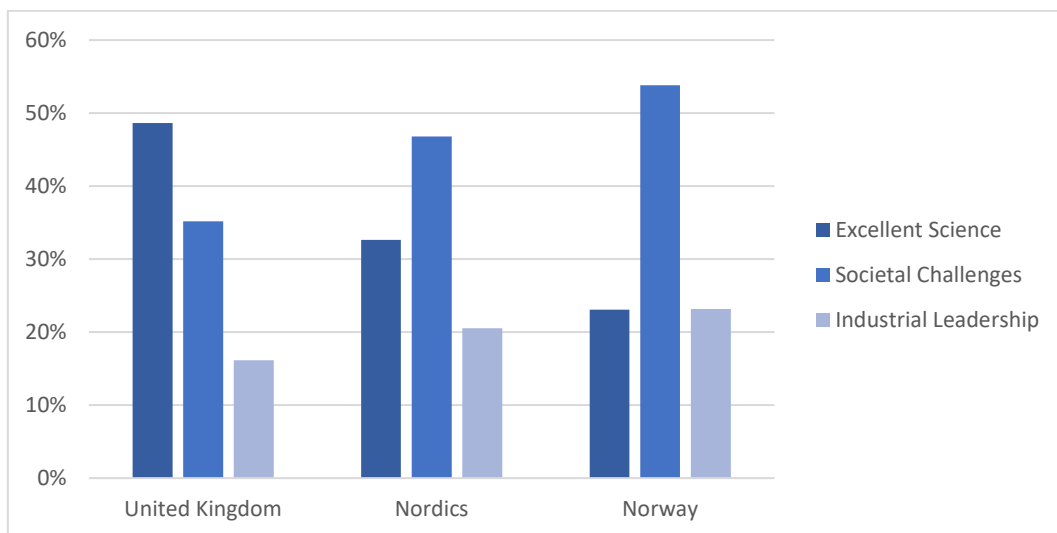


Figure 5-6. Distribution of Horizon 2020 participation on pillars, for further description see Explanation of figures and conclusions

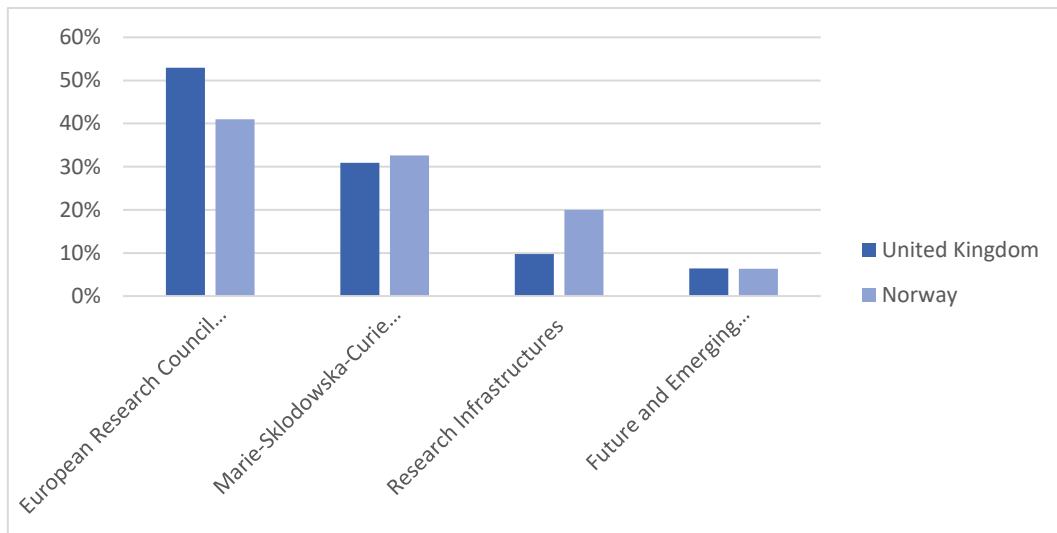


Figure 5-7. Participation in excellent science objectives, for further description see *Explanation of figures and conclusions*

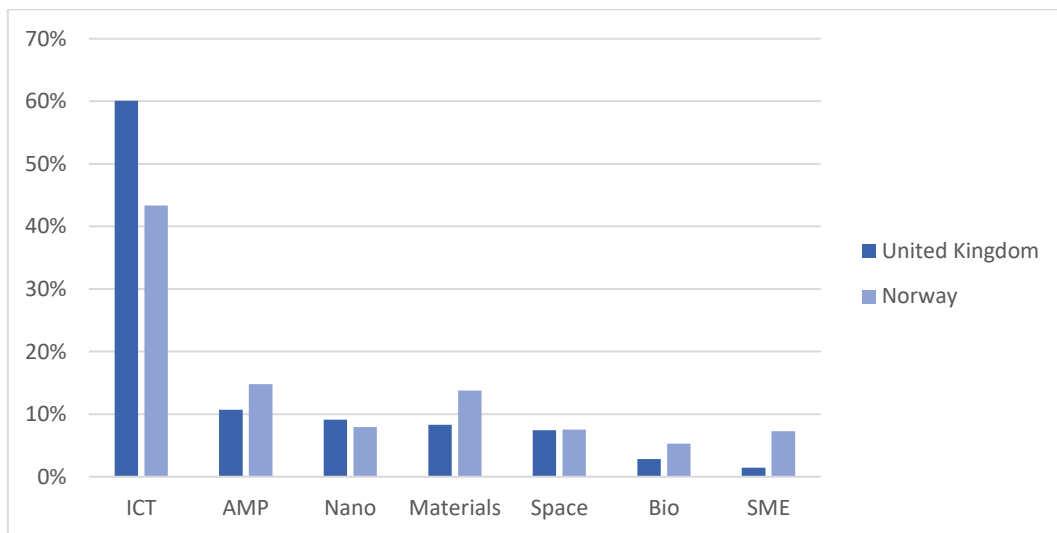


Figure 5-8. Participation in industrial leadership objectives, for further description see *Explanation of figures and conclusions*

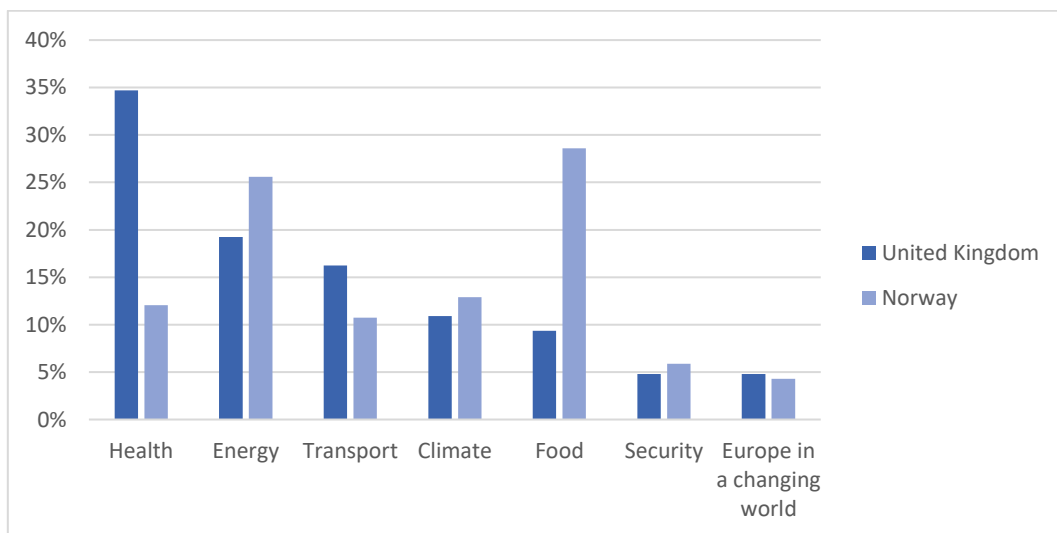


Figure 5-9. Participation in societal challenges objectives, for further description see *Explanation of figures and conclusions*

6. Sweden

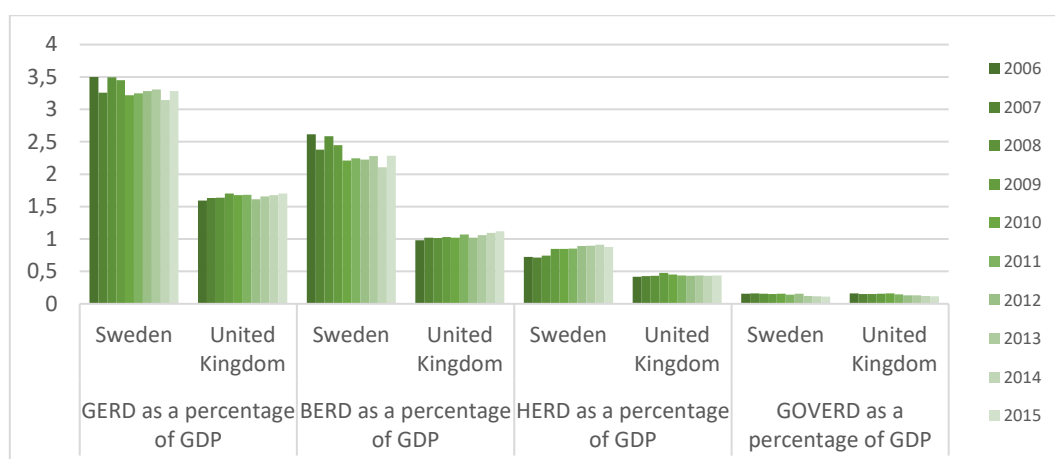


Figure 6-1. Selection of OECD main science and technology indicators, for further description see Explanation of figures and conclusions

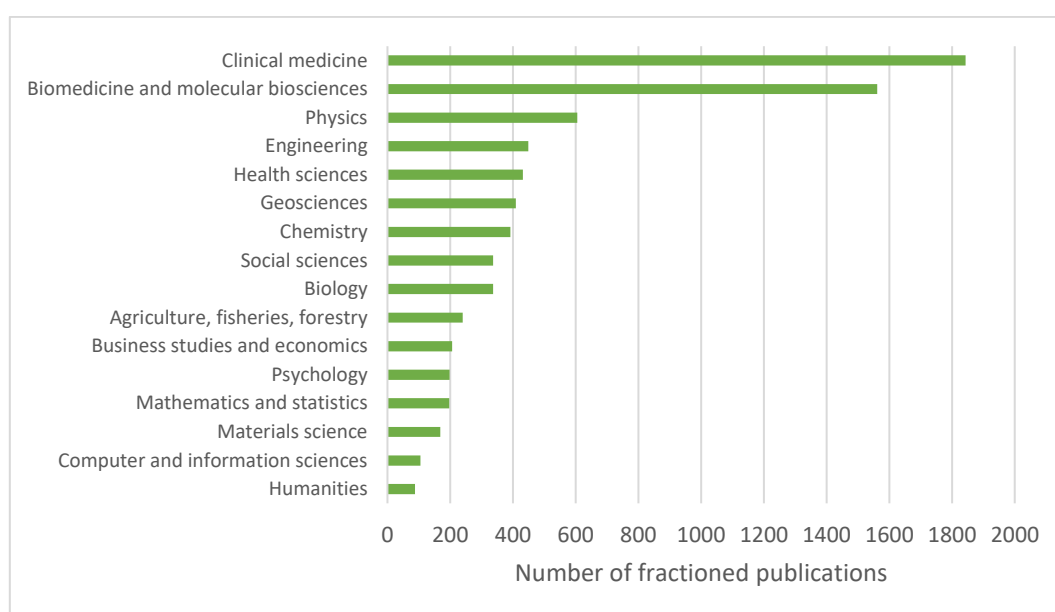


Figure 6-2. Number of bilateral fractioned publications co-authored with the UK, for further description see Explanation of figures and conclusions

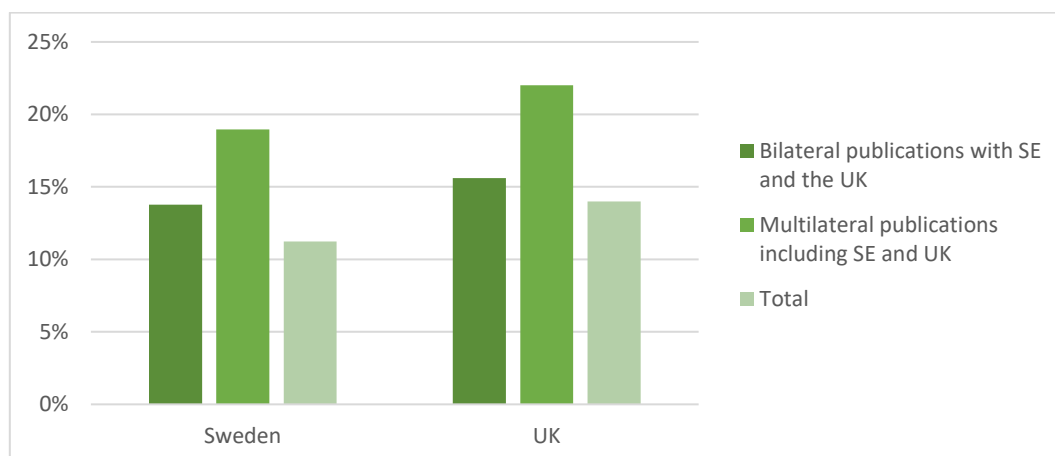


Figure 6-3. Proportion of highly cited publications, for further description see Explanation of figures and conclusions

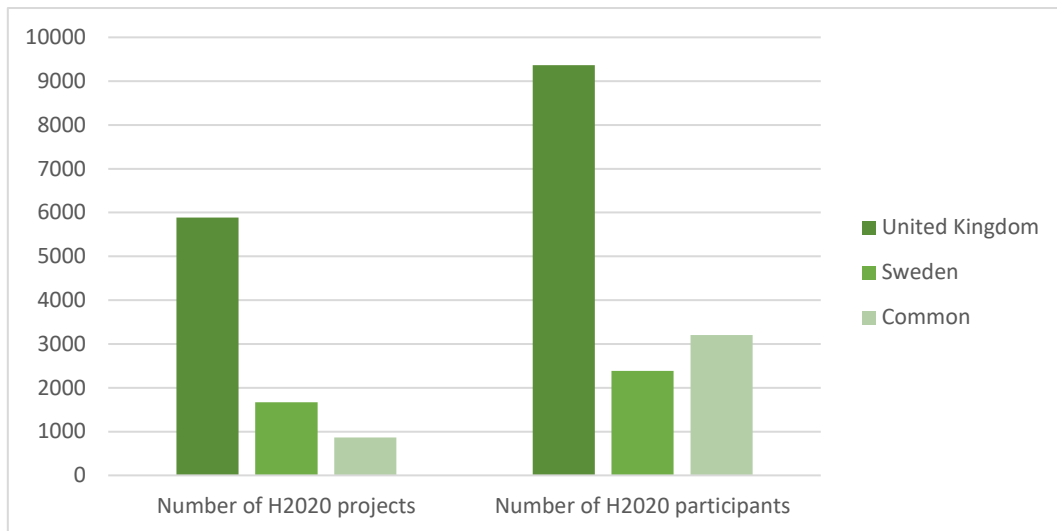


Figure 6-4. Horizon 2020 key figures, for further description see Explanation of figures and conclusions

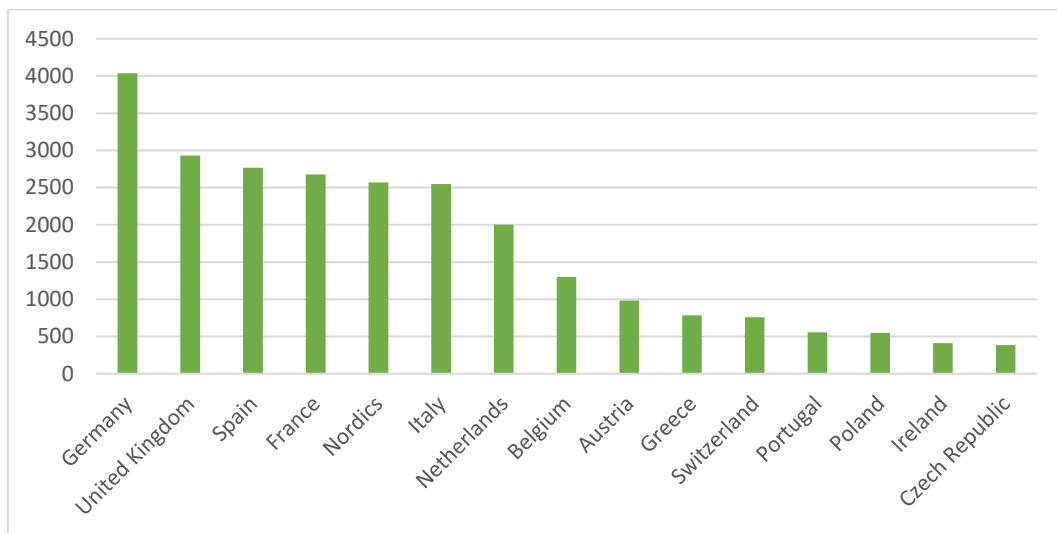


Figure 6-5. Number of collaborations in Horizon 2020, for further description see Explanation of figures and conclusions

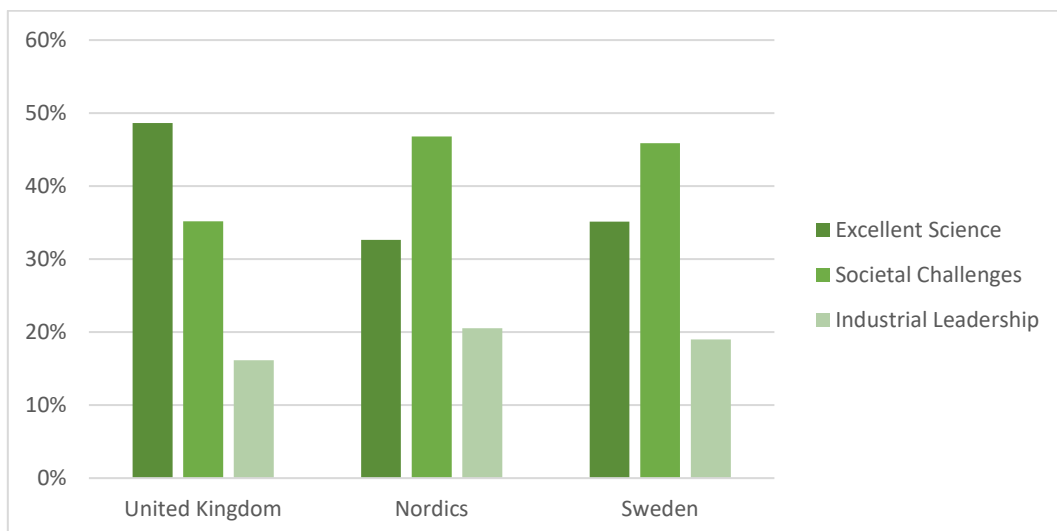


Figure 6-6. Distribution of Horizon 2020 participation on pillars, for further description see Explanation of figures and conclusions

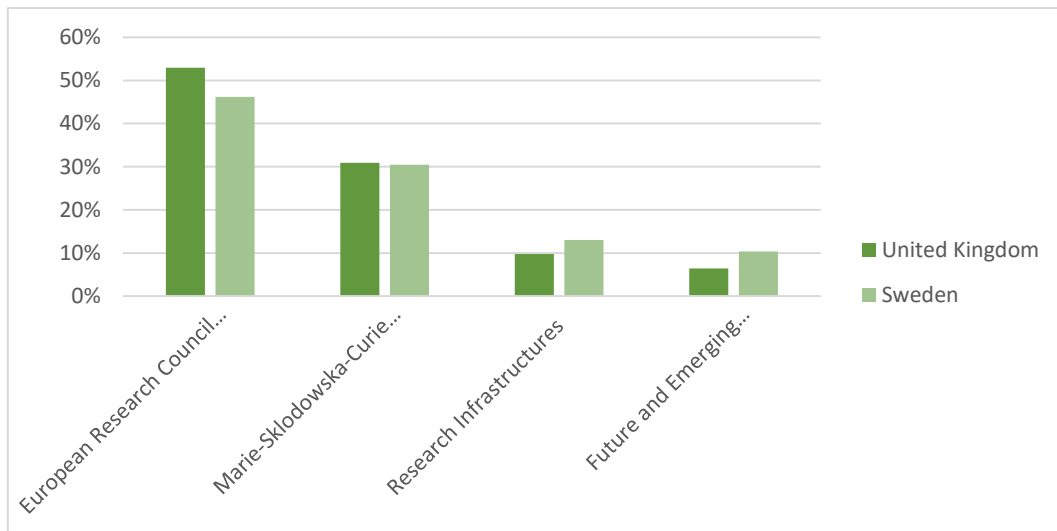


Figure 6-7. Participation in excellent science objectives, for further description see *Explanation of figures and conclusions*

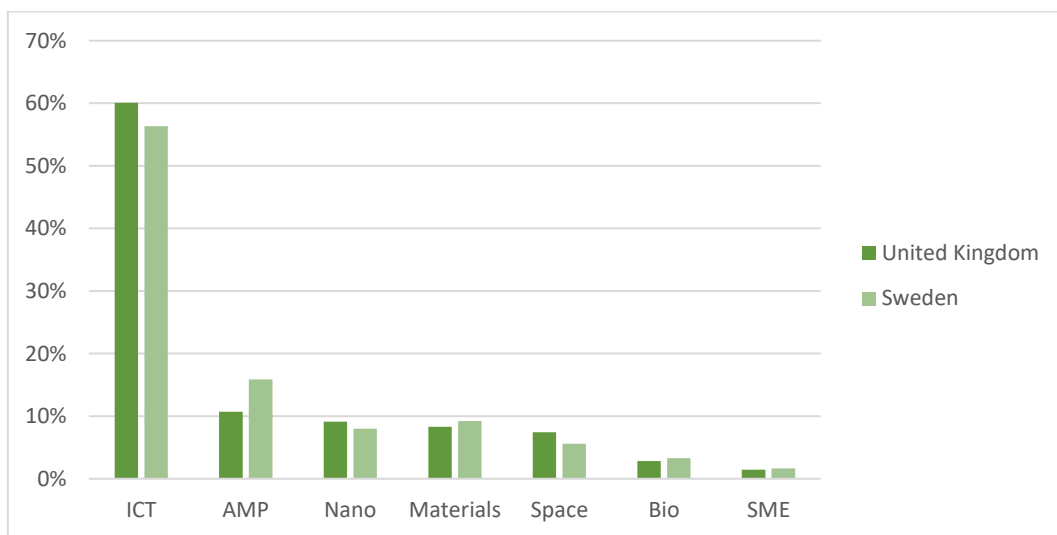


Figure 6-8. Participation in industrial leadership objectives, for further description see *Explanation of figures and conclusions*

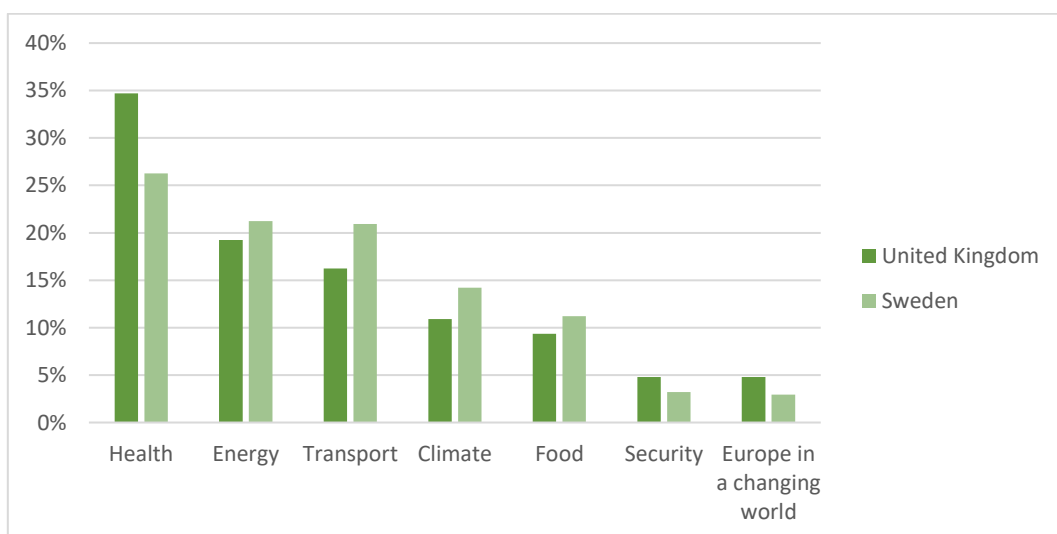


Figure 6-9. Participation in societal challenges objectives, for further description see *Explanation of figures and conclusions*

7. United Kingdom

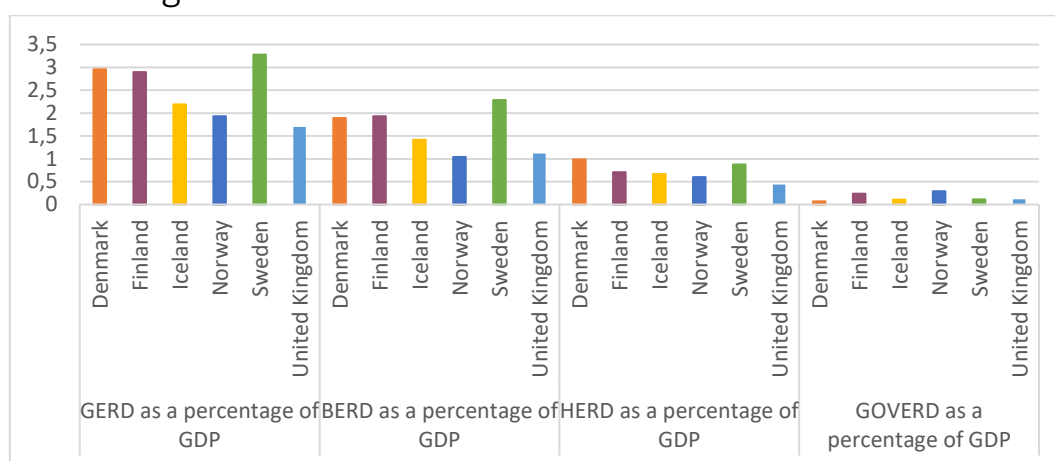


Figure 7-1. Selection of OECD main science and technology indicators 2015, for further description see Explanation of figures and conclusions

Figure 7-2, 7-3 and 7-4 are omitted and the reader is recommended to see each Nordic country's individual section.

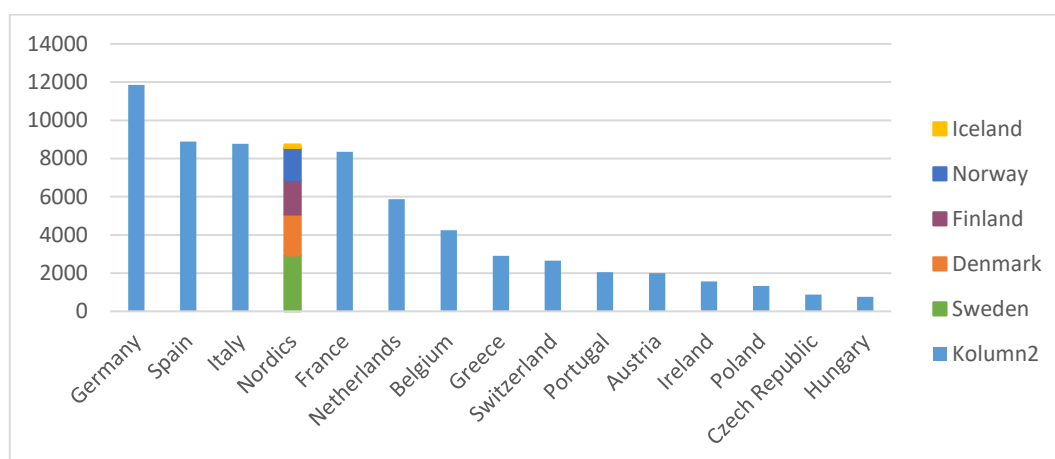


Figure 7-5. Number of collaborations in Horizon 2020, for further description see Explanation of figures and conclusions

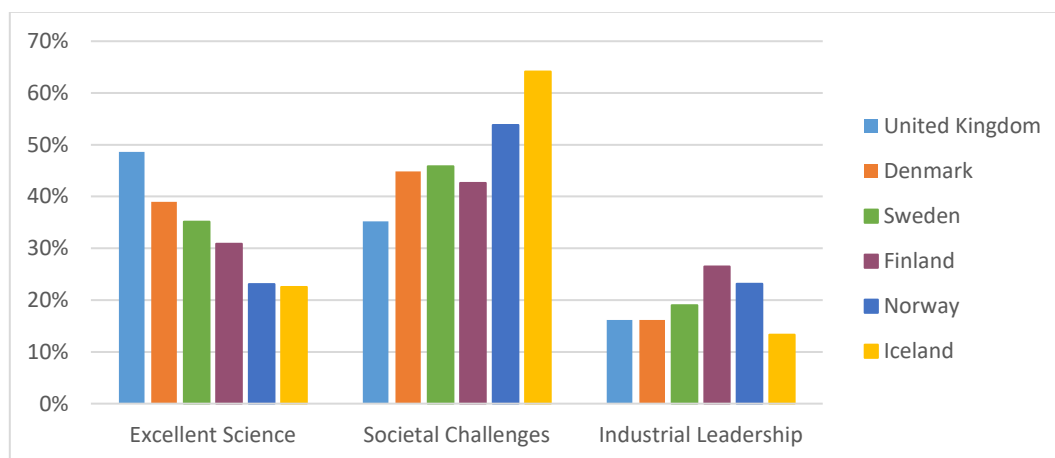


Figure 7-6. Distribution of Horizon 2020 participation on pillars, for further description see Explanation of figures and conclusions

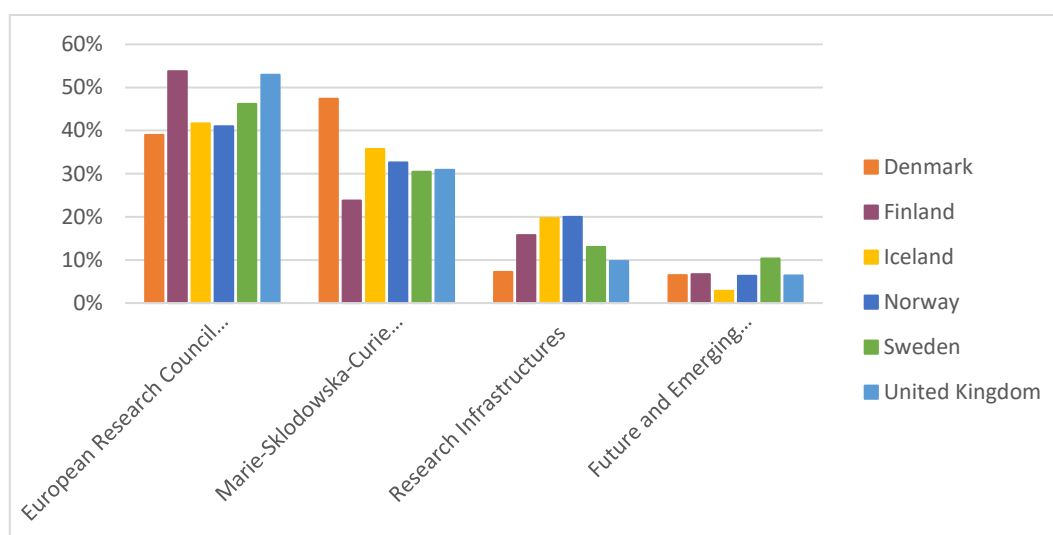


Figure 7-7. Participation in excellent science objectives, for further description see Explanation of figures and conclusions

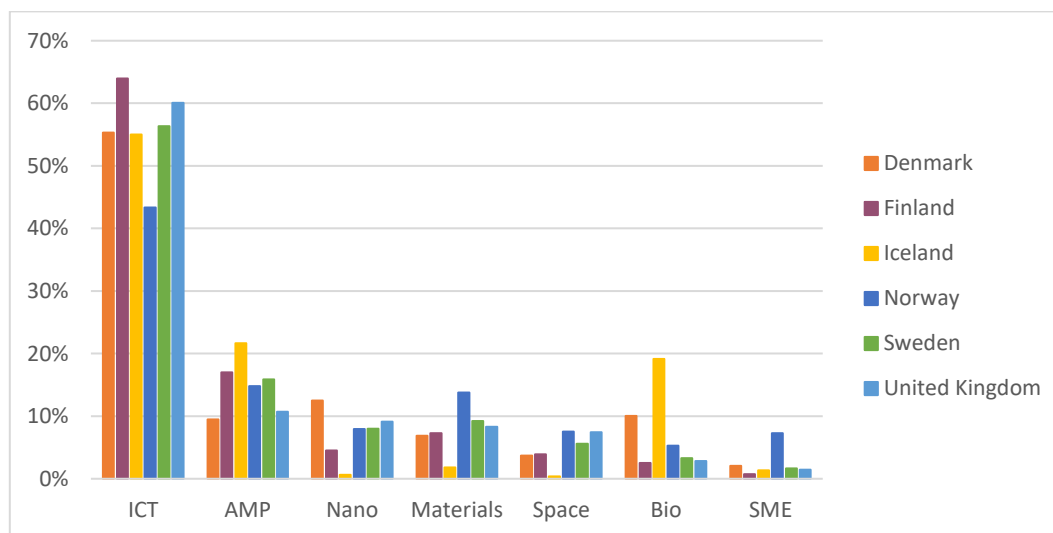


Figure 7-8. Participation in industrial leadership objectives, for further description see Explanation of figures and conclusions

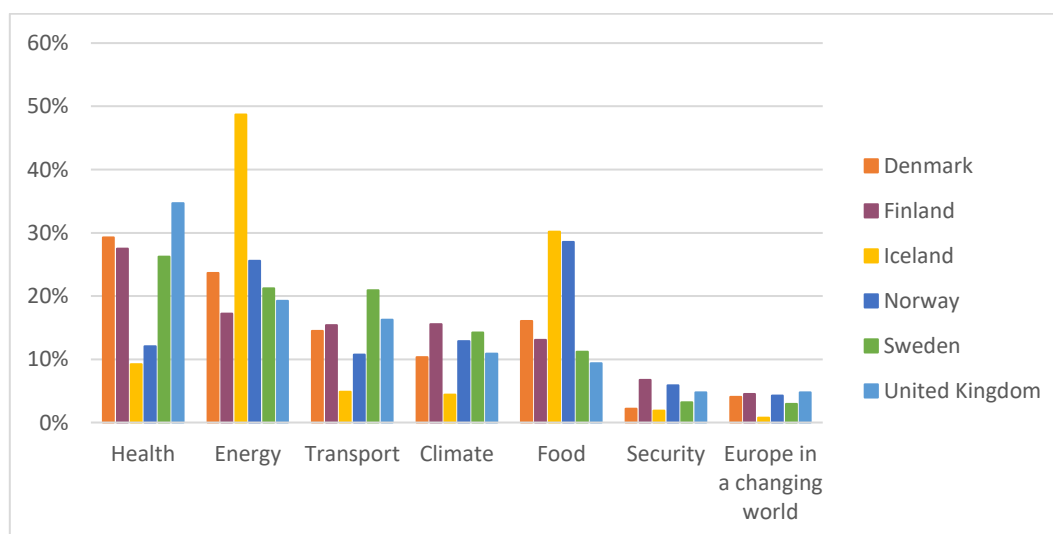


Figure 7-9. Participation in societal challenges objectives, for further description see Explanation of figures and conclusions