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## Cooperating on the generation of new knowledge

*Descriptive statistics on the collaboration between Aalborg University and the business community*

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# Cooperating on the generation of new knowledge: Descriptive statistics on the collaboration between Aalborg University and the business community

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## Authors

Christian Nielsen and Martin Juul Bentsen<sup>1</sup>

## Abstract

This paper reports the descriptive statistics of Aalborg University's database of university-industry collaborations where funding is involved from 2008 to 2011. In the past years there has been an increased focus on the role of universities in the regional economic development by making universities focus more on the so-called third mission activities. The purpose of this paper is to describe point of departure and the development in the collaborations between researchers from Aalborg University and local industry partners. The paper is only concerned with collaborations based on contractual agreements with companies in the Northern Jutland region of Denmark. The paper illustrates a series of potential benefits, barriers and lastly also speculates on how the registration of student-company collaboration could be achieved successfully.

## Key words

University-industry collaboration, Northern Denmark, descriptive statistics

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## Table of Content

|   |    |
|---|----|
| 1. Introduction .....   | 5  |
| 2. Methodology and data.....  | 5  |
| 2.1 The classification of agreement-types .....   | 5  |
| 2.2 Specific notes about the role of foundations .....  | 6  |
| 3. Analysis of the number of agreements and types of agreement.....                                     | 6  |
| 3.1 Numbers without funding from foundations/associations.....  | 9  |
| 4. Analysis of the size of funding in monetary terms .....  | 10 |
| 5. Analysis of the average size of contract agreements .....  | 13 |
| 6. Agreements dispersed by size of the collaboration .....  | 15 |
| 7. Descriptive statistics concerning the different types of contracts.....                              | 16 |
| 8. Analysis of the size of companies that enter into funded collaboration with Aalborg University ..... | 20 |
| 8.1 The allocation of foundations/associations .....  | 22 |
| 8.2 Looking at the development without foundations and associations .....                               | 22 |
| 9. Analyzing the types of companies that enter into agreements .....                                    | 24 |
| 9.1 Statistics on the funding size correlated with company size.....                                    | 25 |
| 9.2 Development in the average grant size dispersed across company size .....                           | 28 |
| 10. Descriptive statistics across industry groups .....   | 29 |
| 10.1 Size of agreements .....   | 31 |
| 11. Distribution of funding across faculties.....   | 32 |
| 12. Zip code analysis .....   | 34 |
| 12.1 Heat map of collaboration according to zip-code .....  | 38 |
| 13. Concluding remarks.....   | 38 |
| 13.1 Concerning students .....  | 39 |
| 14. References.....   | 40 |

## List of figures

- Table 1: Number of agreements per type of agreement
- Table 2: Number of agreements per type of agreement
- Table 3: The distribution of the number of agreements per type of agreement
- Table 4: Index of number of agreements per type of agreement
- Table 5: The development in number of agreements per type of agreement
- Table 6: Percentage of agreements per type of agreement
- Table 7: Number of agreements per type of agreement without foundations/associations
- Table 8: The distribution of the number of agreements per type of agreement without foundations/associations
- Table 9: Number of agreements per type of agreement without foundations/associations
- Table 10: Size of agreements per type of agreement
- Table 11: Size of agreements per type of agreement
- Table 12: Percentage of size of agreements per type of agreement
- Table 13: Size of agreements per type of agreement without foundations/associations
- Table 14: Size of agreements per type of agreement without foundations/associations
- Table 15: Percentage of size of agreements per type of agreement without foundations/associations
- Table 16: Average size of agreements per type of agreement
- Table 17: The development in average size of agreements per type of agreement
- Table 18: Average size of agreements per type of agreement without foundations/associations
- Table 19: The development in average size of agreements per type of agreement without foundations/associations
- Table 20: The distribution of the sizes of funding
- Table 21: The development in the number of joint research contracts
- Table 22: The development in the number of CR contracts
- Table 23: The development in the number of Ph.D.'s
- Table 24: The development in the number of D.pr. contracts
- Table 24: The development in the number of D.fa. contracts
- Table 25: The development in the number of network
- Table 26: The development in the number of Co-financing of equipment contracts
- Table 27: The development in the number of other agreements
- Table 28: The number of companies that have signed agreements with Aalborg University according to their size
- Table 29: The number of companies that have signed agreements with Aalborg University according to their size
- Table 30: Percentage of companies that have signed agreements with Aalborg University according to their size
- Table 31: Percentage of companies that have signed agreements with Aalborg University according to their size
- Table 32: The allocation of companies based on company size
- Table 33: The number of companies without foundations/associations based on company size
- Table 34: The number of companies without foundations/associations based on company size

Table 35: The distribution of companies without foundations/associations based on company size  
 Table 36: The development in companies without foundations/associations based on company size  
 Table 37: The different types of companies signing contracts with Aalborg University  
 Table 38: The development in different types of companies signing contracts with Aalborg University  
 Table 39: The distribution of the different types of companies signing contracts with Aalborg University  
 Table 40: The distribution of the different types of companies signing contracts with Aalborg University  
 Table 41: The development in funding size based on company size  
 Table 42: The development in funding size based on company size  
 Table 43: The average of funding based on company size  
 Table 44: The size of foundation/associations based on company size  
 Table 45: The development in funding size without foundations/associations based on company size  
 Table 46: The development in funding size without foundations/associations based on company size  
 Table 47: The average of funding without foundations/associations based on company size  
 Table 48: The development in funding based on company size without foundations/associations  
 Table 49: The average grant size based on company size  
 Table 50: The average grant size based on company size  
 Table 51: Number of agreements based on industries  
 Table 52: Distribution of agreements based on industries  
 Table 53: Size of agreement based on industry  
 Table 54: Distribution of size of agreement based on industry  
 Table 55: Distribution of number of funding agreements across faculties  
 Table 56: Distribution of number of funding agreements based on faculties  
 Table 57: Size of funding based on faculties  
 Table 58: Distribution of the size of funding agreements based on faculty  
 Table 59: Number of agreement based on zip code  
 Table 60: The distribution of the number of agreements based on zip code  
 Table 61: Number of foundations based on zip code  
 Table 62: The distribution of the number of agreements without foundations based on zip code  
 Table 63: Heat map of collaboration based on zip code

## 1. Introduction

This paper takes a snapshot of the contractual agreements that were entered into between Aalborg University and the business community in Northern Jutland, Denmark, during the period 2008 to 2011. We use Aalborg University's database on contractual agreements as a proxy for developments in the overall collaboration between Aalborg University and the business community and ask what future activities should be aimed at for the sake of achieving true symbiosis with the surrounding community. The database is a proxy because it does not capture collaborations without funding involved or where funding somehow is channeled around the official channels. We therefore risk missing out on a number of collaborative agreements that are based on long-term ties and strong networks, and furthermore, also all the collaboration that was channeled through the students affiliated with the university.

We are interested in mapping the contractual database for several reasons:

1. We wish to see the status and trends in the collaborative activities
2. We wish to establish whether the database as it is structured today could be improved for the sake of creating management reports on the data
3. We wish to estimate the cost-benefit of upholding such a database
4. We wish to speculate on the costs and benefits of creating a database of student reports on projects done in collaboration with the business community

## 2. Methodology and data

The current paper is based on the collaborations registered by the Contract Unit at Aalborg University. The collaborations were found in a review of the Contract Unit database of collaborations from 2008-2011. Consequently, the numbers in the report do not necessarily cover the total level of cooperation in the region since collaboration between researchers and companies as well as students and companies can take place outside of the Contract Unit from which this data is derived. This is especially the case when there are collaborations where funding is not involved.

It is also worth noticing that the applied database is not meant to give an overview of the total amount of collaborations but as an overview of the contractual arrangements entered which certainly had an impact on the way the registrations were conducted.

### 2.1 The classification of agreement-types

In the database there are a number of different types of agreements. Their classifications are briefly described below:

**Joint research projects (JR)** – Cover collaborative research projects

**Consulting relationships (CR)** – University researchers are paid to conduct activities with no research purposes

**Business Ph.d. (Ph.d.)** – An arrangement where Ph.d. students work half of the time in a company and half of their time at the university

**Donations for projects (D.pr.)** – Donations granted for specific research projects

**Donations for research facilities (D.fa.)** – Donations granted for research facilities, including research personnel

**Network activities (Network)** – Contractual agreement concerning network activities

**Co-financing of research facilities (CO)** – Companies help to finance e.g. laboratories against gaining access to these

**Other agreements (Other)** – Non-Disclosure Agreements (NDA), repayment schemes

## 2.2 Specific notes about the role of foundations

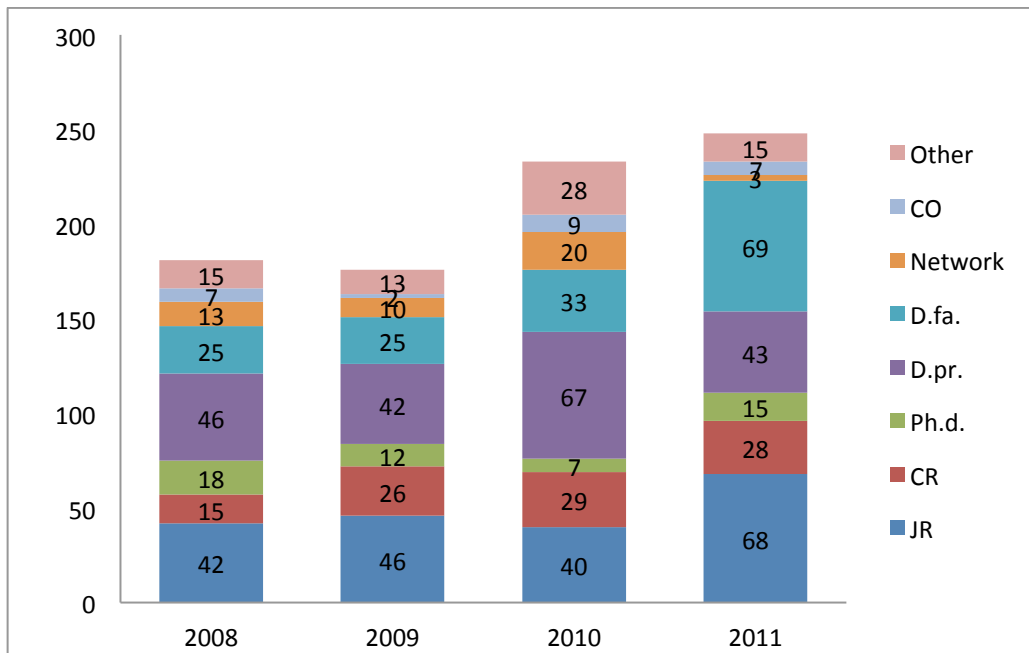
When reviewing the data it becomes clear that foundations and associations play a significant role in the number and average size of the agreements signed with the university and external parties. It is assumed that in general these actors not necessarily fulfill the ambition of the third mission as they rather represent charitable purpose in relation to the university. That means that they do not have a financial interest in the contractual process and consequently, this type of arrangement is not necessarily linked to socio-economic growth. Therefore, it is considered to be relevant to examine the numbers both with and without funds, which will be applicable for the rest of the report.

## 3. Analysis of the number of agreements and types of agreement

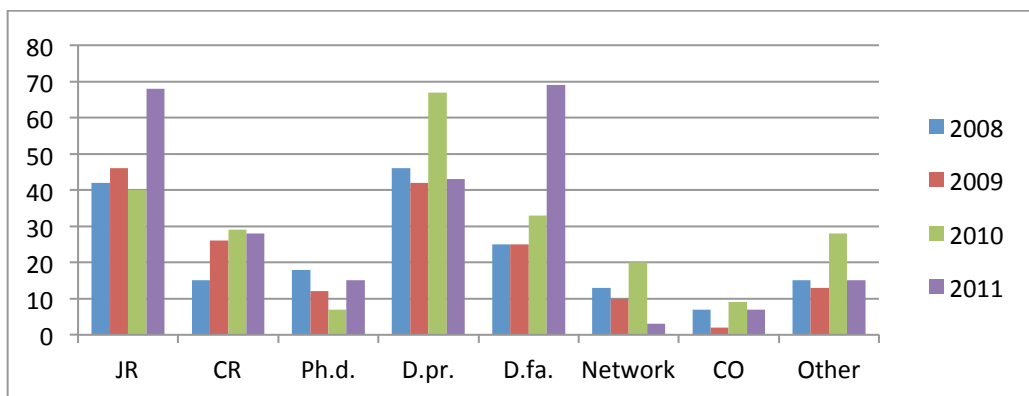
|              | JR  | CR | Ph.d. | D.pr. | D.fa. | Network | CO | Other | Total |
|--------------|-----|----|-------|-------|-------|---------|----|-------|-------|
| <b>2008</b>  | 42  | 15 | 18    | 46    | 25    | 13      | 7  | 15    | 181   |
| <b>2009</b>  | 46  | 26 | 12    | 42    | 25    | 10      | 2  | 13    | 176   |
| <b>2010</b>  | 40  | 29 | 7     | 67    | 33    | 20      | 9  | 28    | 233   |
| <b>2011</b>  | 68  | 28 | 15    | 43    | 69    | 3       | 7  | 15    | 248   |
| <b>Total</b> | 196 | 98 | 52    | 198   | 152   | 46      | 25 | 71    | 838   |

*Table 1: Number of agreements per type of agreement*

The above table shows that the number of collaborations in the period from 2008-2011 has increased by 67 contracts equivalent to 37.0 %. This reflects that there is a decrease of 5 agreements corresponding to - 2.76% from 2008 to 2009, while from 2009 to 2010 there is an increase of 57 agreements corresponding to 32.39%. Similarly, there is an increase from 2010 to 2011 of 15 agreements corresponding to 6.44 %. Furthermore, the table shows the types of agreements signed in the different years. Especially joint research projects. The development of this distribution is illustrated in the graph below:



**Table 2: Number of agreements per type of agreement**



**Table 3: The distribution of the number of agreements per type of agreement**

- The table shows that the number of joint research agreements (JR) is relatively stable from 2008 to 2010. From 2010 to 2011 the number of joint research agreements increases by 70%.
- There has been an increase in agreements on revenue generating activities (CR) of 86.67 % over the entire period. The increase is 73.33% from 2008 to 2009, while it is 11.54% from 2009 to 2010 and a minor decrease of 3.45% from 2010 to 2011.
- Conversely, there has been a decline in contracts for Ph.D. thesis at 16.67% for the whole period. From 2008 to 2010 the number of Ph.D. thesis contracts drops by 61.11%. However the Ph.D. contracts increase again from 2010 to 2011 by 114.29%. The total reduction is again seen against the increase in the total number of contracts.

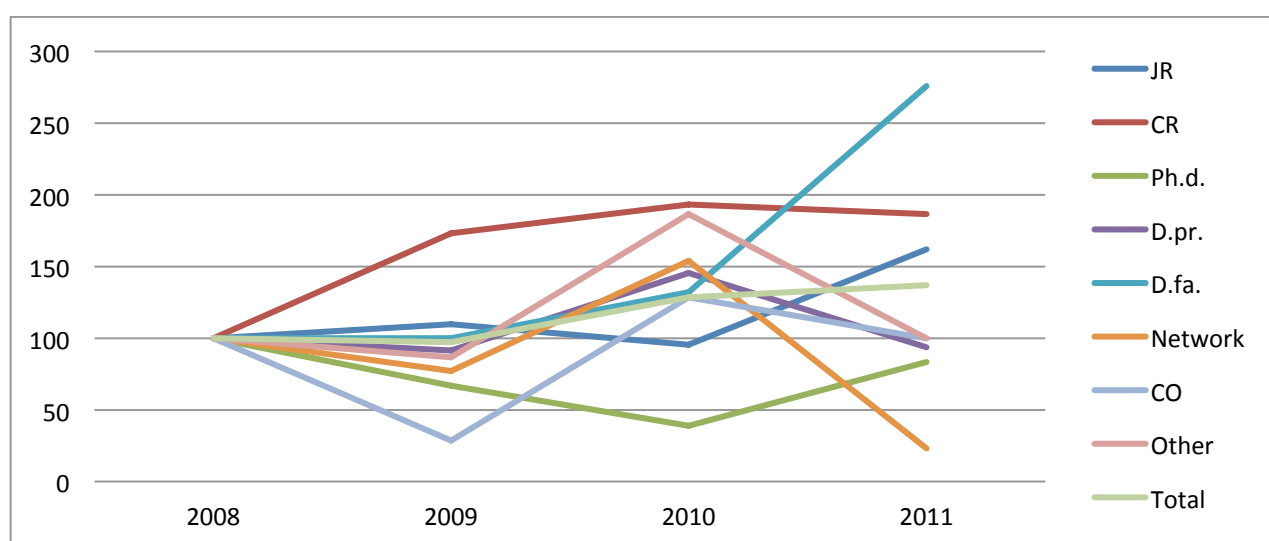


- The number of grants for both projects and equipment has increased over the period particularly in 2010. The number of grants for projects has decreased by -6.52% over the period, while the number of grants for equipment has increased by 24.24% over the period.
- The number of agreements relating to the creation of networks between universities and companies has been reduced by 76.92 % during the period. From 2009 to 2010 the network agreements increase by 100 %. From 2010 to 2011 the network agreements decrease by 85 %.
- Agreements related to co-financing of equipment remain unchanged over the period. Similarly, the number of other agreements remains unchanged over the period, however experiencing an increase of 115.38% from 2009 to 2010 but a decrease of 46.43 % from 2010 to 2011.

Converted to index numbers with 2008 being the base year, the development is as following:

|             | JR  | CR  | Ph.d. | D.pr. | D.fa. | Network | CO  | Other | Total |
|-------------|-----|-----|-------|-------|-------|---------|-----|-------|-------|
| <b>2008</b> | 100 | 100 | 100   | 100   | 100   | 100     | 100 | 100   | 100   |
| <b>2009</b> | 110 | 173 | 67    | 91    | 100   | 77      | 29  | 87    | 97    |
| <b>2010</b> | 95  | 193 | 39    | 146   | 132   | 154     | 129 | 187   | 129   |
| <b>2011</b> | 162 | 187 | 83    | 93    | 276   | 23      | 100 | 100   | 137   |

*Table 4: Index of number of agreements per type of agreement*



*Table 5: The development in number of agreements per type of agreement*

The above development has created a number of changes in the composition of agreements. In 2011 grants for research facilities (D.fa.) represent a greater proportion of the total number of agreements. The same applies to agreements dealing with "JR" and "CR". However, "D.pr.", "PhD" and "network" represent a smaller proportion of the total number of agreements. In this context it is interesting to notice that the increase in the number of agreements represents 29 units, corresponding to 55.8% of the increase in agreements can be attributed appropriations.

| %           | JR    | CR    | Ph.d. | D.pr. | D.fa. | Network | CO   | Other | Total |
|-------------|-------|-------|-------|-------|-------|---------|------|-------|-------|
| <b>2008</b> | 23,20 | 8,29  | 9,94  | 25,41 | 13,81 | 7,18    | 3,87 | 8,29  | 100   |
| <b>2009</b> | 26,14 | 14,77 | 6,82  | 23,86 | 14,20 | 5,68    | 1,14 | 7,39  | 100   |
| <b>2010</b> | 17,17 | 12,45 | 3,00  | 28,76 | 14,16 | 8,58    | 3,86 | 12,02 | 100   |
| <b>2011</b> | 27,42 | 11,29 | 6,05  | 17,34 | 27,82 | 1,21    | 2,82 | 6,05  | 100   |
| <b>Avg.</b> | 23,39 | 11,69 | 6,21  | 23,63 | 18,14 | 5,49    | 2,98 | 8,47  | 100   |

Table 6: Percentage of agreements per type of agreement

### 3.1 Numbers without funding from foundations/associations

|              | JR  | CR | Ph.d. | D.pr. | D.fa. | Network | CO | Other | Total |
|--------------|-----|----|-------|-------|-------|---------|----|-------|-------|
| <b>2008</b>  | 41  | 15 | 18    | 17    | 4     | 13      | 7  | 15    | 130   |
| <b>2009</b>  | 46  | 26 | 12    | 12    | 2     | 10      | 2  | 13    | 123   |
| <b>2010</b>  | 40  | 28 | 7     | 33    | 1     | 20      | 9  | 26    | 164   |
| <b>2011</b>  | 65  | 26 | 15    | 23    | 8     | 2       | 5  | 14    | 158   |
| <b>Total</b> | 192 | 95 | 52    | 85    | 15    | 45      | 23 | 68    | 575   |

Table 7: Number of agreements per type of agreement without foundations/associations

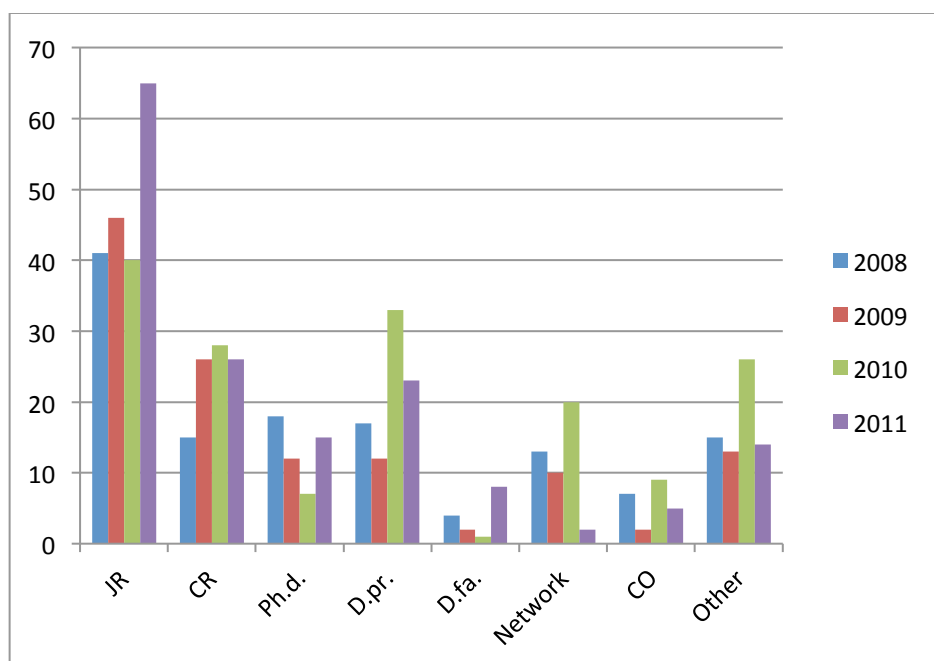
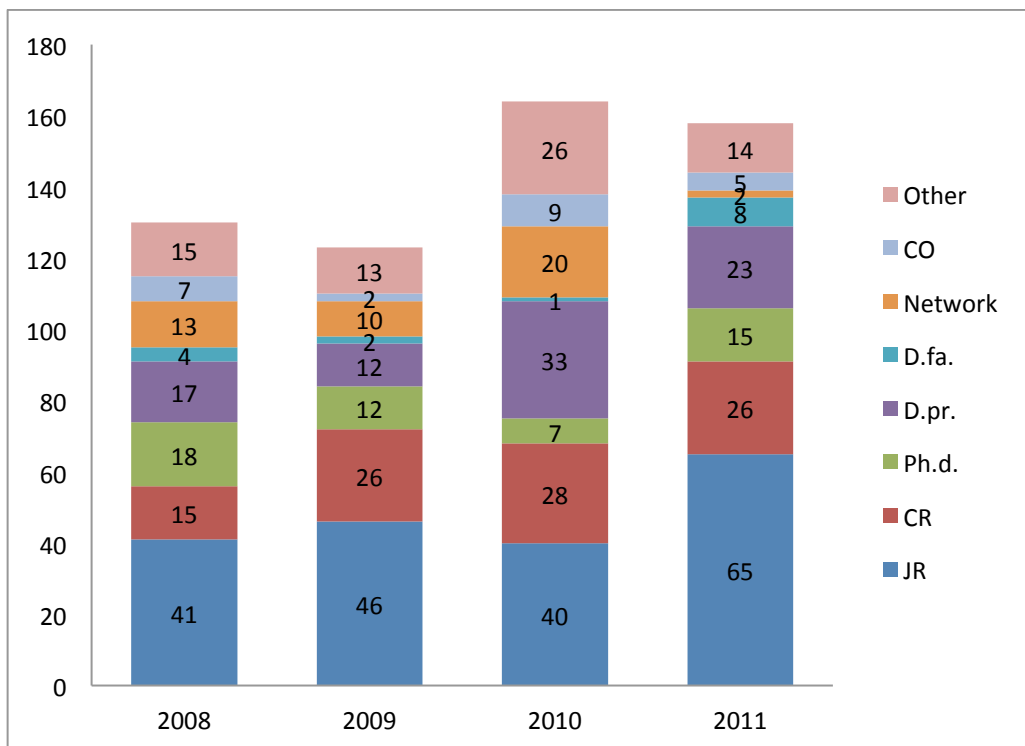


Table 8: The distribution of the number of agreements per type of agreement without foundations/associations



*Table 9: Number of agreements per type of agreement without foundations/associations*

From the above tables it is clear that foundations/associations account for a significant part of the funding, particularly funding for equipment to be used in research purposes. However, it is interesting to notice that the increase in funding for projects cannot be attributed to increased activity from foundations and associations. Overall, it is worth noticing that there is progress both in terms of the number of foundation and association agreements, and the number of agreements with companies. In particular, the number of agreements on joint research, revenue generating activities, donations for projects that account for the increase, while the number of PhD, network and co-financing agreements are decreasing.

#### 4. Analysis of the size of funding in monetary terms

The preparation of the financing is divided into a number of sections. The first section deals with the total amounts of the various types of contracts with the university. Then, the development in the total amounts is explained by presenting the size of the average agreement. Finally, the development of the individual types of agreements and their impact on the total will be commented based on the statistics.

## Total amounts in DKK

|              | JR                | CR               | Ph.d.             | D.pr.             | D.fa.             | Network          | CO               | Other            | Total              |
|--------------|-------------------|------------------|-------------------|-------------------|-------------------|------------------|------------------|------------------|--------------------|
| <b>2008</b>  | 28.428.705        | 909.498          | 11.154.883        | 10.014.390        | 4.319.987         | 407.000          | 2.001.154        | 1.275.000        | 58.510.617         |
| <b>2009</b>  | 18.935.839        | 1.586.323        | 4.151.650         | 19.036.952        | 5.505.387         | 1.562.500        | 2.491.964        | 175.000          | 53.445.615         |
| <b>2010</b>  | 37.421.559        | 2.578.816        | 2.760.379         | 17.982.452        | 38.084.345        | 1.657.910        | 443.168          | 557.632          | 101.486.260        |
| <b>2011</b>  | 13.747.398        | 916.917          | 8.827.949         | 25.894.847        | 30.658.045        | 25.000           | 2.557.554        | 1.600.000        | 84.227.710         |
| <b>Total</b> | <b>98.533.501</b> | <b>5.991.554</b> | <b>26.894.861</b> | <b>72.928.641</b> | <b>78.567.763</b> | <b>3.652.410</b> | <b>7.493.840</b> | <b>3.607.632</b> | <b>297.670.207</b> |

Table 10: Size of agreements per type of agreement

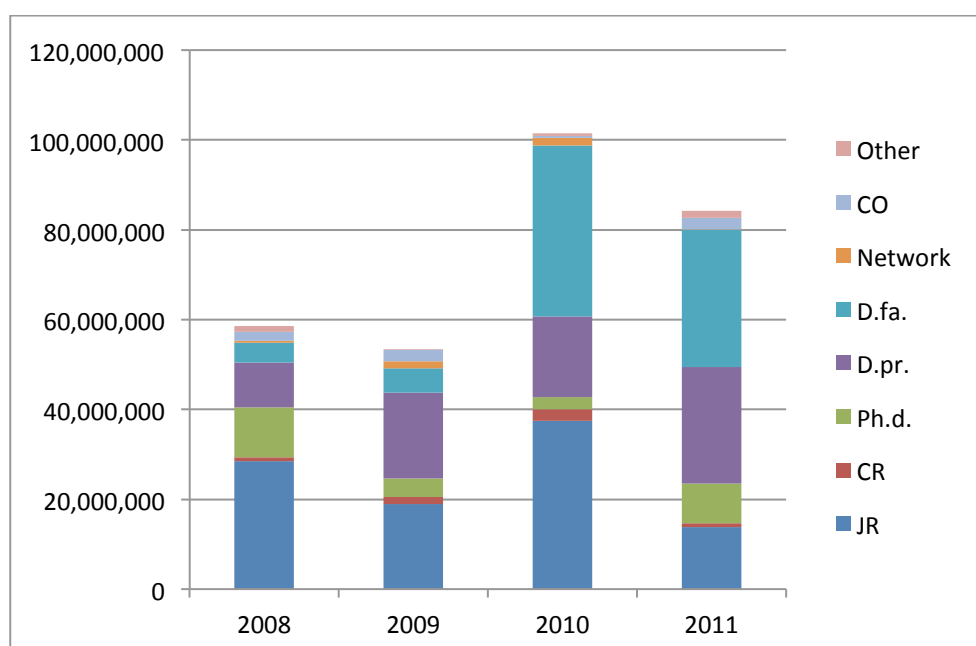


Table 11: Size of agreements per type of agreement

From the table above it can be seen that the total amount accrued to AAU has increased significantly in the period from 58.5 million in 2008 to 84.2 million in 2011, representing an increase of 43.9 %. The positive trend in the total amount of agreements has thus exceeded the positive trend in the number of agreements, which is also illustrated by the increasing average amount per agreement.

Looking at the distribution of the amounts distributed on contract types, it is seen that appropriations represent an increasing portion of the total amount. Accordingly, they only represent 24.7 % of the total amount in 2008, while they represent 67.14 % of the total in 2011.

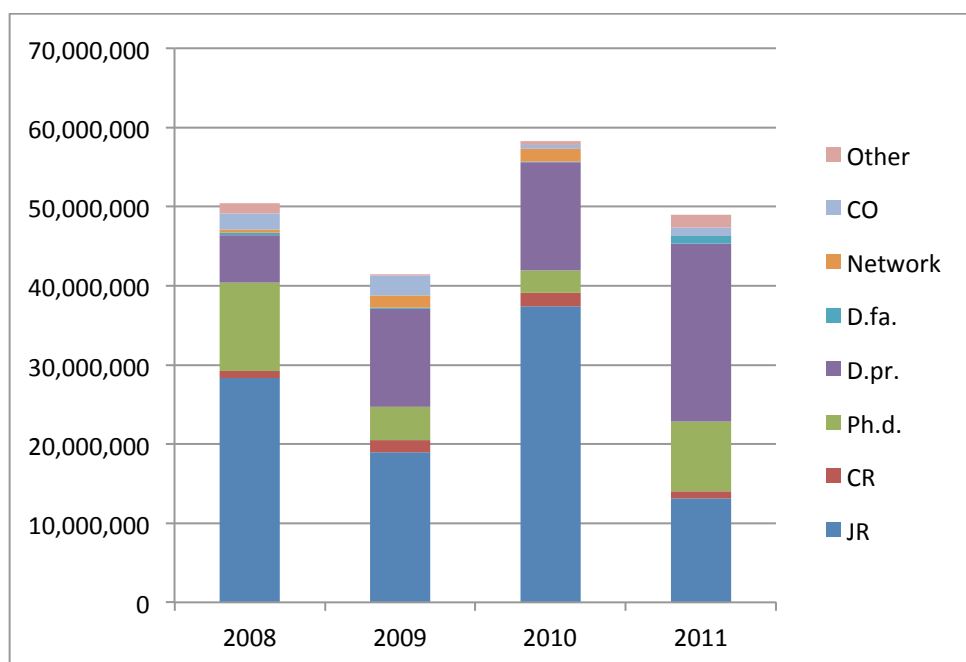
|             | JR  | CR | Ph.d. | D.pr. | D.fa. | Network | CO | Other | Total |
|-------------|-----|----|-------|-------|-------|---------|----|-------|-------|
| <b>2008</b> | 49% | 2% | 19%   | 17%   | 7%    | 1%      | 3% | 2%    | 100%  |
| <b>2009</b> | 35% | 3% | 8%    | 36%   | 10%   | 3%      | 5% | 0%    | 100%  |
| <b>2010</b> | 37% | 3% | 3%    | 18%   | 38%   | 2%      | 0% | 1%    | 100%  |
| <b>2011</b> | 16% | 1% | 10%   | 31%   | 36%   | 0%      | 3% | 2%    | 100%  |
| <b>Avg.</b> | 33% | 2% | 9%    | 24%   | 26%   | 1%      | 3% | 1%    | 100%  |

*Table 12: Percentage of size of agreements per type of agreement*

Additionally, the figure shows that the numbers behind this positive development are highly affected by the fact that the study's largest agreement in terms of monetary amount is in 2010. It concerns a grant of 33 million DKK to "star professorships" from "The Obel Family Foundation" (under B. Equipment). As mentioned in the beginning of the report, it is generally interesting to deduct amounts from foundations etc. as these usually represent charitable purpose. If all fund agreements are removed, the figure is as follows:

|              | JR         | CR        | Ph.d.      | D.pr.      | D.fa.     | Network   | CO        | Other     | Total       |
|--------------|------------|-----------|------------|------------|-----------|-----------|-----------|-----------|-------------|
| <b>2008</b>  | 28.328.703 | 909.498   | 11.154.883 | 5.964.990  | 355.000   | 407.000   | 2.001.154 | 1.275.000 | 50.396.228  |
| <b>2009</b>  | 18.935.839 | 1.586.323 | 4.151.650  | 12.437.093 | 115.000   | 1.562.500 | 2.491.964 | 175.000   | 41.455.369  |
| <b>2010</b>  | 37.421.559 | 1.718.816 | 2.760.379  | 13.734.190 | 23.202    | 1.657.910 | 443.168   | 557.632   | 58.316.856  |
| <b>2011</b>  | 13.127.398 | 916.917   | 8.827.949  | 22.434.147 | 1.010.532 | 12.500    | 1.057.554 | 1.600.000 | 48.986.997  |
| <b>Total</b> | 97.813.499 | 5.131.554 | 26.894.861 | 54.570.420 | 1.503.734 | 3.639.910 | 5.993.840 | 3.607.632 | 199.155.450 |

*Table 13: Size of agreements per type of agreement without foundations/associations*



*Table 14: Size of agreements per type of agreement without foundations/associations*

The first thing worth noticing is that foundations and associations account for a large portion of the funding for equipment. It is especially joint research and project grants, which help increase the total amount. Conversely, there is a decrease in the amounts allocated to PhD. The distribution in percentage without foundations/associations is as follows:

|             | JR  | CR | Ph.d. | D.pr. | D.fa. | Network | CO | Other | Total |
|-------------|-----|----|-------|-------|-------|---------|----|-------|-------|
| <b>2008</b> | 56% | 2% | 22%   | 12%   | 1%    | 1%      | 4% | 3%    | 100%  |
| <b>2009</b> | 46% | 4% | 10%   | 30%   | 0%    | 4%      | 6% | 0%    | 100%  |
| <b>2010</b> | 64% | 3% | 5%    | 24%   | 0%    | 3%      | 1% | 1%    | 100%  |
| <b>2011</b> | 27% | 2% | 18%   | 46%   | 2%    | 0%      | 2% | 3%    | 100%  |

*Table 15: Percentage of size of agreements per type of agreement without foundations/associations*

From the above it can be inferred that agreements related to joint research (JR), despite a declining number of total agreements constitute the most important category in terms of the size of amounts. Along with funding for projects (B. Project), these two categories of agreements account for up to 70% throughout the period.

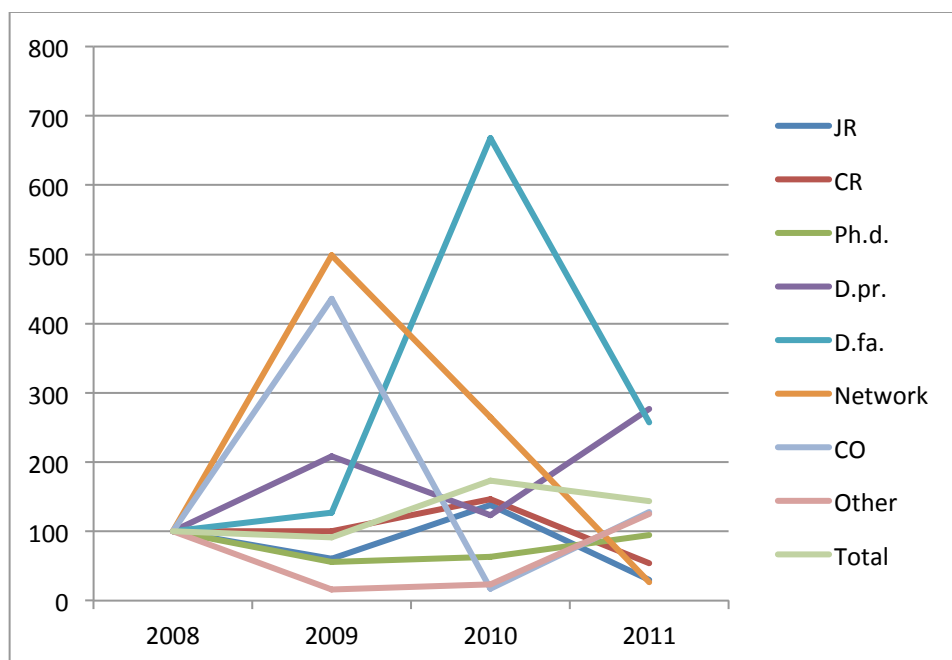
## 5. Analysis of the average size of contract agreements

The following table reflects the average size of the agreements. Note that this includes contributions from foundations and associations.

| DKK         | JR      | CR     | Ph.d.   | D.pr.   | D.fa      | Network | CO        | Other   | Total   |
|-------------|---------|--------|---------|---------|-----------|---------|-----------|---------|---------|
| <b>2008</b> | 676.874 | 60.633 | 619.716 | 217.704 | 172.799   | 31.308  | 285.879   | 85.000  | 323.263 |
| <b>2009</b> | 411.649 | 61.012 | 345.971 | 453.261 | 220.215   | 156.250 | 1.245.982 | 13.462  | 303.668 |
| <b>2010</b> | 935.539 | 88.925 | 394.340 | 268.395 | 1.154.071 | 82.896  | 49.241    | 19.915  | 435.563 |
| <b>2011</b> | 202.168 | 32.747 | 588.530 | 602.206 | 444.319   | 8.333   | 365.365   | 106.667 | 339.628 |

*Table 16: Average size of agreements per type of agreement*

Below the development of the individual categories average size of amount with index 100 = 2008, is depicted.



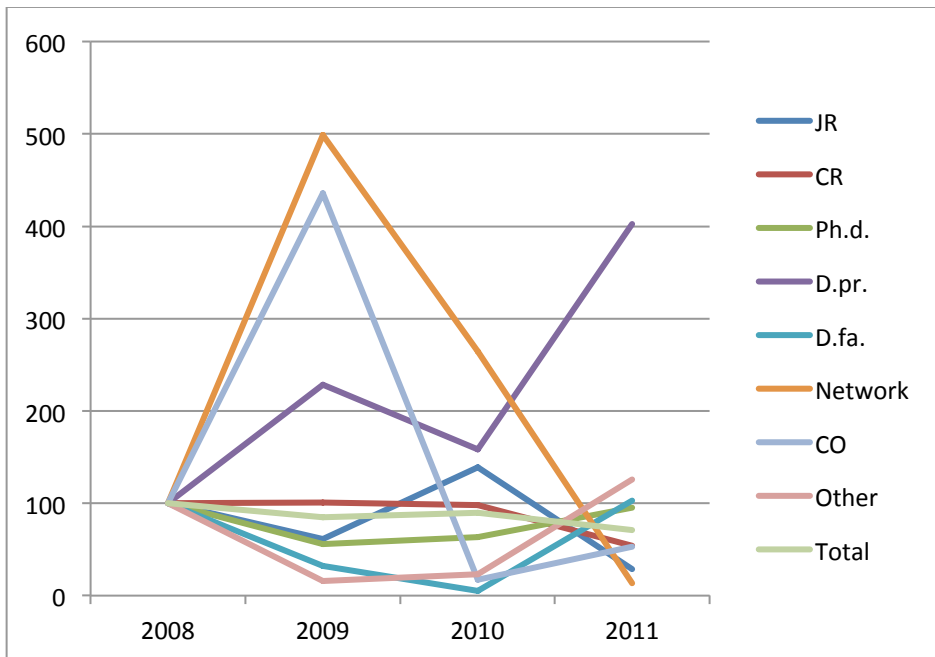
*Table 17: The development in average size of agreements per type of agreement*

Overall, the average amount per agreement has increased. Co-financing of equipment consists of very few agreements which make it difficult to conclude in relation to trend of the development. The development of appropriations of equipment is highly influenced by the large single amount of 33 million DDK from "The Obel Family Foundation". Yet again, it is relevant to examine the numbers when foundations and associations are not included.

|             | JR      | CR     | Ph.d.   | D.pr.   | D.fa.  | Network | CO        | Other   | Total   |
|-------------|---------|--------|---------|---------|--------|---------|-----------|---------|---------|
| <b>2008</b> | 674.493 | 60.633 | 619.716 | 129.674 | 14.200 | 31.308  | 285.879   | 85.000  | 278.432 |
| <b>2009</b> | 411.649 | 61.012 | 345.971 | 296.121 | 4.600  | 156.250 | 1.245.982 | 13.462  | 235.542 |
| <b>2010</b> | 935.539 | 59.270 | 394.340 | 204.988 | 703    | 82.896  | 49.241    | 19.915  | 250.287 |
| <b>2011</b> | 193.050 | 32.747 | 588.530 | 521.724 | 14.645 | 4.167   | 151.079   | 106.667 | 197.528 |

*Table 18: Average size of agreements per type of agreement without foundations/associations*

Below the development of the individual categories average size of amount with index 100 = 2008, is depicted.

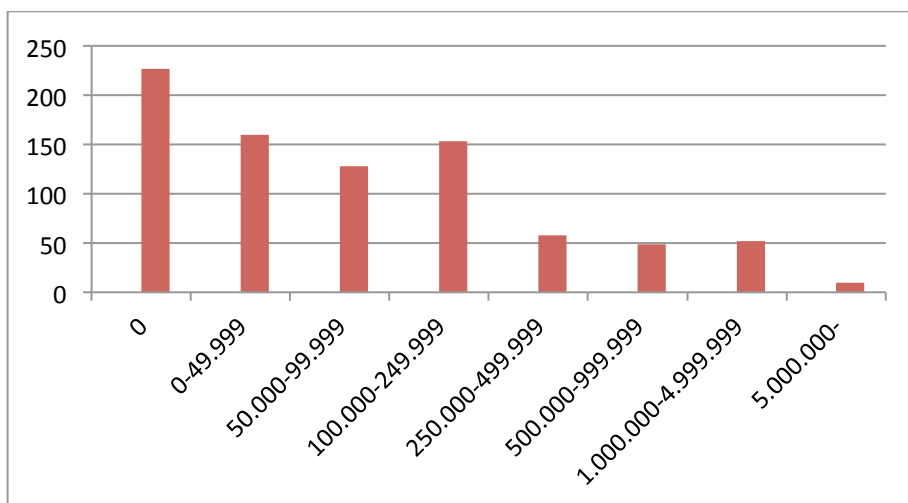


**Table 19: The development in average size of agreements per type of agreement without foundations/associations**

Overall, the average contract amount is now declining slightly over the period when the foundations are not included. However, there is a slight increase from 2009 to 2010.

## 6. Agreements dispersed by size of the collaboration

The distribution of sizes of funding is depicted in the following graph where the vertical axis shows the number of agreements in the interval:



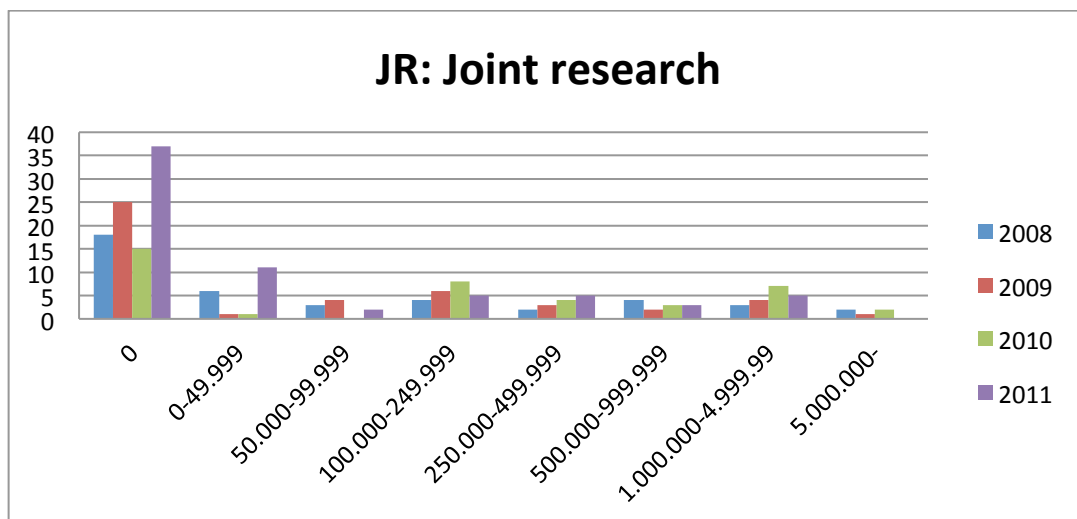
**Table 20: The distribution of the sizes of funding**



Most of the agreements are concerned with amounts below 250,000 DDK. A large part of the agreements does not involve any financial resources. 52 contracts concerns more than DKK 1.0 million, from which 10 involve more than DKK 5 million.

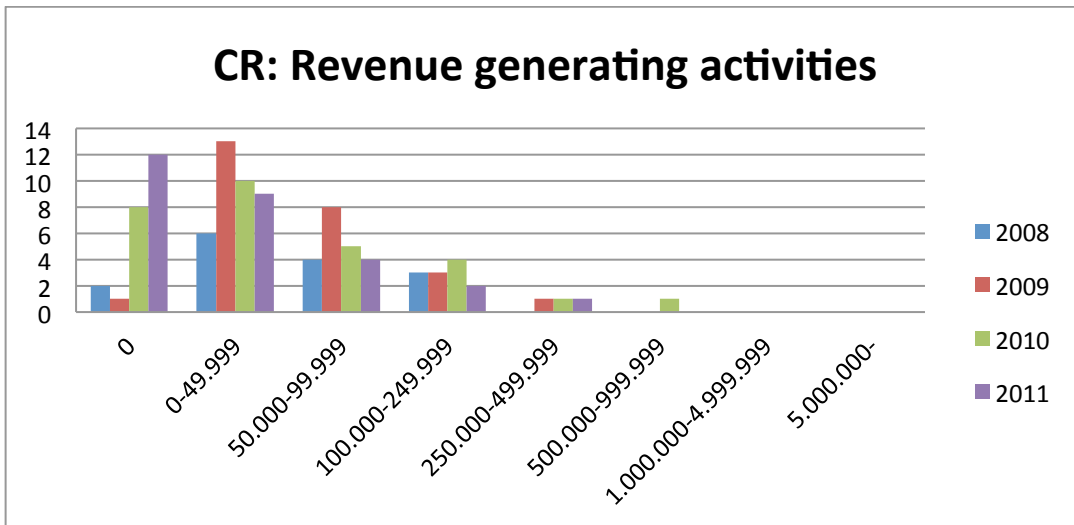
## 7. Descriptive statistics concerning the different types of contracts

The developments within the different types of contracts are described in the following graph:



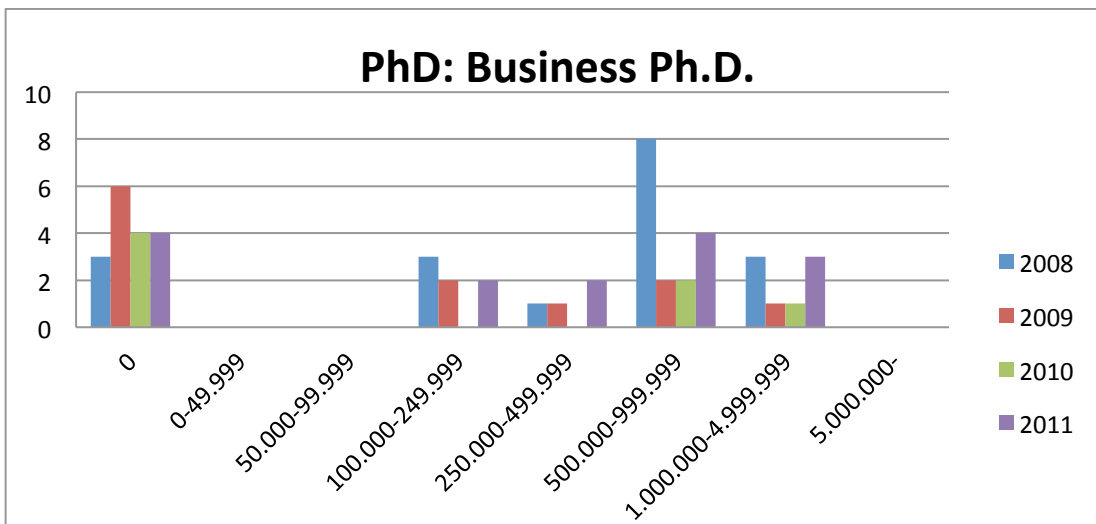
**Table 21: The development in the number of joint research contracts**

Within the joint research, there is a tendency to enter a greater amount of larger agreements at the expense of the number of agreements in the range of 0-100,000. It is also seen that the average JR agreement increases by the amount while the total number of agreements decreases slightly over the period.



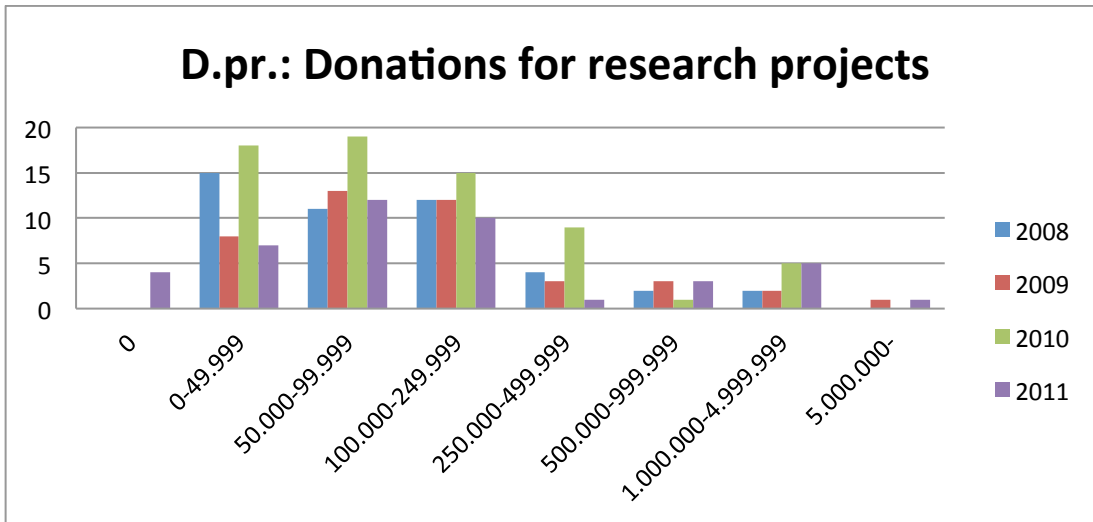
*Table 22: The development in the number of CR contracts*

The above figure reflects the increasing number CR agreements, without being significantly increasing additionally. Thus, the general trend is that there is an increasing number of CR agreements and there is a similar increase in the average amount. However, this can probably be attributed to the single contract in the range of 500,000-999,000 in 2010.



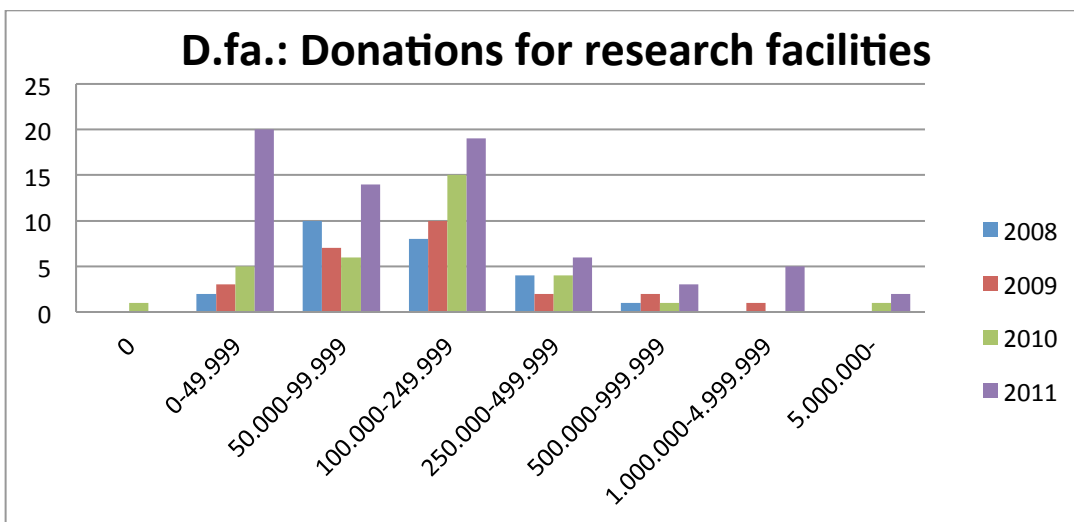
*Table 23: The development in the number of Ph.D.'s*

The figure reflects the decreasing number of agreements concerning Ph.D. projects. However, it is seen that there is a decreasing number of commercial Ph.D. agreements, while the average amount of commercial PhD similarly declines.



*Table 24: The development in the number of D.pr. contracts*

The graph illustrates an increase in the number of project grants but it also shows that this increase is generally distributed over the different intervals. The figure reflects that there is a general increase in project funding while the average amount is increasing slightly over the period. However, it is worth noticing that a single record in 2009 of more than 10 million significantly affects the numbers to increase in 2009. It is also worth noticing that foundations and associations play a major role in this category. However, there is still an increase in project funding and the average agreement size when foundations and associations are excluded in the numbers.



*Table 25: The development in the number of D.fa. contracts*

Furthermore, the graph of equipment appropriations illustrates an increase in the number of appropriations but these similarly spread over the different intervals. Overall, there is an increase in both the number and the average amount of agreements. However, it is worth noticing that foundations and

associations have a major impact on this particular category. Without foundations and associations, the contribution of equipment allocations is negligible with only one agreement in 2010.

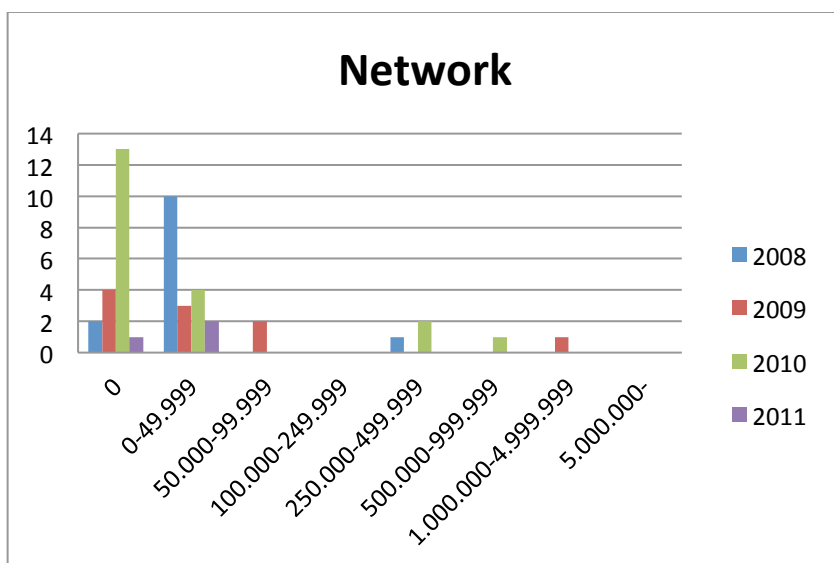


Table 26: The development in the number of network

Generally, the database for networking is too narrow to conclude anything upon. Overall, the figures for the network data show an increase in the number of network agreements as well as an increase in the average agreement size.

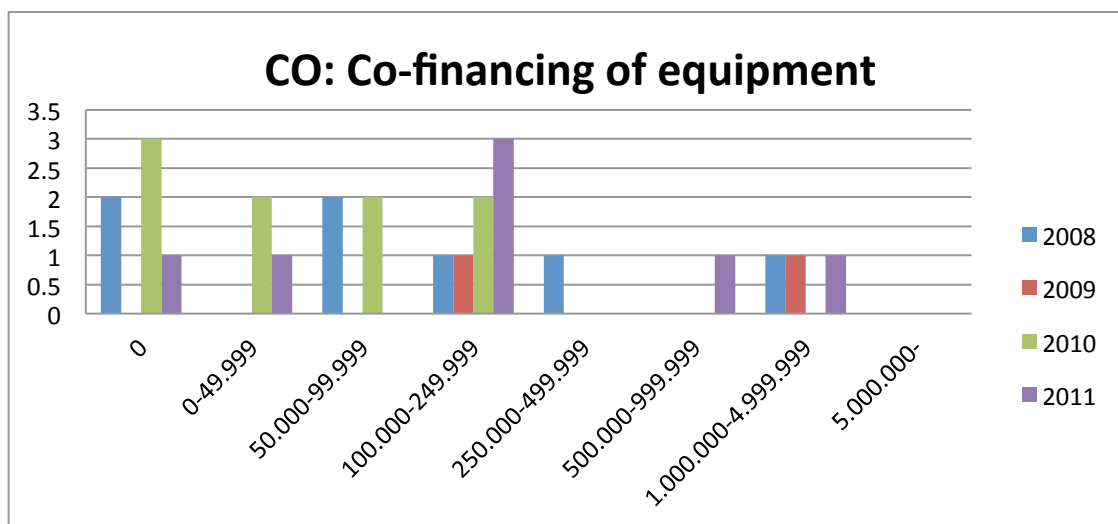
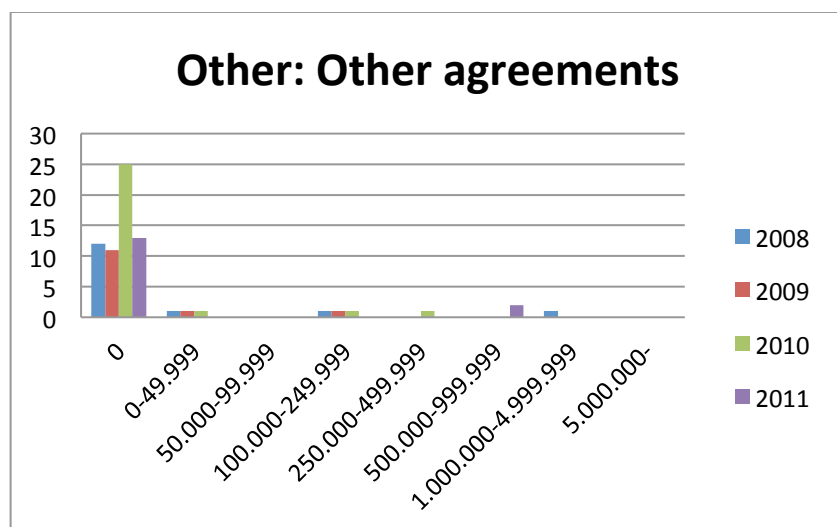


Table 27: The development in the number of Co-financing of equipment contracts

Generally, there has been an increase in co-financing of equipment agreements but the average agreement has decreased. However, it is difficult to draw a general trend due to the small number of agreements.



*Table 28: The development in the number of other agreements*

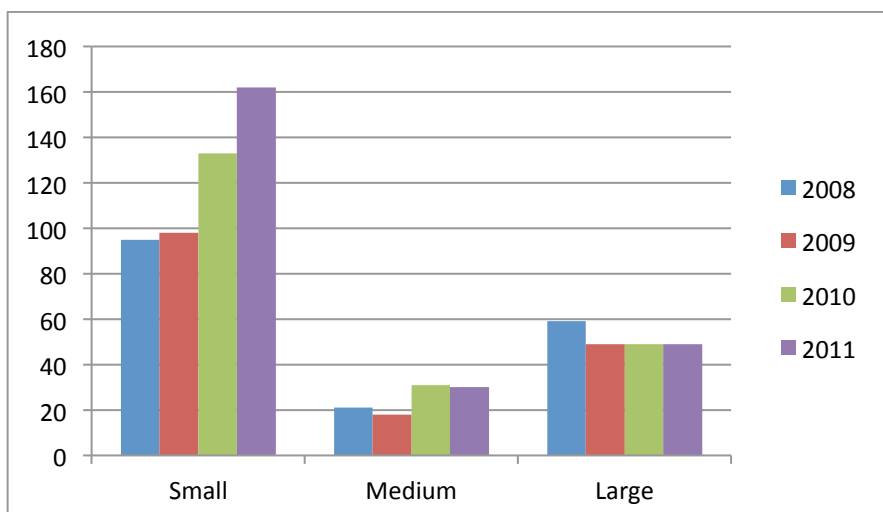
The category "other" refers to agreements, which according to the Contract Unit cannot be classified according to the different criteria. There has been a relatively large increase in the number of agreements under this category but at the same time the average amount fell significantly over the period.

## 8. Analysis of the size of companies that enter into funded collaboration with Aalborg University

The table below summarizes the size of the companies that have signed agreements with Aalborg University according to their size. It is interesting to track this because there is a massive political focus on upgrading the knowledge base of especially SME's.

|              | Small      | Medium     | Large      | Total      |
|--------------|------------|------------|------------|------------|
| 2008         | 95         | 21         | 59         | 175        |
| 2009         | 98         | 18         | 49         | 165        |
| 2010         | 133        | 31         | 49         | 213        |
| 2011         | 162        | 30         | 49         | 241        |
| <b>Total</b> | <b>488</b> | <b>100</b> | <b>206</b> | <b>794</b> |

*Table 29: The number of companies that have signed agreements with Aalborg University according to their size*

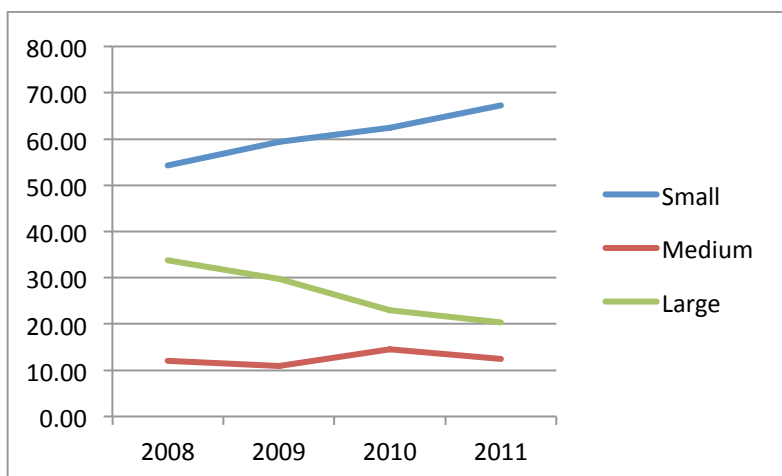


**Table 30: The number of companies that have signed agreements with Aalborg University according to their size**

Be aware that not all agreements are classified. This is due to the fact that other agreement parties (besides AAU) could not be identified in 44 cases. Despite this, the data clearly shows that small businesses have signed the most agreements in all the years and the number of contracts with small and medium-sized enterprises is increasing in the period. However, the number of agreements with large companies has fallen slightly although it seems quite stable. This has resulted in the number of agreements with small businesses accounting for 67% of the agreements in 2011 compared to 54% in 2008, the proportion of agreements with medium-sized companies has remained unchanged around 12% in the period. Contrasting, the proportion of contracts with large companies decreased from 34% in 2008 to 20% in 2011.

| %    | Small | Medium | Large | Total  |
|------|-------|--------|-------|--------|
| 2008 | 54,29 | 12,00  | 33,71 | 100,00 |
| 2009 | 59,39 | 10,91  | 29,70 | 100,00 |
| 2010 | 62,44 | 14,55  | 23,00 | 100,00 |
| 2011 | 67,22 | 12,45  | 20,33 | 100,00 |
| Avg. | 61,46 | 12,59  | 25,94 | 100,00 |

**Table 31: Percentage of companies that have signed agreements with Aalborg University according to their size**



**Table 32: Percentage of companies that have signed agreements with Aalborg University according to their size**

However, relating to the above figure one should be aware of the number of large foundations behind a number of agreements are classified as small businesses, including “The Obel Family Foundation” that in the period has signed 132 agreements with AAU and the “Spar Nord Foundation” that in period has concluded 25 agreements with the university.

### 8.1 The allocation of foundations/associations

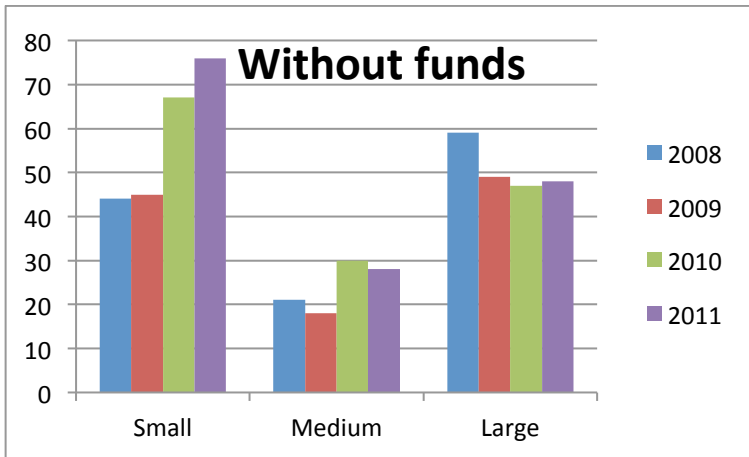
|              | Small      | Medium   | Large    | Total      |
|--------------|------------|----------|----------|------------|
| 2008         | 51         | 0        | 0        | 51         |
| 2009         | 53         | 0        | 0        | 53         |
| 2010         | 66         | 1        | 2        | 69         |
| 2011         | 86         | 2        | 1        | 89         |
| <b>Total</b> | <b>256</b> | <b>3</b> | <b>3</b> | <b>262</b> |

**Table 33: The allocation of companies based on company size**

### 8.2 Looking at the development without foundations and associations

|              | Small      | Medium    | Large      | Total      |
|--------------|------------|-----------|------------|------------|
| 2008         | 44         | 21        | 59         | 124        |
| 2009         | 45         | 18        | 49         | 112        |
| 2010         | 67         | 30        | 47         | 144        |
| 2011         | 76         | 28        | 48         | 152        |
| <b>Total</b> | <b>232</b> | <b>97</b> | <b>203</b> | <b>532</b> |

**Table 34: The number of companies without foundations/associations based on company size**

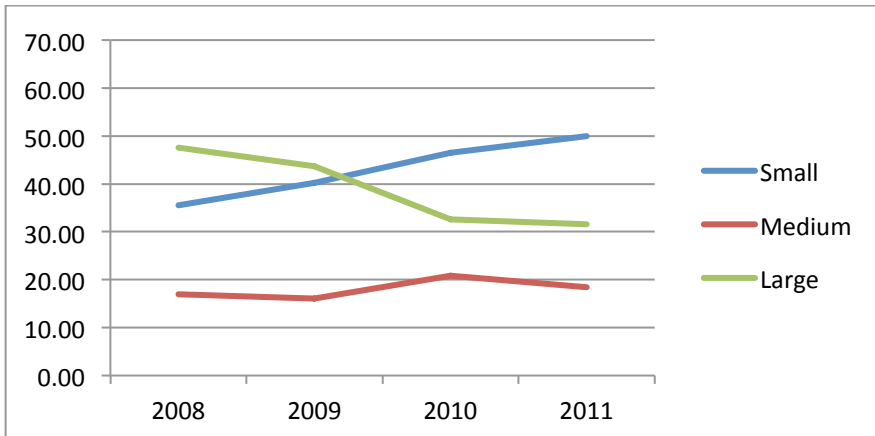


**Table 35: The number of companies without foundations/associations based on company size**

From the above, it is seen that even if you do not include agreements with funds there has been an increase in the number of agreements with small and medium-sized enterprises. However, the proportion of agreements is still a very large part of the total number of agreements without foundations / associations. The distribution is shown in the table below. The distribution as a percentage:

|      | Small | Medium | Large | Total      |
|------|-------|--------|-------|------------|
| 2008 | 35.48 | 16.94  | 47.58 | 100        |
| 2009 | 40.18 | 16.07  | 43.75 | 100        |
| 2010 | 46.53 | 20.83  | 32.64 | 100        |
| 2011 | 50.00 | 18.42  | 31.58 | 100        |
| Avg. | 43.61 | 18.23  | 38.16 | <b>100</b> |

**Table 36: The distribution of companies without foundations/associations based on company size**



**Table 37: The development in companies without foundations/associations based on company size**

Cooperation with SMEs plays an increasingly important role even when disregarding from the growing number of grants from foundations and associations. Here it is interesting to notice that agreements with



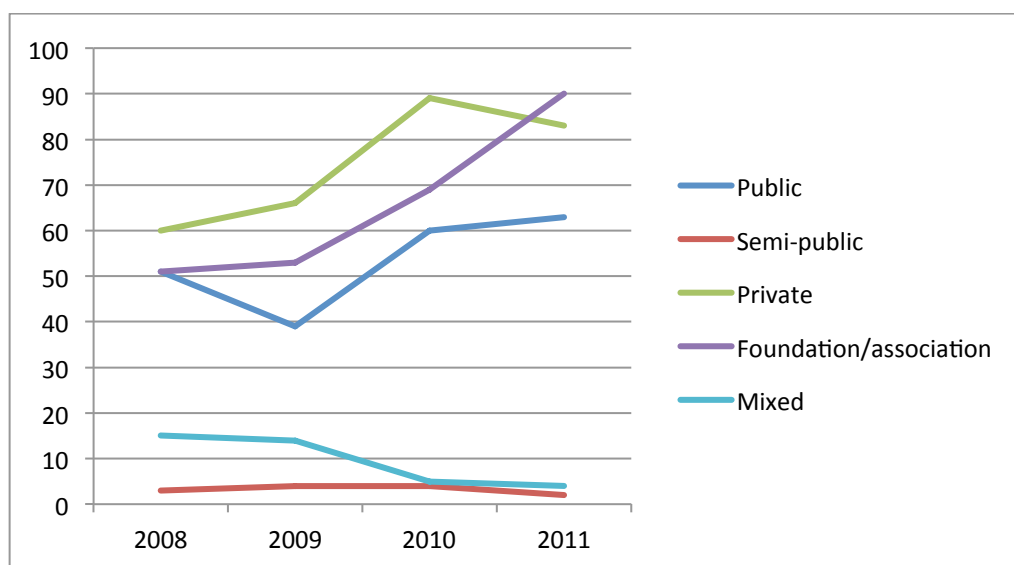
small businesses in 2010 exceed the number of agreements with large companies. However, the large companies are still strongly represented in relation to the general economic statistics.

## 9. Analyzing the types of companies that enter into agreements

Looking at the different types of companies that sign contracts with the university the numbers are as follows:

|       | Public | Semi-public | Private | Foundation/association | Mixed | Total |
|-------|--------|-------------|---------|------------------------|-------|-------|
| 2008  | 51     | 3           | 60      | 51                     | 15    | 180   |
| 2009  | 39     | 4           | 66      | 53                     | 14    | 176   |
| 2010  | 60     | 4           | 89      | 69                     | 5     | 227   |
| 2011  | 63     | 2           | 83      | 90                     | 4     | 242   |
| i alt | 213    | 13          | 298     | 263                    | 38    | 825   |

*Table 38: The different types of companies signing contracts with Aalborg University*



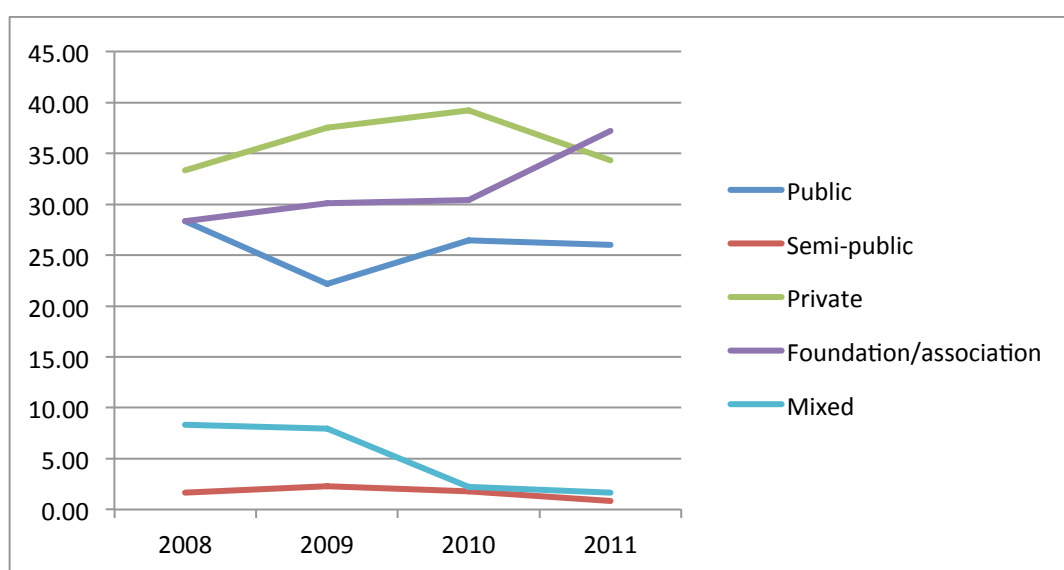
*Table 39: The development in different types of companies signing contracts with Aalborg University*

There has been an increase in the number of agreements with both public and private companies and foundations / associations. In particular, it is worth noticing that the number of agreements with private partners has increased throughout the period. The number of agreements involving a mixture of different types seems to decrease. However, it is very difficult to quantify because it depends on how contracts are created. The same project can be created as 3 contracts in which various types of enterprises participating while other times the contract is created as one agreement and then classified as "mixed". When looking at

the percentage distribution of the agreements, the proportion of agreements involving private partners in addition to the above has risen:

| %    | Public | Semi-public | Private | Foundation/association | Mixed | Total |
|------|--------|-------------|---------|------------------------|-------|-------|
| 2008 | 28,33  | 1,67        | 33,33   | 28,33                  | 8,33  | 100   |
| 2009 | 22,16  | 2,27        | 37,50   | 30,11                  | 7,95  | 100   |
| 2010 | 26,43  | 1,76        | 39,21   | 30,40                  | 2,20  | 100   |
| 2011 | 26,03  | 0,83        | 34,30   | 37,19                  | 1,65  | 100   |
| Avg. | 25,82  | 1,58        | 36,12   | 31,88                  | 4,61  | 100   |

*Table 40: The distribution of the different types of companies signing contracts with Aalborg University*



*Table 41: The distribution of the different types of companies signing contracts with Aalborg University*

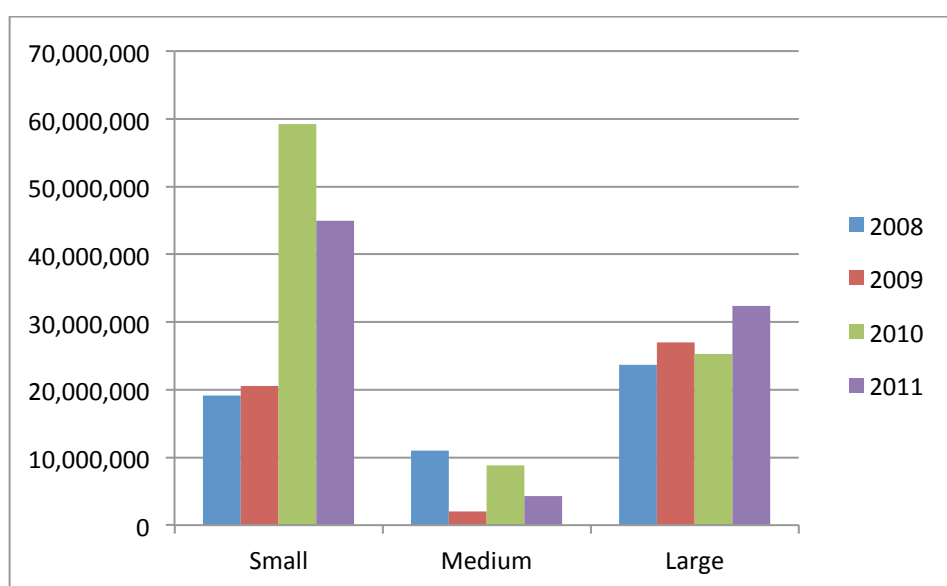
## 9.1 Statistics on the funding size correlated with company size

Looking at the development in the amounts it is seen that cooperation with small businesses also plays an increasingly important role. However, the total amount from large and medium-sized enterprises is more stable:

|              | Small              | Medium            | Large              | Total              |
|--------------|--------------------|-------------------|--------------------|--------------------|
| 2008         | 19.118.544         | 11.037.924        | 23.717.326         | 53.873.794         |
| 2009         | 20.524.126         | 2.054.369         | 26.953.299         | 49.531.794         |
| 2010         | 59.275.289         | 8.876.665         | 25.290.199         | 93.442.153         |
| 2011         | 44.985.766         | 4.266.942         | 32.353.546         | 81.606.254         |
| <b>Total</b> | <b>143.903.725</b> | <b>26.235.900</b> | <b>108.314.370</b> | <b>278.453.995</b> |

*Table 42: The development in funding size based on company size*

The total amount differs from the amount of all contracts in the study, because as mentioned earlier it has been impossible to classify all companies by size.



*Table 43: The development in funding size based on company size*

|             | Small        | Medium      | Large        | Total         |
|-------------|--------------|-------------|--------------|---------------|
| 2008        | 35,49        | 20,49       | 44,02        | 100,00        |
| 2009        | 41,44        | 4,15        | 54,42        | 100,00        |
| 2010        | 63,44        | 9,50        | 27,07        | 100,00        |
| 2011        | 55,13        | 5,23        | 39,65        | 100,00        |
| <b>Avg.</b> | <b>51,68</b> | <b>9,42</b> | <b>38,90</b> | <b>100,00</b> |

*Table 44: The average of funding based on company size*

The above development is caused by the fact that the foundations have donated an increasing amount per year and that those are classified as small businesses. Looking only at the category "foundations/associations etc." in relation to size the development is as follows:

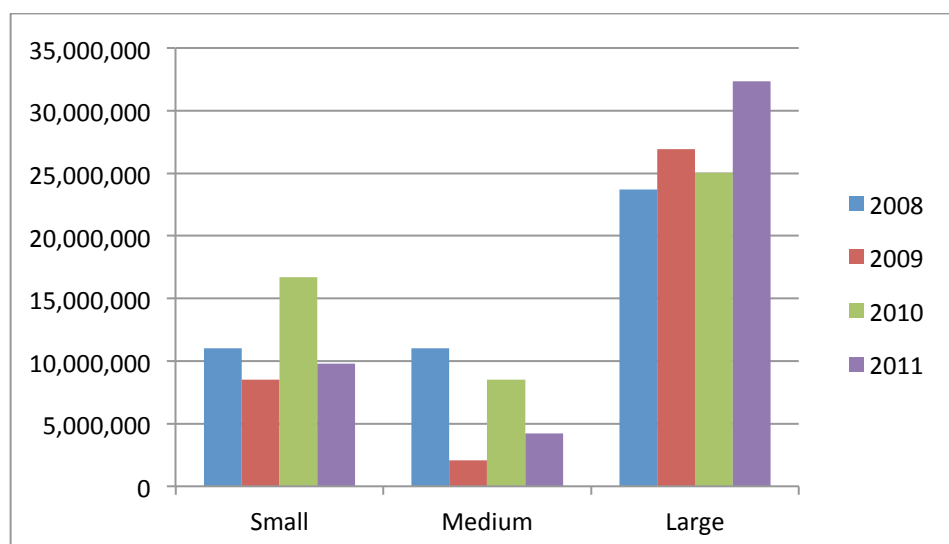
|              | Small             | Medium         | Large          | Total             |
|--------------|-------------------|----------------|----------------|-------------------|
| 2008         | 8.114.389         | 0              | 0              | 8.114.389         |
| 2009         | 11.990.246        | 0              | 0              | 11.990.246        |
| 2010         | 42.551.722        | 369.583        | 248.100        | 43.169.405        |
| 2011         | 35.178.213        | 50.000         | 12.500         | 35.240.713        |
| <b>Total</b> | <b>97.834.569</b> | <b>419.583</b> | <b>260.600</b> | <b>98.514.752</b> |

*Table 45: The size of foundation/associations based on company size*

Here it is seen that the large increase in the amount that small businesses contribute with can be attributed to the foundations. In that way the foundations contribute with increasing amounts. However, once again it is the one large lump sum of 33 million from “The Obel Family Foundation” that is accountable for the increase. By removing this amount from the data the contribution from the foundations is significantly more stable during the period. However, looking at the overall figures without foundations and associations we see that small businesses still seem to play a more important role:

|              | Small             | Medium            | Large              | Total              |
|--------------|-------------------|-------------------|--------------------|--------------------|
| 2008         | 11.004.155        | 11.037.924        | 23.717.326         | 45.759.405         |
| 2009         | 8.533.880         | 2.054.369         | 26.953.299         | 37.541.548         |
| 2010         | 16.723.567        | 8.507.082         | 25.042.099         | 50.272.749         |
| 2011         | 9.807.553         | 4.216.942         | 32.341.046         | 46.365.541         |
| <b>Total</b> | <b>46.069.156</b> | <b>25.816.317</b> | <b>108.053.770</b> | <b>179.939.243</b> |

*Table 46: The development in funding size without foundations/associations based on company size*



*Table 47: The development in funding size without foundations/associations based on company size*

|      | Small | Medium | Large | Total      |
|------|-------|--------|-------|------------|
| 2008 | 24,05 | 24,12  | 51,83 | 100        |
| 2009 | 22,73 | 5,47   | 71,80 | 100        |
| 2010 | 33,27 | 16,92  | 49,81 | 100        |
| 2011 | 21,15 | 9,09   | 69,75 | 100        |
| Avg. | 25,60 | 14,35  | 60,05 | <b>100</b> |

*Table 48: The average of funding without foundations/associations based on company size*

Thus, the amount increased significantly from 2008 to 2010 and small companies (without foundations) contribute with 33.27% of the total in 2010. However, the contribution from small companies decreased from 2010 to 2011 affecting small companies to only contribute with 21.15% in 2011. From 2010 to 2011 the contributions from larger companies in contrast increased significantly from 49.81% to 69.75%. However, large companies contribute with the most resources overall during the period.



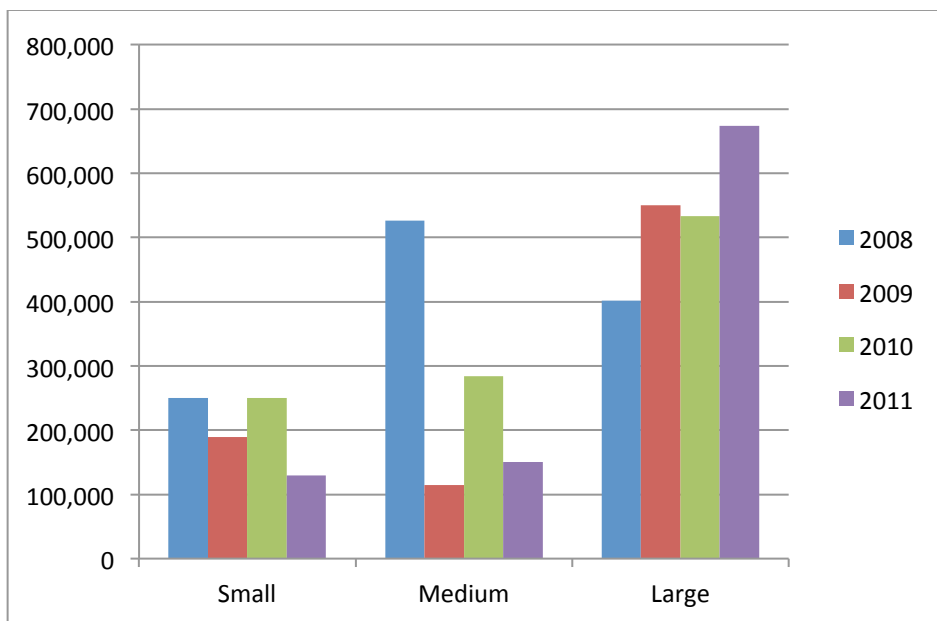
*Table 49: The development in funding based on company size without foundations/associations*

## 9.2 Development in the average grant size dispersed across company size

Finally, the development in the average size of amounts distributed by the company size is examined. Notice that these numbers are adjusted for agreements with foundations.

|      | Small   | Medium  | Large   |
|------|---------|---------|---------|
| 2008 | 250.094 | 525.615 | 401.989 |
| 2009 | 189.642 | 114.132 | 550.067 |
| 2010 | 249.605 | 283.569 | 532.811 |
| 2011 | 129.047 | 150.605 | 673.772 |

*Table 50: The average grant size based on company size*



*Table 51: The average grant size based on company size*

From the above it is seen that there has not been any significant development for the small businesses while the agreement size of the larger companies seem to be steadily increasing. The total increased amount from the large companies is due to the fact that the agreements are generally larger offsetting the decrease in the number of total agreements.

## 10. Descriptive statistics across industry groups

Looking at the dispersion of collaboration across industry groups, AAU has entered agreements with businesses spread over a total of 98 different industries (industry numbers). The vast majority of industries are only represented 1-5 times. However, a number of industries are strongly represented. Below is an overview of the industry distribution including industries represented more than 10 times during the period:

| Industry code | 2008       | 2009       | 2010       | 2011       | Total      |
|---------------|------------|------------|------------|------------|------------|
| 370000        | 5          | 3          | 7          | 6          | 21         |
| 620100        | 6          | 10         | 9          | 12         | 37         |
| 620200        | 5          | 2          | 4          | 2          | 13         |
| 642020        | 36         | 41         | 55         | 76         | 208        |
| 682040        | 9          | 10         | 6          | 10         | 35         |
| 702200        | 2          | 2          | 3          | 4          | 11         |
| 711210        | 3          | 6          | 4          | 1          | 14         |
| 711290        | 3          | 4          | 6          |            | 13         |
| 721900        | 14         | 11         | 18         | 11         | 54         |
| 841100        | 26         | 21         | 27         | 29         | 103        |
| 854100        | 3          | 3          | 3          | 6          | 15         |
| 861000        | 8          | 9          | 3          | 9          | 29         |
| <b>Total</b>  | <b>120</b> | <b>122</b> | <b>145</b> | <b>166</b> | <b>553</b> |

Table 52: Number of agreements based on industries

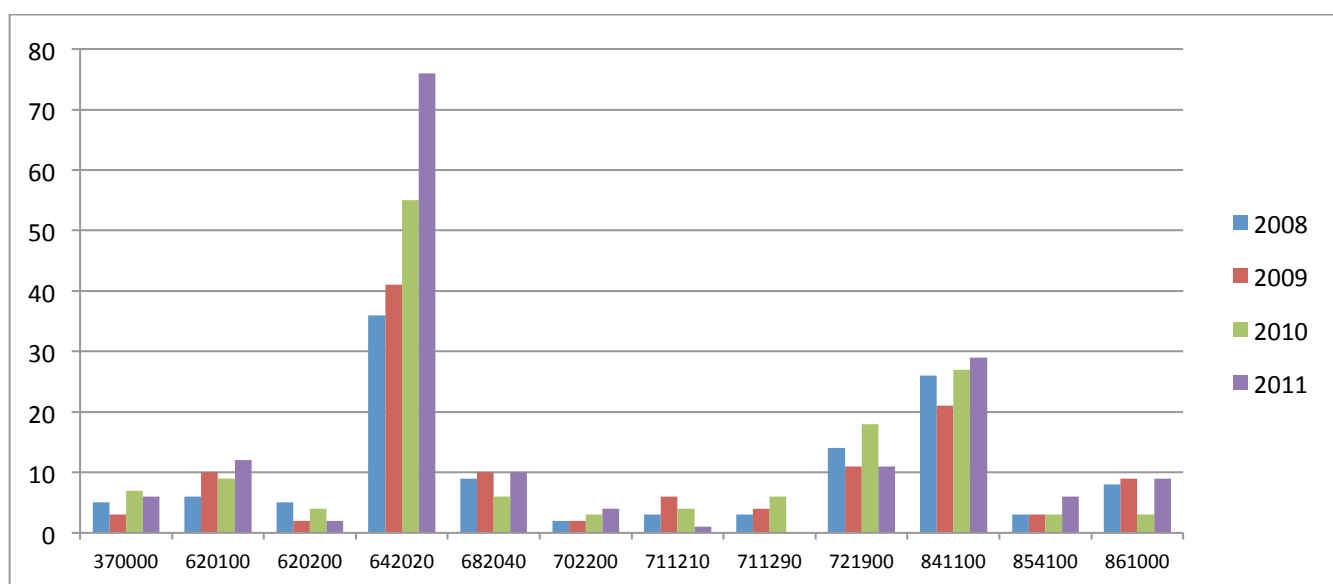


Table 53: Distribution of agreements based on industries

370000: Collection and treatment of sewage - There is a number of agreements with the region's wastewater treatment plant on a microbiological database.

620100: Computer programming

620200: Information technology consultancy activities

642020: Non-financial holding companies “The Obel Family Foundation”

682040: Rentals of commercial properties - Primary "Spar Nord Foundation"

702200: Business and other management consultancy activities

711210: Consulting engineering in construction and civil engineering

711290: Other technical consultancy

721900: Other research and experimental development on natural sciences and technology

841100: General public services - Regional municipalities etc.

861000: Hospitals

Once again, it is seen that "The Obel Family Foundation" enters into many agreements and so do to the region and municipalities. However, there is also an increase in cooperation with companies engaged in the research, development and technology.

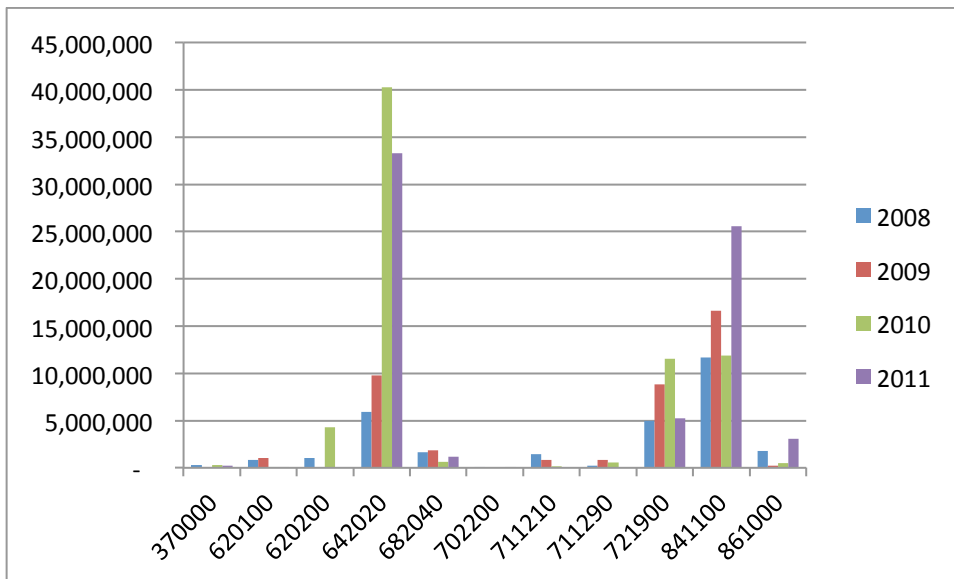
### 10.1 Size of agreements

However, when looking at the size of the agreements it is still the industries and the public companies that provide the greatest amount. Yet, there is an increasing trend in the amount from 721900/other research:

| Industry code | 2008              | 2009              | 2010              | 2011              | Total              |
|---------------|-------------------|-------------------|-------------------|-------------------|--------------------|
| 370000        | 310.000           | 115.000           | 319.701           | 214.400           | 959.101            |
| 620100        | 841.215           | 1.020.000         | 86.163            | 97.600            | 2.044.978          |
| 620200        | 1.030.600         | 0                 | 4.269.000         | 0                 | 5.299.600          |
| 642020        | 5.906.025         | 9.750.528         | 40.243.597        | 33.267.448        | 89.167.597         |
| 682040        | 1.668.362         | 1.839.955         | 665.000           | 1.144.004         | 5.317.321          |
| 702200        | 9.000             | 0                 | 0                 | 111.265           | 120.265            |
| 711210        | 1.418.000         | 819.000           | 169.731           | 0                 | 2.406.731          |
| 711290        | 243.048           | 811.759           | 551.775           | 0                 | 1.606.582          |
| 721900        | 4.942.357         | 8.840.698         | 11.514.578        | 5.255.395         | 30.553.028         |
| 841100        | 11.679.540        | 16.610.914        | 11.884.795        | 25.544.808        | 65.720.057         |
| 861000        | 1.810.420         | 210.420           | 509.999           | 3.093.858         | 5.624.697          |
| <b>Total</b>  | <b>29.858.567</b> | <b>40.018.274</b> | <b>70.214.339</b> | <b>68.728.778</b> | <b>208.819.957</b> |

*Table 54: Size of agreement based on industry*





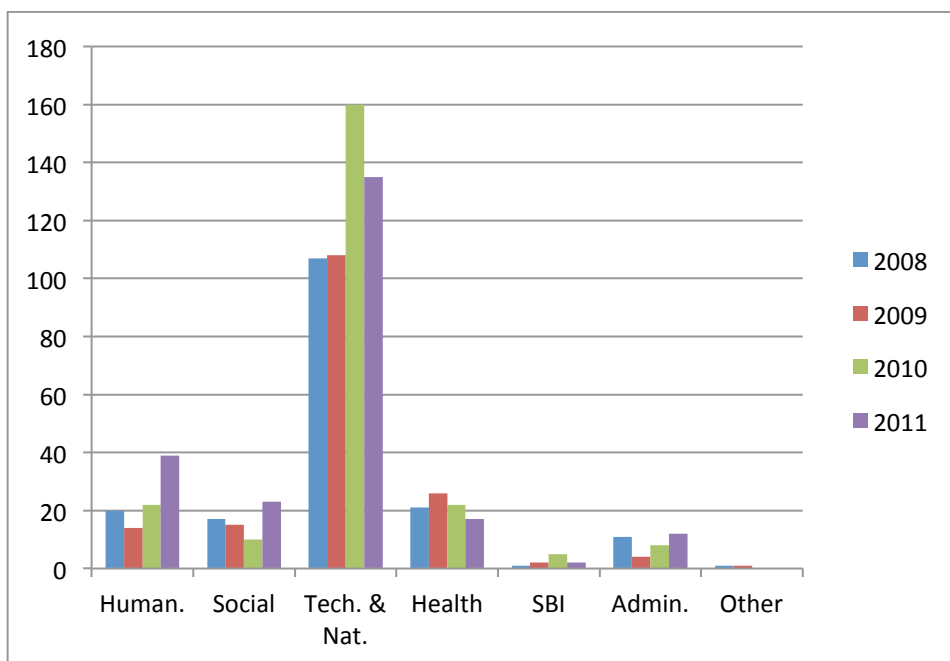
**Table 55: Distribution of size of agreement based on industry**

As an example, note that the industry 620100/computer programming enters many agreements but contributes with a very small amount of money. This covers a group of less than 10 companies that have several agreements with the university not involving money or a very small amount of money. Several of the companies are affiliated with NOVI Innovation and located in the immediate area of AAU.

### 11. Distribution of funding across faculties

|       | Human. | Social | Tech. & Nat. | Health | SBI | Admin. | Other | Total |
|-------|--------|--------|--------------|--------|-----|--------|-------|-------|
| 2008  | 20     | 17     | 107          | 21     | 1   | 11     | 1     | 178   |
| 2009  | 14     | 15     | 108          | 26     | 2   | 4      | 1     | 170   |
| 2010  | 22     | 10     | 160          | 22     | 5   | 8      | 0     | 227   |
| 2011  | 39     | 23     | 135          | 17     | 2   | 12     | 0     | 228   |
| Total | 95     | 65     | 510          | 86     | 10  | 35     | 2     | 803   |

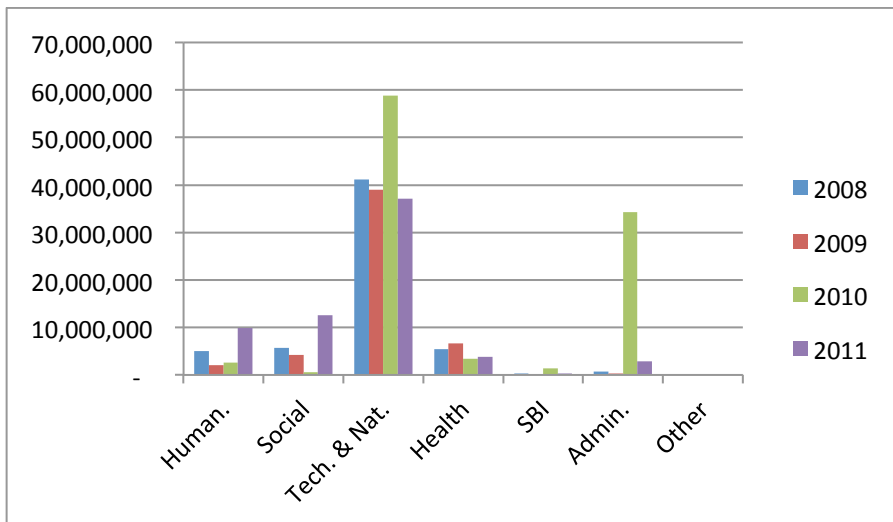
**Table 56: Distribution of number of funding agreements across faculties**



*Table 57: Distribution of number of funding agreements based on faculties*

|       | Human.     | Social     | Tech. & Nat. | Health     | SBI       | Admin.     | Other   | Total       |
|-------|------------|------------|--------------|------------|-----------|------------|---------|-------------|
| 2008  | 5.017.867  | 5.749.173  | 41.214.405   | 5.382.172  | 368.000   | 779.000    | -       | 58.510.617  |
| 2009  | 1.998.631  | 4.266.557  | 39.024.529   | 6.697.398  | 111.000   | 360.000    | 100.000 | 52.558.115  |
| 2010  | 2.645.000  | 618.163    | 58.771.535   | 3.449.248  | 1.389.982 | 34.289.583 | -       | 101.163.510 |
| 2011  | 9.860.990  | 12.636.396 | 37.118.097   | 3.843.015  | 298.000   | 2.915.600  | -       | 66.672.098  |
| Total | 19.522.488 | 23.270.289 | 176.128.566  | 19.371.832 | 2.166.982 | 38.344.183 | 100.000 | 278.904.340 |

*Table 58: Size of funding based on faculties*



**Table 59: Distribution of the size of funding agreements based on faculty**

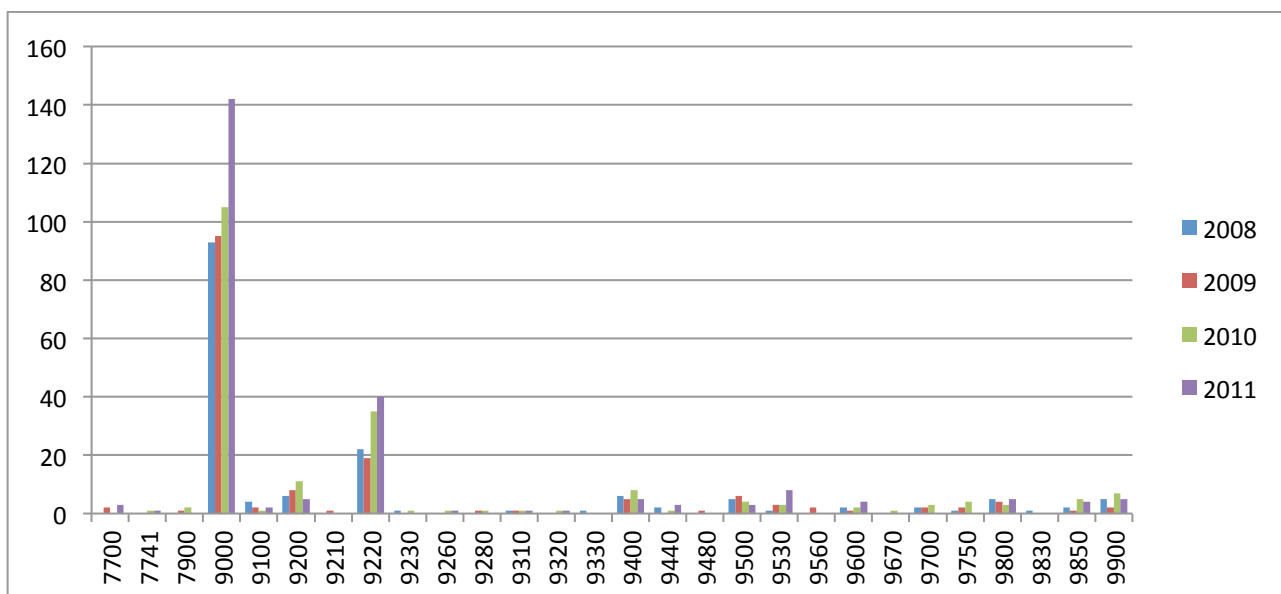
Notice once again that not all agreements are registered to a department / faculty. Another drawback is that the Department of education, learning and philosophy is subject to all faculties, but has been placed in HUM. Also, Department of languages and philosophy is shared between SOC and HUM, but has been placed in HUM. SBI is the National Building Research. It may be placed under the TEK-NAT, but is always listed independently. Admin. covers student administration and leadership Secretariat. The large appropriation of 33 million in 2010 is given only to the management secretariat. However, one must assume that the "star professorships" has since been assigned to the individual faculties. This development is in relation to agreement levels to a large extent driven by Tek-Nat.

## 12. Zip code analysis

There are a total of 520 identified agreements entered with a company that could be related to a zip code in Northern Jutland. These agreements are divided into the 28 North Jutland zip codes:

| Postal Code  | 2008       | 2009       | 2010       | 2011       | Avg.          | Total      |
|--------------|------------|------------|------------|------------|---------------|------------|
| 7700         | 0          | 2          | 0          | 3          | 1,25          | 5          |
| 7741         | 0          | 0          | 1          | 1          | 0,50          | 2          |
| 7900         | 0          | 1          | 2          | 0          | 0,75          | 3          |
| 9000         | 93         | 95         | 105        | 142        | 108,75        | 435        |
| 9100         | 4          | 2          | 1          | 2          | 2,25          | 9          |
| 9200         | 6          | 8          | 11         | 5          | 7,50          | 30         |
| 9210         | 0          | 1          | 0          | 0          | 0,25          | 1          |
| 9220         | 22         | 19         | 35         | 40         | 29,00         | 116        |
| 9230         | 1          | 0          | 1          | 0          | 0,50          | 2          |
| 9260         | 0          | 0          | 1          | 1          | 0,50          | 2          |
| 9280         | 0          | 1          | 1          | 0          | 0,50          | 2          |
| 9310         | 1          | 1          | 1          | 1          | 1,00          | 4          |
| 9320         | 0          | 0          | 1          | 1          | 0,50          | 2          |
| 9330         | 1          | 0          | 0          | 0          | 0,25          | 1          |
| 9400         | 6          | 5          | 8          | 5          | 6,00          | 24         |
| 9440         | 2          | 0          | 1          | 3          | 1,50          | 6          |
| 9480         | 0          | 1          | 0          | 0          | 0,25          | 1          |
| 9500         | 5          | 6          | 4          | 3          | 4,50          | 18         |
| 9530         | 1          | 3          | 3          | 8          | 3,75          | 15         |
| 9560         | 0          | 2          | 0          | 0          | 0,50          | 2          |
| 9600         | 2          | 1          | 2          | 4          | 2,25          | 9          |
| 9670         | 0          | 0          | 1          | 0          | 0,25          | 1          |
| 9700         | 2          | 2          | 3          | 0          | 1,75          | 7          |
| 9750         | 1          | 2          | 4          | 0          | 1,75          | 7          |
| 9800         | 5          | 4          | 3          | 5          | 4,25          | 17         |
| 9830         | 1          | 0          | 0          | 0          | 0,25          | 1          |
| 9850         | 2          | 1          | 5          | 4          | 3,00          | 12         |
| 9900         | 5          | 2          | 7          | 5          | 4,75          | 19         |
| <b>Total</b> | <b>160</b> | <b>159</b> | <b>201</b> | <b>233</b> | <b>188,25</b> | <b>753</b> |

*Table 60: Number of agreement based on zip codes*



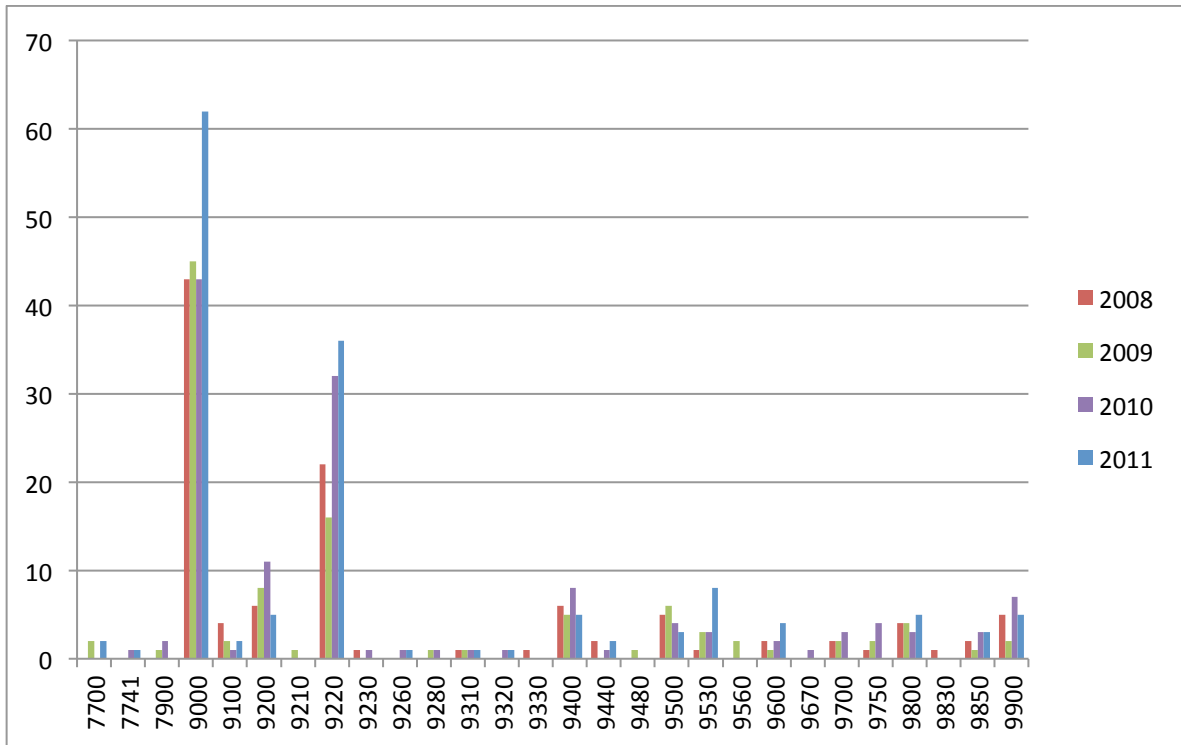
**Table 61: The distribution of the number of agreements based on zip codes**

There is a clear tendency for the majority of all agreements entered with companies that are located in the Aalborg area (zip codes 9000 to 9220). Thus, 78.1% of the agreements in 2008, 78.6% of the agreements in 2009, 75.6% of the agreements in 2010 and 81.1% agreements in 2011 entered with companies with zip codes in Aalborg. One should be aware that the foundations are located in Aalborg and therefore increase the number of zip codes in that area significantly. Foundations/associations distributed on zip codes:

| Postal Code  | 2008      | 2009      | 2010      | 2011      | Total      |
|--------------|-----------|-----------|-----------|-----------|------------|
| 7700         | 0         | 0         | 0         | 1         | 1          |
| 9000         | 50        | 50        | 62        | 80        | 242        |
| 9220         | 0         | 3         | 3         | 4         | 10         |
| 9440         | 0         | 0         | 0         | 1         | 1          |
| 9800         | 1         | 0         | 0         | 0         | 1          |
| 9850         | 0         | 0         | 2         | 1         | 3          |
| <b>Total</b> | <b>51</b> | <b>53</b> | <b>67</b> | <b>87</b> | <b>258</b> |

**Table 62: Number of foundations based on zip codes**

From the above it is obvious that the foundations/association category to a large extent helps drawing the distribution towards Aalborg. When the numbers are adjusted for foundations and associations, the distribution is as follows:



*Table 63: The distribution of the number of agreements without foundations based on zip codes*

This gives the distribution a small overweight in the Aalborg area however there is still an obvious tendency that the agreements are within the Aalborg area (zip codes 9000-9220). Below is 68.8% of the agreements in 2008, 67.9% in 2009, 64.9% in 2010 and 71.9% in 2011.

In comparison, only approx. 17% of companies in the region of Northern Jutland are registered on these five zip codes. Looking at companies with more than 50 employees, the number is approx. 25%, while in companies with more than 200 employees the number is approx. 40%. This may partly explain the disproportion, in relation to the general business statistics, explained by the larger companies often find themselves in the Aalborg area rather than in the peripheral regions. Furthermore, it should be noted that many agreements can be attributed to Aalborg East (9220). Several of them are related to NOVI and thus have a certain attachment to the AAU.

## 12.1 Heat map of collaboration according to zip-code

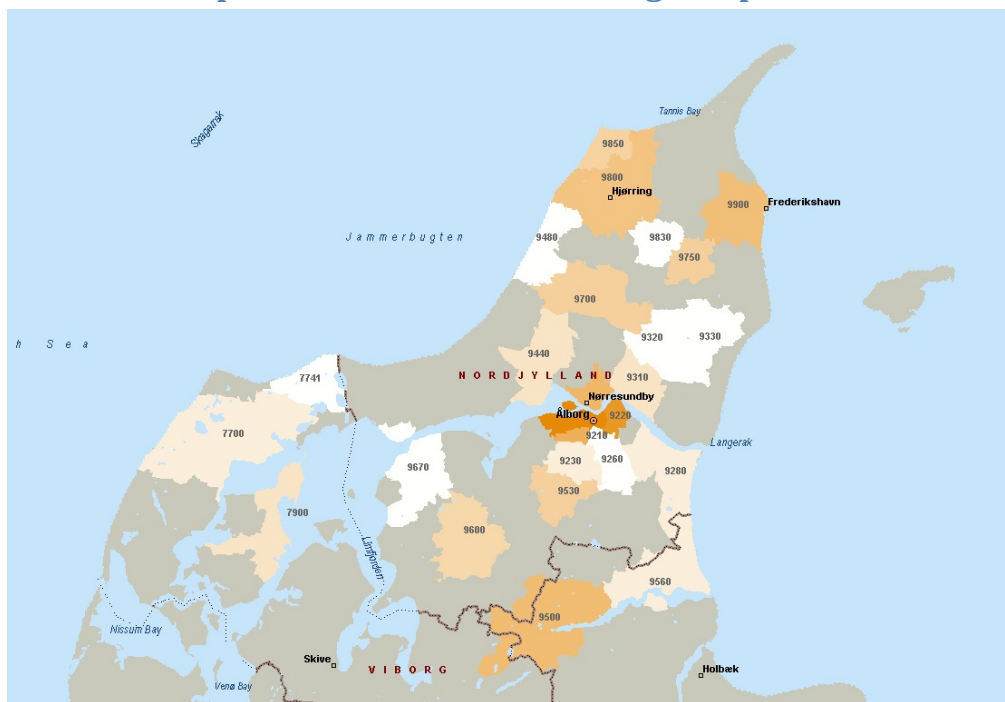


Table 64: Heat map of collaboration based on zip codes

## 13. Concluding remarks

We have now been through the data on collaborative agreements between Aalborg University and the partners located in Northern Jutland. We set out to cover the following agenda in this paper:

1. To see the status and trends in the collaborative activities
2. To establish whether the database as it is structured today could be improved for the sake of creating management reports on the data
3. To estimate the cost-benefit of upholding such a database
4. To speculate on the costs and benefits of creating a database of student reports on projects done in collaboration with the business community

Our analyses have shown the importance of testing for outliers and rinsing the data for funding without any ongoing research-based process underneath. The status shows a healthy development which has not been scarred by the ongoing financial crisis. Importantly, our data shows that Aalborg University has a firm grasp on a wide range of SME's and that one of the strongest trends in the dataset is the growth in SME collaborations.

What the database does not tell us is a series of aspects concerning the momentum and success rate, both in terms of project management success such as meeting budgets, keeping deadlines and having a good environment around the project, and success of the project in terms of reaching the pre-agreed goals. Such

data are not easily accessible neither through the businesses, the academics nor their support staff without direct contact. We estimate that one full-time research assistant per year would be able to track the following aspects of collaboration success:

- Phase tracking according to planned
- Meeting budgets
- Project management success
- Performance management and incentives
- Alignment of interests before and during the project
- Knowledge flow during the different phases of the project
- Bi-directional knowledge transfer
- Estimating the value creation of university-industry collaborations

The costs of upholding such a database ought not be incurred unless this initiative is the part of bigger plan like e.g. a longitudinal research project into the aspects of collaborative success and failures putting Aalborg University at the forefront of research into creating successful Triple-Helix constellations, a marketing exercise towards politicians, or that the university wishes to uphold a distinct focus on being a successful collaborator with the business community. The real question here is: "What is the value creation in measuring the value creation of collaborations"? And to answer it, we will need to be precise in defining how it is possible to visualize the value of collaboration. To this question we have no answer at present. However, preliminary data indicates that perceived success of a project is not necessarily related to meeting all milestones or attaining all of the set out goals. Rather, the value may be found in establishing a continuous dialogue where all parties enrich one-another and learn from the other partners' key competences.

### 13.1 Concerning students

The key question with regard to the students is whether there are substantial benefits to outweigh the costs that may potentially be incurred in having to register the students, supervisors and businesses (this might in fact also go for non-funded collaborations between researchers and businesses)?

Potential benefits:

- Ability to conduct surveys of satisfaction among companies and students
- Ability to disperse student-use of companies in a more fair manner
- Ability to better align company expectations and demands for certain types of knowledge/students/size of projects
- Ability to coordinate student access, project types and create progression in the knowledge that the company receives

Potential disadvantages and costs:

- Bureaucratic if done manually
- Difficult to uphold data-discipline if no punishment available



- Hard to sell as an advantage to the administrative staff

Registration needs:

- Data would that be required
  - Semester, study, course title
  - Student names/emails, group no., supervisor
  - Company, contact person, email
  - Title of the project
  - Start date, proposed ending date
- Potential solution
  - Students can send in their front page in word, pdf, mail, picture, print to a central unit that can scan it using intelligent recognition software
  - Create a standard front page with ID-fields that make it easy for the software to read project front pages and insert them into a database
  - This can be done centralized via “studiekontoret” or via STADS (failure to comply equals no exam mark?)
  - The database can be used to generate random questionnaires to the involved
  - Combined with STADS, the amount of projects that are not finished on time can be tracked

## 14. References

The AAU contract-unit database