Blue Growth in EU sea basins: methodology for data gathering and processing for the North Sea and Atlantic Arc

Annex II Innovation indicators for sea basin report

Client: DG Maritime Affairs and Fisheries

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1. Introduction

Innovation is fundamental to the future development of any economy and thus receives a strong focus by policy makers, including the Europe 2020 strategy[1]. In September 2013 the European Commission published a new communication introducing new innovation indicators[2]. There is a broad agreement on the need of better innovation indicators especially when it comes to the output oriented side. The gap remains in capturing the dynamism of entrepreneurial activities in turning frontline research into applicable innovations. The need is for an indicator to compliment the current existing ones (such as IUS & SII) in order to complete the overall picture of all the steps in the *Innovation Cycle*.

The communication has raised several interesting indicators, of which elements have been considered and where possible incorporated in the development and use of innovation indicators for this study, despite significant data challenges to collect these data at the level of a maritime economic activity. Notwithstanding these difficulties they create a useful insight in the innovation performance of maritime economic activities.

Innovation as part of the innovation cycle

When we consider innovation we should refrain from considering it as a static snapshot or a singular linear process. In fact the "Innovation cycle" has four distinct steps: *Discovery, Invention, Pre-Commercial, Commercial use*. These stages often mix and interact and form the dynamic cycle needed to create a valuable innovation. During several points in the cycle there are checks to take stock of the process, discard not applicable discoveries or inventions (or add new ones) and allow for a horizontal/interdisciplinary view of the problematic and the possible solutions.

The Innovation cycle is also in line with the product life cycle[3] in that it represents the first three stages of *Pre-development, Development and Introduction*. Such division of the innovative process is important as different companies are at different stages in their product life cycle. It would therefore be misleading to categorise, according to the same indicators, a new start-up (or a new product) with a well established company (or a well known brand). The same applies to different economic activities. Since new sectors such as Blue Biotech are at the early stages of share development compared to a very well established and well resourced offshore oil & gas industry.

[1] http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/priorities/index_en.htm
[2] European Union, 2013: Measuring innovation output in Europe: towards a new indicator. COM(2013)624 final
[3] This scheme was used as underlying categorisation for the maritime economic activities in the initial Blue Growth study 2012: Blue Growth Final Report, 2012. Available here: https://webgate.ec.europa.eu/maritimeforum/content/2946

Figure 1 Innovation Cycle approach

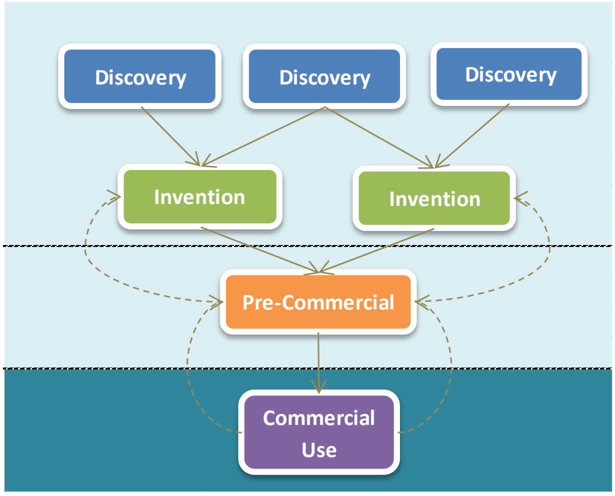
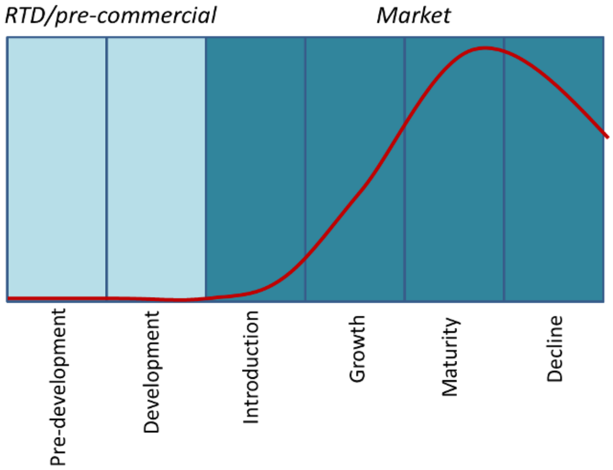


Figure 2 Product life cycle



1. **Discovery**
   This is the stage in which new ideas and concepts are created, written in academic papers and debated amongst the experts in the specific field. This stage is typically theoretical (based on experiments and models) and functions as the first point to idea creation.

2. **Invention**
   This stage takes in the ideas and concepts created in the previous stage and apply them to create operational and functioning new products or techniques/systems. The process is personified by hands on experimentation and construction of working prototypes, or testing of techniques/systems. This stage is rather horizontal and cross cutting as it seeks to combine the best fitting ideas and concepts from the previous stage to fit a specific function.

3. **Pre-commercial**
   This stage is the part where an invention needs to be tailored to fit the practical needs for commercial development and use. Financial analysis and strategy are important at this point as the aim is to select the invention that would best serve its function, yet be commercially viable.

4. **Commercial use**
   This stage is the final in the Innovation cycle as it tests if the new product/technique/system is successful or not. If it is not, careful evaluation should reveal where the problem occurred and allow for alterations to be done so that the next product will be a success. This stage is often rather harsh when the Innovation cycle is not concluded successfully; however, it is fundamental in revealing mistakes or gaps and producing a successful product/technique/system the next time.

2. Innovation indicators

The innovation indicators are inspired by the recent communication on innovation indicators which aim to capture the innovation level of a country[4]. After careful evaluation of the available data we have selected the following three indicators[5]:

1. **Publications**

   We have used data that was collected by Thomson Reuters (in 2011)[6] on the number of scientific publications released in respected journals and other publications in several Maritime Economic Activities (MEA) in the EU Member States (amongst which also the Atlantic Member States.

   The data on the quantity of publication was then divided by the GVA of the Economic activity in the Member state to adjust for the size of the country or the sector. Such analysis allowed for comparison of the performance in frontier research and creation of new ideas/concepts.

2. **Inventions (patents)**

   Similarly to the previous indicator we have also used the same data from Thomson Reuters (2011) that calculated the number of patent applications as well as accreditations per MEA.

   This data was also divided by the GVA of the MEA in the Member State to allow for better comparisons to be made. The analysis revealed how active the MEAs were in turning frontline research into inventions and innovative products/services/systems.

3. **R&D spending**

   R&D spending has been determined based on two different databases: Amadeus and OECD ANBERD.

   The Amadeus database contains micro financial information on companies around the EU. One of the indicators is R&D spending that the company makes per year. The information can be adjusted to cyclical and sectorial oscillations by converting it into a ratio of R&D spending as a share of the company's revenue. Such ratio showed the amount of R&D expenditure differences between MEAs, thus allowing a comparison to be made of the amount of innovation focus in each of the economic activities.

   The OECD's ANalytical Business Enterprise Research and Development (ANBERD) database presents annual data on R&D expenditures by industry and was developed to provide analysts with comprehensive data on industrial R&D expenditures that address the problems of international comparability and breaks in the time series of official business enterprise R&D data. The ANBERD database includes a number of estimations and is published under the responsibility of the Secretary General of the OECD as it does not represent Member countries' official submissions of business enterprise R&D data. The current version of the ANBERD database presents industrial R&D expenditure data broken down in up to 100 manufacturing and services sectors for OECD countries and selected non-member economies from 1987 onwards. Data are expressed as a percentage of GVA.

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[4] European Union, 2013: Measuring innovation output in Europe: towards a new indicator. COM(2013)624 final

[5] In addition we have approached Eurostat to use micro-data from the Community Innovation Survey (CIS). However Eurostat could not deliver these data in time for the current report.

[6] Analysis of patenting and publication output and key players, Blue Growth Study prepared by Thomson Reuters IP Consulting for IDEA Consult, 2011. In: Blue Growth Final Report, 2012. Annex 2. Available here: https://webgate.ec.europa.eu/maritimeforum/content/2946

Rationale for not considering certain indicators

Unfortunately some interesting indicators mentioned in the Communication: “Measuring innovation output in Europe: towards a new indicator” COM(2013)624 final, could not be included due to technical reasons. At this instance we mention a few examples to demonstrate that careful consideration has been taken in dismissing those potential indicators.

- Employment in knowledge-intensive activities (KIA)
  The KIAs are compiled together by bundling several Nace rev. 2 codes together into a basket that defines the knowledge intensive activities. It is therefore impossible to disaggregate in terms of specific Economic Activities that at times use very limited number of 4 digit Nace codes.

- Competitiveness of the knowledge-intensive sectors as a share of exports
  Relate to the relative importance of high-tech projects in total exports. Nevertheless we felt that it did not bring substantive value added in analysing technological innovation when applied at a MAE level (as the comparison basis disappears).

- Labour force survey & other indicators associated with the level of education
  The Labour force survey that would be the most appropriate source of such information differentiates only by 2 digit Nace codes, which is not sufficient for our analysis, since we need 4 digit codes. Upon conversations with Eurostat itself, we have been unable to jointly come up with an alternative indicator.

3. Methodology for establishing the innovation indicators

Such dynamic cycle is very difficult to capture with one single figure. More still a single figure would miss the key details and render such Innovation Indicator cumbersome at best. In our analysis we have therefore opted to analysing each of the indicators by their own merit, since they describe different parts of the Innovation Cycle.

Innovation indicator 1 and 2: Publications & Inventions

Since the collection of the data occurred simultaneously we will describe the approach to the two distinct indicators in one section.

The data was collected by Thomson Reuters (in 2011)[7] on:

- The number of scientific publications released in respected journals and other publications in selected MEAs in the Atlantic Member States.
- The number of patent applications and patent awards in selected MEAs per Member State

The MEAs identified were selected in the Blue Growth study[8] and reflect the available publication and patent data available.

The number of publication per MEA was subsequently divided by the GVA[9] of the MEA in the Member state to arrive at a relative measure of the level of publications and adjust for the size of the country or the sector. In cases where the sector is small a default figure of €1 million has been used.

Limitations

There are significant data gaps. Both in terms of the number of maritime economic activities covered as well as the completeness of the available data in the MEAs in all Member States.

Innovation indicator 3: R&D spending

Amadeus:

On the basis of financial data available in the Amadeus company database we have been able to collect data on the:

- Nominal R&D expenditure per company (within a given NACE rev 2 four digit code[10]);
- A ratio of R&D expenditure compared to the annual operating revenue (per company within a given NACE rev 2 four digit code);
- Profit margin (per company within a given NACE rev 2 four digit code).

Each of the indicators have been analysed for the period between the years 2008 – 2012.

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[7] Analysis of patenting and publication output and key players, Blue Growth Study prepared by Thomson Reuters IP Consulting for IDEA Consult, 2011. In: Blue Growth Final Report, 2012. Annex 2. Available here: https://webgate.ec.europa.eu/maritimeforum/content/2946

[8] https://webgate.ec.europa.eu/maritimeforum/content/2946

[9] We have chosen GVA as it is a better comparison to the level of innovation, since it does not take into account external (intermediate) expenditure (such as taxes). The data was taken from the country studies in this study.

[10] The companies have been sorted by their primary Nace code as well as their secondary Nace activity

The indicators are not only used the calculate the R&D expenditure as a percentage of annual operating revenue illustrating the R&D intensity in companies, but also to examine the relationship between R&D spending and the profitability in the economic activity.

According to the available information we have created the following MEA, that directly correspond to their 4-digit NACE rev. 2 codes.

MEA	NACE codes used
0.1 Shipbuilding and ship repair	**33.15** Repair and maintenance of ships and boats **30.11** Building of ships and floating structures **30.12** Building of pleasure and sporting boats
1.1 Deep – sea shipping and **1.2 Short-sea shipping**	**50.20** Sea and coastal freight water transport **77.34** Renting and leasing of water transport equipment **52.24** Cargo handling **52.10** Warehousing and storage **52.22** Service activities incidental to water transportation
2.1 Fish for human consumption **2.2 Fish for animal feeding**	**03.11** Marine fishing **03.12** Freshwater fishing **10.20** Processing and preserving of fish, crustaceans and molluscs **46.38** Wholesale of other food, including fish, crustaceans and molluscs **47.23** Retail sale of fish, crustaceans and molluscs in specialised stores
3.1 Oil and gas	**06.10** Extraction of crude petroleum **06.20** Extraction of natural gas **09.10** Support activities for petroleum and natural gas extraction
4.1 Coastal tourism	**55.10** Hotels and similar accommodation **55.20** Holiday and other short-stay accommodation **55.30** Camping grounds, recreational vehicle parks and trailer parks **55.90** Other accommodation

Source: Ecorys,2013

Limitations

The database functions on data received the Chamber of Commerce and other such voluntary organisations each of the Member States. Although the data is largely complete for the main indicators, more specific ones (such as R&D expenditure) are at times lacking. For our specific purposes, **the information was available only for companies based in the UK.**

Each company is asked to select a primary economic activity (4 digit NACE code) and a couple of secondary ones. However, there is no further indication just how much of the company and resources are allocated to each of those parts. This becomes particularly an issue in large companies and conglomerates, that are active in multiple disciplines and activities. As a result of the lack of disaggregated data we have taken the whole company that has been listed under the economic activity of our focus (both primary and secondary) and included their whole company indicators in our analysis.

Due to this selection we included both very large companies (even multi €billion) as well as micro enterprise. In order to prevent the dominance of large enterprise in the outcome of the analysis, we have taken the average of all the indicators and excluded the disproportionate effect of the top and lowest 5% of companies.

OECD-ANBERD

Calculations are performed on the R&D expenditure per industry sector divided by the value added in this sector (all-in current prices and national currencies). Both are found in the ANBERD database. R&D data are categorised by industry sector ISIC rev. 4 (data before 2008/2009 are estimates based on ISIC rev 3). For Spain, Portugal and UK value added figures by industry sector ISIC rev 3 are used. For France ISIC rev.4 is used.

The data for Spain in this table are distributed according to the main activity of the enterprise carrying out the R&D. The data for the United Kingdom, France and Portugal are distributed according to the product field of the R&D for large firms, while for small firms the R&D is allocated to their main activity.

The sector classifications available do not always create a perfect match with the (sub)sector that are included in the Blue Growth study as they often are at a higher level of aggregation (e.g. fisheries is combined with the much larger agriculture sector, and oil & gas is part of mining). As such figures should only be treated indicatively.

4. Results

4.1. Publications

The table below shows the results from our analysis of the number of publications per MEA for each of the Member States on the Atlantic Arc. We have grouped the MEAs according to their publication performance in groups (colour coded in the table).

<u>Tips to reading the table</u>

We present the nominal count of publications to give an idea of the absolute number of publications per MEA per country. This shows for example the high number of publication in the UK in comparison to other Member States in the sea-basin.

We also illustrate an adjusted ratio to a €1 million of GVA of that particular MEA in that particular country. This gives an indication on the importance of the sector compared to its size. In these case results should be treated as indications only.

The top sector (in green) is considered as the most active in terms of publications, while the middle (salmon) is a special case of very active, but also very large and therefore less innovative compared to its size. The last sector (blue) is considered less active and therefore less innovative compared to the other sectors

Ratio of number of publication to GVA (€ M)[11]

Maritime Economic Activities		Ireland		Portugal		Spain		France		UK		total
		number	ratio	number	ratio	number	ratio	number	ratio	number	ratio	number
2.4	Blue biotechnology			101	101.0	188	188.0	326	326.0	479	479.0	1094
3.3	Ocean renewable energy	28	56.0	76	76.0	101	101.0	148	148.0	351	351.0	704
3.6	Marine minerals mining			30	30.0	159	159.0	125	125.0	204	204.0	518
6.3	Environmental monitoring	26	26.0	78	78.0	255	10.5	720	720.0	853	853.0	1932
3.1	Offshore oil and gas			35	35.0	124	7.8	226	226.0	469	0.0	854
2.3	Marine aquaculture	42	1.1	117	18.6	220	1.7	198	0.8	308	2.3	858
3.2	Offshore wind			22	22.0	62	62.0	76	76.0	173	173.0	836
3.7	Desalination			3	3.0	19	19.0	23	23.0	29	29.0	74
5.1	Coastal protection			4	0.6	43	0.9	31	2.6	43	43.0	121
6.1/ 6.2	Maritime surveillance	2	2.0	11	11.0	11	11.0	23	23.0	15	15.0	62
	Total	98		477		1182		1896		2924		6577

Source: Ecorys,2013

Environmental monitoring is clearly the sector where most publications are issued. In total 1932 publications were produced in the 5 countries in 2011, with France and the UK accounting for some 80% of the total number of publications. In relative terms it also is the most publication intensive

[11] limitations: it has not been possible to analyse all MEAs due to lack of data; when data on the GVA per economic activity in the selected country was unavailable and assessed to be relatively small, we have assumed it to be equal to €1 million.

activity although this is also due to the fact that GVA figures are missing for most countries and the default value of € 1 million has been used.

Blue Biotech holds a second place showing that it is a young, but developing sector that is investing heavily into thought creation in order to make the first steps in building the industry.

The offshore oil & gas sector has the third most publications out of all of the MEAs considered. Having said that the UK accounts for over a half of that with 469 publications. At the same time its ratio is 0.0 illustrating that the size of the GVA is very large in the UK.

In marine aquaculture, we can also see differences between countries with Portugal publishing twice as many publication as similarly sized Ireland. This would suggest that there is a greater emphasis in Portugal on this particular economic activity, which is supported by the larger ratio (18.6 in Portugal compared to 4.8 in Ireland). From this we can conclude that Portugal is not only more innovative in the field, but also that the size of the GVA for that economic activity is equally much larger.

4.2. Invention

The table below shows the number of inventions (patents), defined as the amount of patent applications and granted patents, per MEA in each of the 5 Member States. Next to the absolute number of patents the ration of the number of patents per million € GVA are presented. Again we have grouped the MEAs according to their invention performance to illustrate that patent activity is more prevalent in certain MEAs compared to others.

Ratio of number of inventions to GVA (€ million)

Maritime economic activity		Ireland		Portugal		Spain		France		UK		total
		number	ratio	number	ratio	number	ratio	number	ratio	number	ratio	
2.4	Blue biotechnology					33	33.0	99	99.0	59	59.0	191
3.3	Ocean renewable energy			5	5.0	82	82.0	62	62.0	259	259.0	408
3.7	Desalination			3	3.0	106	106.0	105	105.0	85	85.0	299
6.3	Environmental monitoring	2	2.0			21	0.9	103	103.0	104	104.0	230
3.1	Offshore oil and gas	1	0.0			12	0.8	188	188.0	426	0.0	627
2.3	Marine aquaculture	5	0.1	5	0.8	54	0.4	60	0.2	105	0.8	229
3.2	Offshore wind	8	1.8	3	3.0	21	21.0	42	42.0	66	66.0	140
3.6	Marine minerals mining	1	1.0			32	32.0	83	83.0	64	64.0	180
5.1	Coastal protection	3	0.7	3	0.5	14	0.3	23	1.9	34	34.0	77
6.1/ 6.2	Maritime surveillance	2	2.0			31	31.0	58	58.0	51	51.0	142
	total	22		19		406		823		1253		2523

Source: Ecorys,2013

Analysing the innovation ratios in relation to the size of the MEA a diverse pattern emerges with differences among countries. For example invention activity in Ocean Renewables is particularly high in the UK having a share of over 50% of all patents in this field in the Atlantic sea-basin, reflecting the strong concentration of this activity in the UK.

On the other hand the level of patents in desalination is high in Spain and France, which together account for the vast majority of all inventions in the 5 countries in this area. In particular we can see that in Spain this sector is the largest in terms of the invention activity, which is not surprising given the serious societal and environmental challenges of lack of water in some parts of Spain. The fact that this MEA was not one of the more productive in terms of frontline research illustrates, that the sector is starting to move to the second stage in the innovation cycle in turning research into inventions.

What becomes particularly evident is that the most inventions come from the offshore oil and gas sector with 627 in 2011 alone. The UK leads this sector with 68% of all the inventions (426). Yet its ratio very close to zero since the GVA of the industry is enormous. This invention focus is due to UK's long experience with oil & gas in the North Sea (Aberdeen in the north of Scotland being dubbed as "the oil capital of EU"). Nevertheless, France is also rather active in the sector with 188 inventions, yet its ratio is very large suggesting that most of the inventions are destined for exportation rather than to be used in its mainland industry.

4.3. R&D spending (R&D intensity)

OECD-ANBERD

R&D expenditure as percentage of value added

	France		UK		Portugal	Spain	
	2007	2011	2007	2008	2008	2007	2009
Agriculture/fisheries/forestry	1,1%	1,3%	1,0%	0,8%	0,2%	0,4%	0,3%
Mining & quarrying	7,3%	10,3%	0,3%	n/a	n/a	5,3%	1,0%
Building of ships and boats	8,7%	16,4%	10,4%	n/a	2,7%	4,0%	n/a
Transportation & storage	0,0%	0,1%	0,0%	n/a	0,4%	0,2%	0,2%
Accommodation & food services	0,0%	0,0%	n/a	n/a	0,0%	0,0%	0,0%

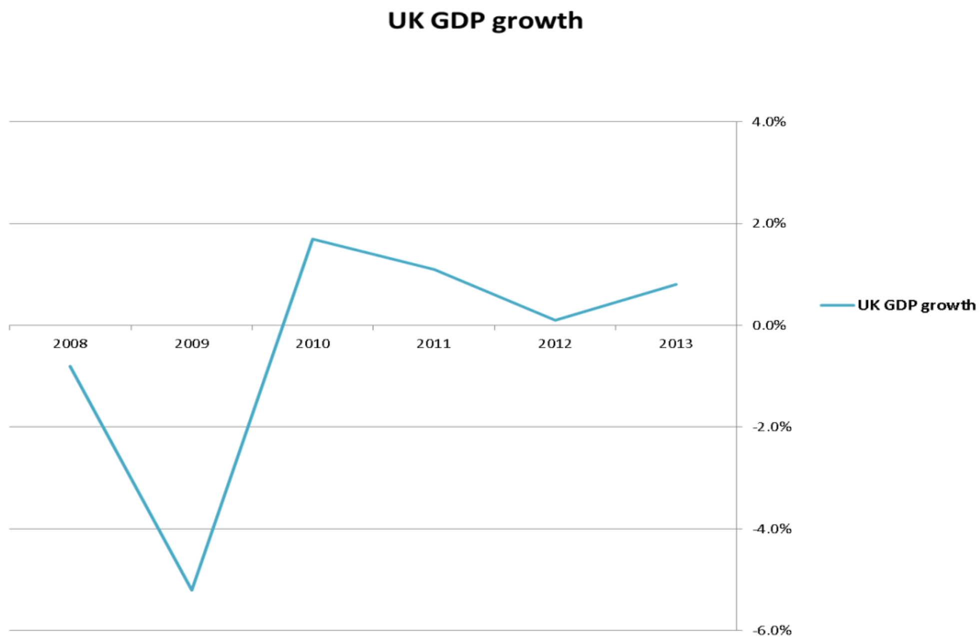
Source: OECD ANBERD database

Figures in the above table show a diverse picture. What becomes clear is that fisheries, shipping and coastal tourism (part of accommodation & food services) form part of a larger sector that has a relatively low R&D intensity. Mining & quarrying, which comprises both deep sea mining (although due to its size that will not show in the figures) and oil & gas, next to all other forms of mining, differs strongly per country. In France and Spain R&D intensity is relatively high, whereas in the UK R&D intensity as a ratio of GVA is very low. This confirms the AMADEUS analysis (see below), and is expected to be related to the relative large size of the sector (offshore oil and gas) in terms of value added. Finally shipbuilding is research intensive in most countries although at a significant higher level in the UK and France most likely due to the characteristics of shipbuilding in these countries (high value added commercial and naval ship versus more traditional shipbuilding activities in Portugal).

Amadeus

Based on Amadeus data a more elaborate analysis was carried out on R&D expenditure an its relation to other indicators in the UK. We analysed three indicators (nominal R&D spending growth, R&D/revenue ratio and profit margin) in order to determine the innovation activity in the private sector in the UK12 between 2008 and 2012.

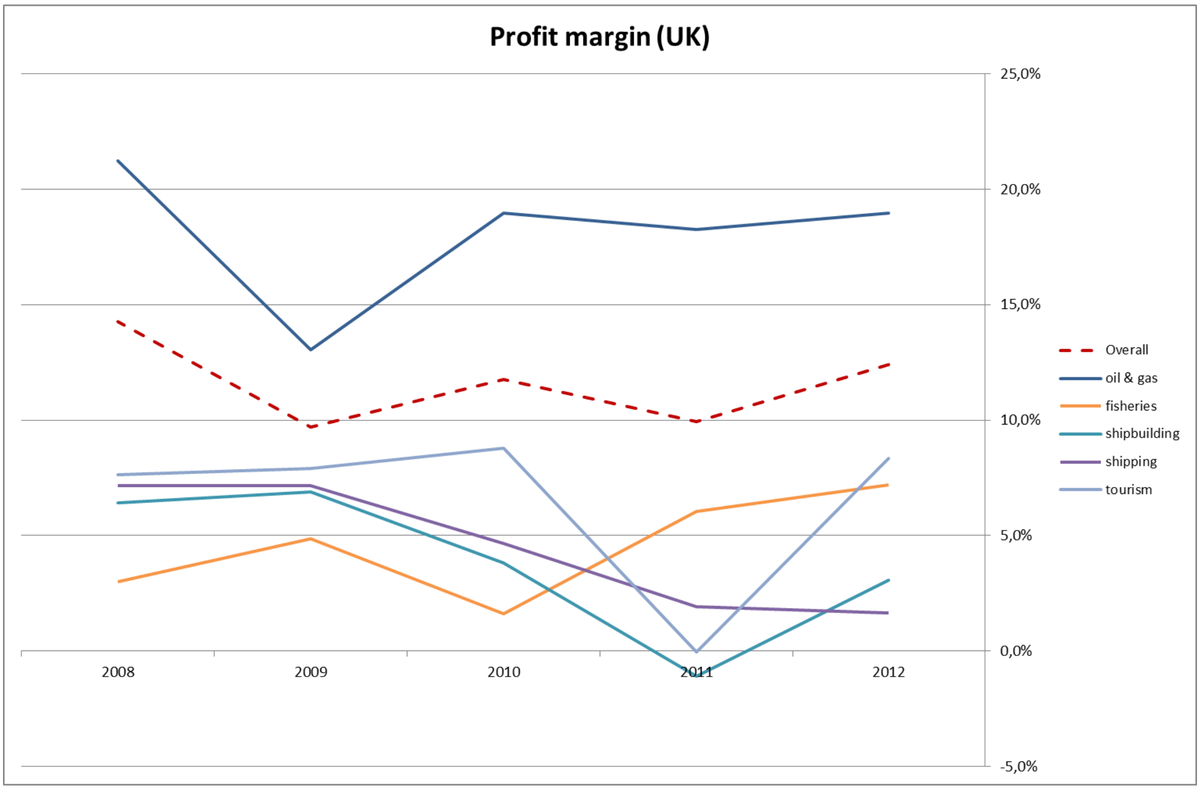
In this period the UK has gone through the worst recession since the 1930s with a tepid recovery. It just narrowly avoided a double dip recession in 2012, but has recently showed signs of a positive turn. Nevertheless the past five years have been very economically hard.



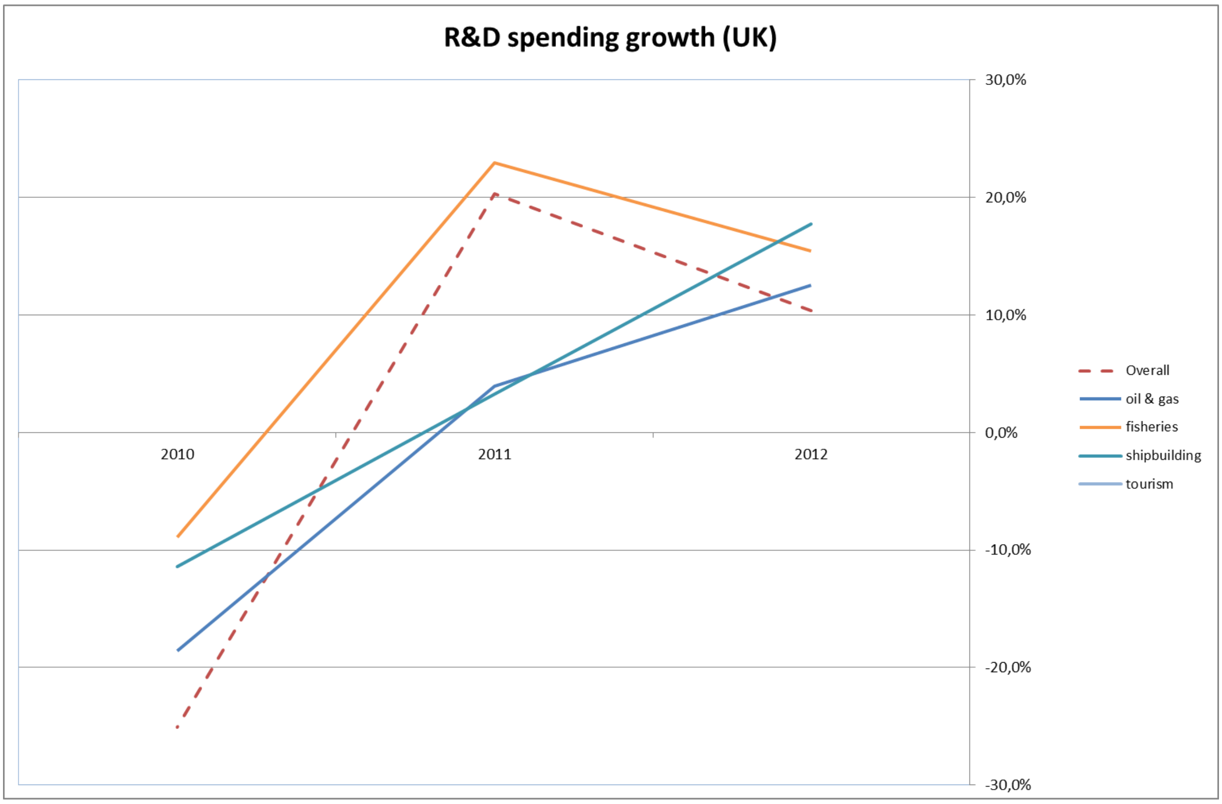
It appears that the profit margins have been affected to a different degree by the recession depending on the sectors. The most profitable of them was, and remains, the offshore oil and gas sector. This sector is closely tied to the economic cycles and saw a sharp fall in 2009 inline with the economy as a whole. However, since then the price of oil has rocketed to above $100 a barrel, thus regaining the profit margins for the sector. Last resource category catching fish is more prone to consumer spending.

On the other hand the non-resource based industries have had a delayed reaction in their profit margin to the economic hardship, for several reasons. One of them being that companies quickly cut costs with decreasing staff numbers in 2009, but have since had to undergo further restructuring (thus decreasing their profit margin) to regain competitiveness in a difficult market13.

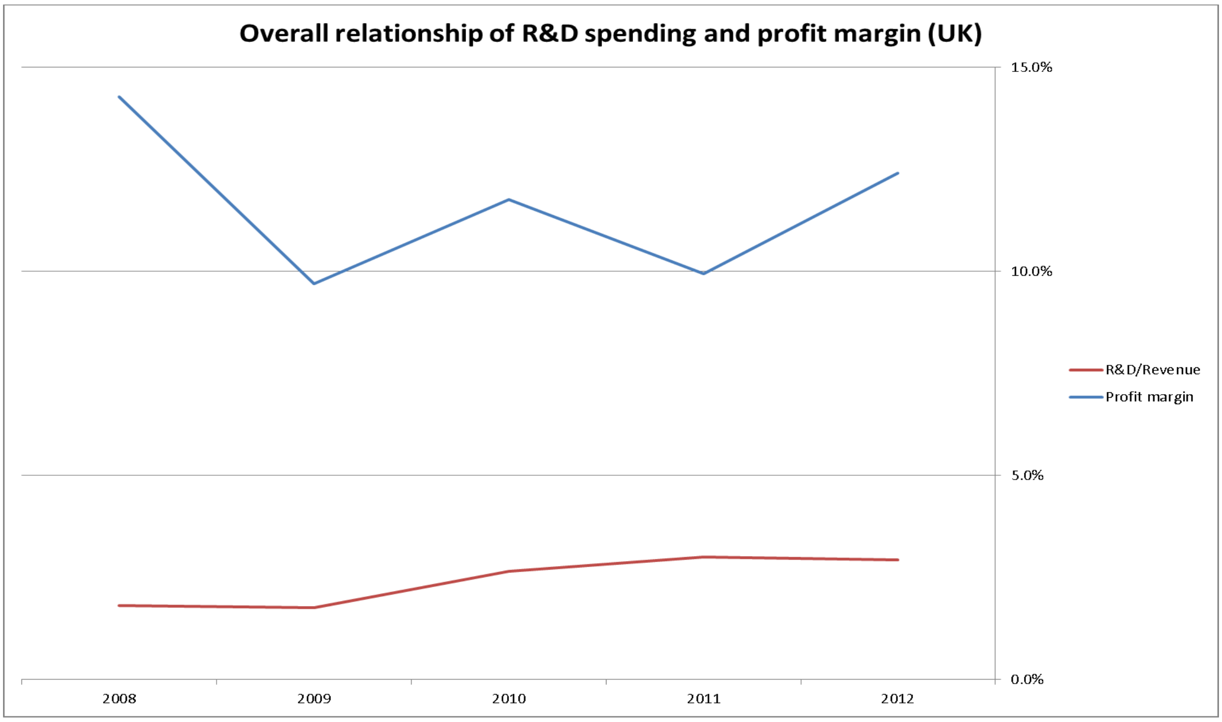
[12] See the limitations in the methodology section
[13] In our analysis we only can observe the companies that have survived the crisis



R&D spending appears to lag behind economic performance (although not by much). This is largely due to the fact that private companies make investment decision based on the performance of the company in the previous year. Therefore as the recession came to an end in 2010 many companies made the strategic decision to significantly increase their R&D spending for 2011. Such behaviour would suggest that private companies (that survive the crisis) understand the need to innovate in order to recover and capture or expand markets with better products and services, or decrease costs with innovative techniques and systems.



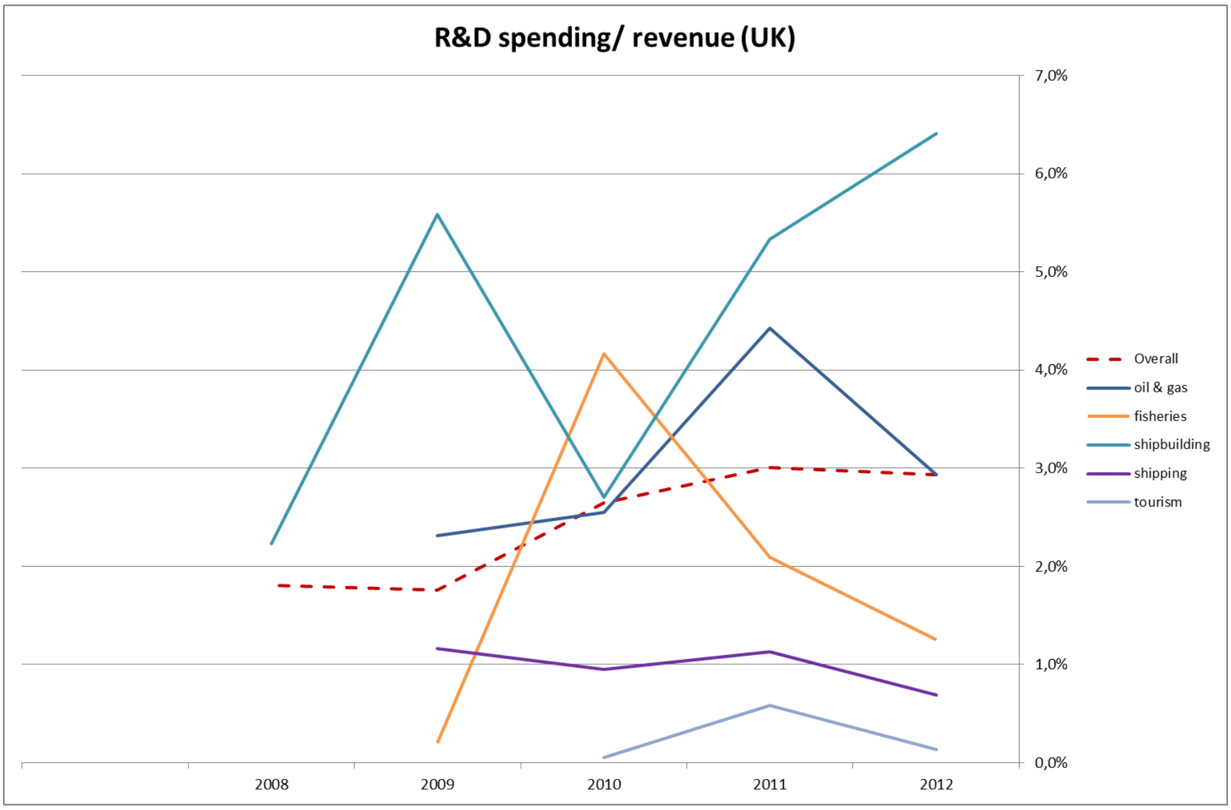
In order to adjust to this change in economic circumstances we calculated the R&D spending / revenue ratio. This shows that in relative terms[14] R&D spending has continued to grow slightly over the period from 1.8% in 2008 to 3.0% by 2012.



[14] Although there has been a nominal decline in R&D spending, this was caused by a decline in economic activity and thus was adjusted by an equally declining nominal revenue.

When we look at this ratio in greater detail, we can see significant differences between the different maritime economic activities in the UK.

Although in 2012 many sectors seem to be declining, this was largely because of nominal revenue growing faster than nominal R&D spending, which is a typical short term occurrence during an economic recovery and before adjustments can be made.



When we look at the individual economic activities in the UK we notice key specificities that demonstrate this further:

Shipbuilding is rather technologically dependant on innovation[15] and has experiences quite dramatic changes in its R&D spending and more importantly revenue. Since 2011 it saw a return towards a more sustainable 5% (and beyond) ratio of R&D spending. This illustrates that although the industry is relatively mature it puts a strong emphasis on innovation.

Shipping is a very low R&D intensive industry (despite increasing its R&D expenditure) and its profitability is rather determined by other indicators such as operational efficiency compared to competition and price of fuel. In this aspect we can observe that the post crisis world has been rather difficult for the Shipping industry.

Catching fish is another example of an industry with rather low innovation intensity. Despite a substantial increase in the ratio in 2010, this has been largely due to a large fall in revenue, since both nominal R&D expenditure as well as profit margin decreased significantly on the previous year.

[15] Since the low technologically demanding shipbuilding has been outsourced to cheaper countries and no longer occurs in the countries studied.

The offshore oil & gas industry is a mature industry, but is atypical since it remains extremely profitable (largely due to rising oil prices and demand for both oil & gas). Nevertheless it is very important for the companies in the sector to maintain their competitive advantage and keep costs down in light of increasing complexity in extraction. The industry is defined by the price of oil and has therefore maintained a stable ratio of around 3% R&D spending.

Mining is still a very young sector (in terms of its maritime activity) and in this analysis is predominantly represented by its onshore activities. Nevertheless it demonstrates the development of the sector that is rapidly increasing its R&D expenditure also as a result of diversifying into deep-sea mining.

5. Conclusions

The below table summarizes the overall picture that arises on the innovation level of a maritime economic activity combining the available information that has been obtained when analysing the indicators. There also appears to be an inverse relationship between maturity of the MEA and the level of innovation, which is in line with the product life cycle as well as the innovation cycle. However exceptions to this general rule exists in particular in capital intensive industries such as the offshore oil & gas and shipbuilding, for which innovation is required due to their specific characteristics or position on the global market.

Maritime economic activity	Innovation intensity	Maturity of the MEA
Offshore oil & gas	●●●	●●●●●
Blue Biotech	●●●●●	●
Dee Sea Mining	●●●●	●
Ocean Renewable Energy	●●●●●	●
Fishing for human consumption	●●	●●●●
Desalination	●●●●	●●●
Shipbuilding	●●●●	●●●●
Marine Aquaculture	●●●●	●●●
Shipping	●	●●●●●
Environmental monitoring	●●●●●	●●
Tourism	●	●●●●●
Coastal protection	●	●●●●
Maritime surveillance	●	●●●●
Offshore wind	●●●	●●