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

Authors

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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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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
2008	42	15	18	46	25	13	7	15	181
2009	46	26	12	42	25	10	2	13	176
2010	40	29	7	67	33	20	9	28	233
2011	68	28	15	43	69	3	7	15	248
Total	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:

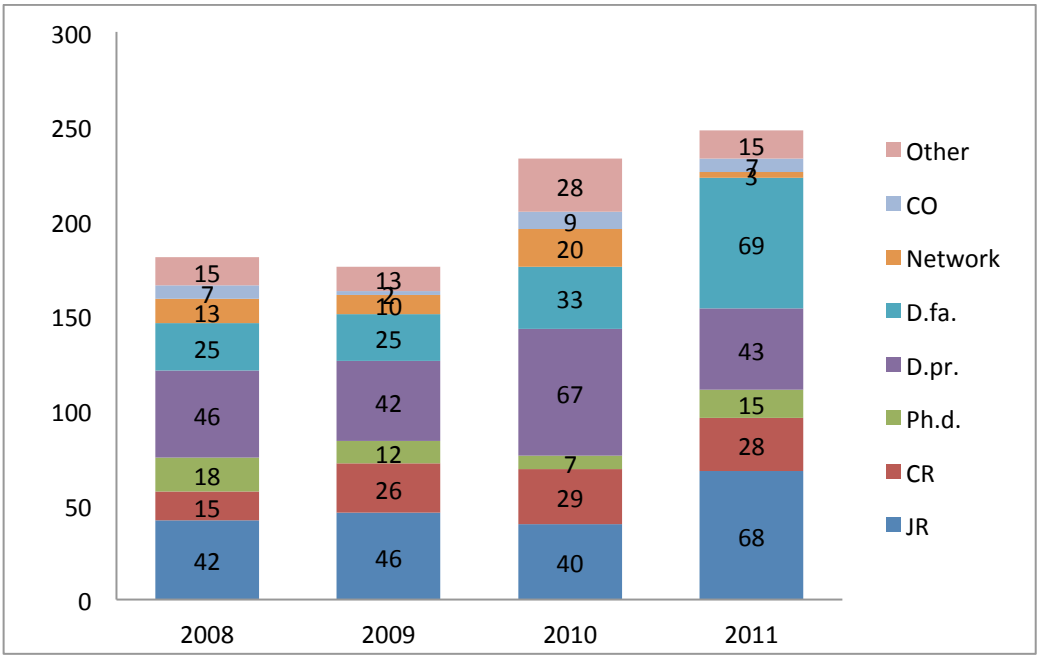

Table 2: Number of agreements per type of agreement

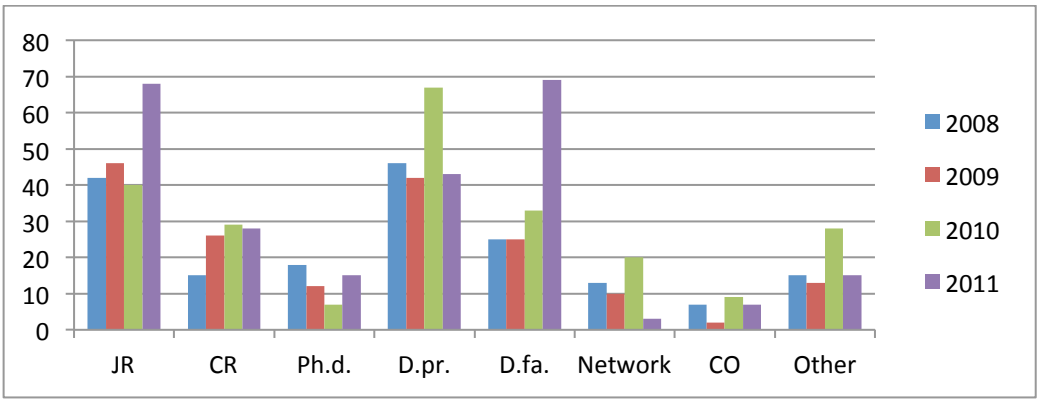

Table 3: The distribution of the number of agreements per type of agreement

- 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
2008	100	100	100	100	100	100	100	100	100
2009	110	173	67	91	100	77	29	87	97
2010	95	193	39	146	132	154	129	187	129
2011	162	187	83	93	276	23	100	100	137

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

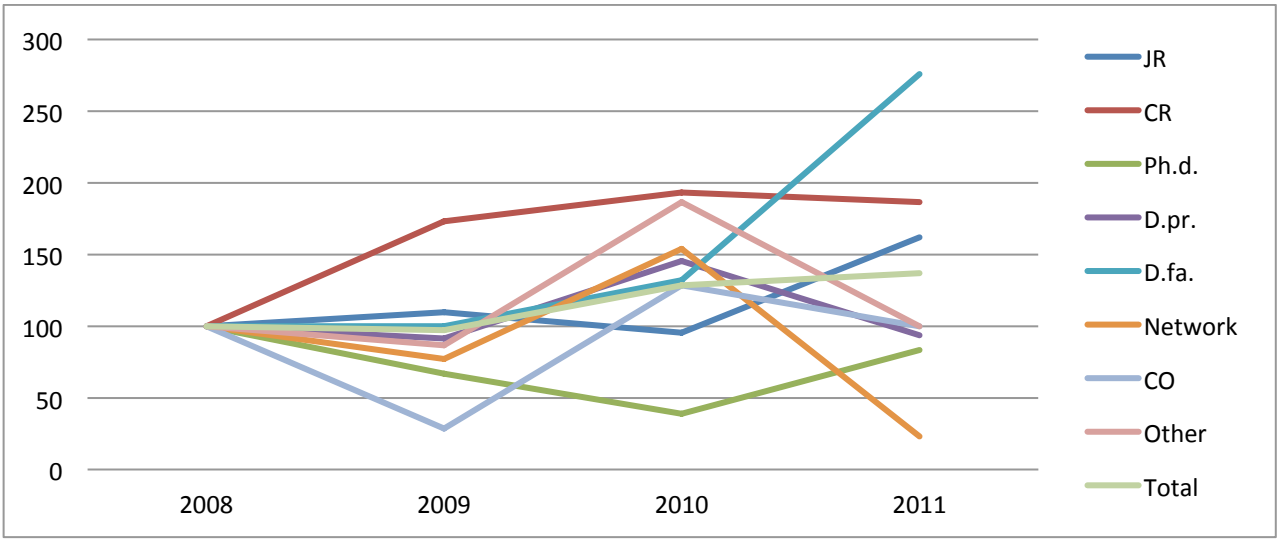

Table 5: The development in number of agreements per type of agreement

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
2008	23,20	8,29	9,94	25,41	13,81	7,18	3,87	8,29	100
2009	26,14	14,77	6,82	23,86	14,20	5,68	1,14	7,39	100
2010	17,17	12,45	3,00	28,76	14,16	8,58	3,86	12,02	100
2011	27,42	11,29	6,05	17,34	27,82	1,21	2,82	6,05	100
Avg.	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
2008	41	15	18	17	4	13	7	15	130
2009	46	26	12	12	2	10	2	13	123
2010	40	28	7	33	1	20	9	26	164
2011	65	26	15	23	8	2	5	14	158
Total	192	95	52	85	15	45	23	68	575

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

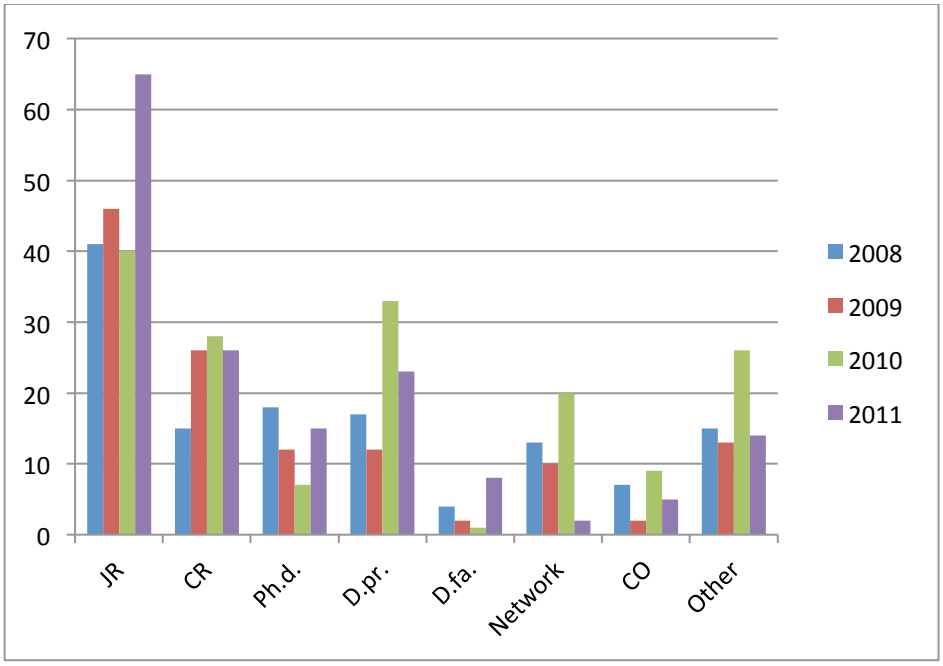

Table 8: The distribution of the number of agreements per type of agreement without foundations/associations

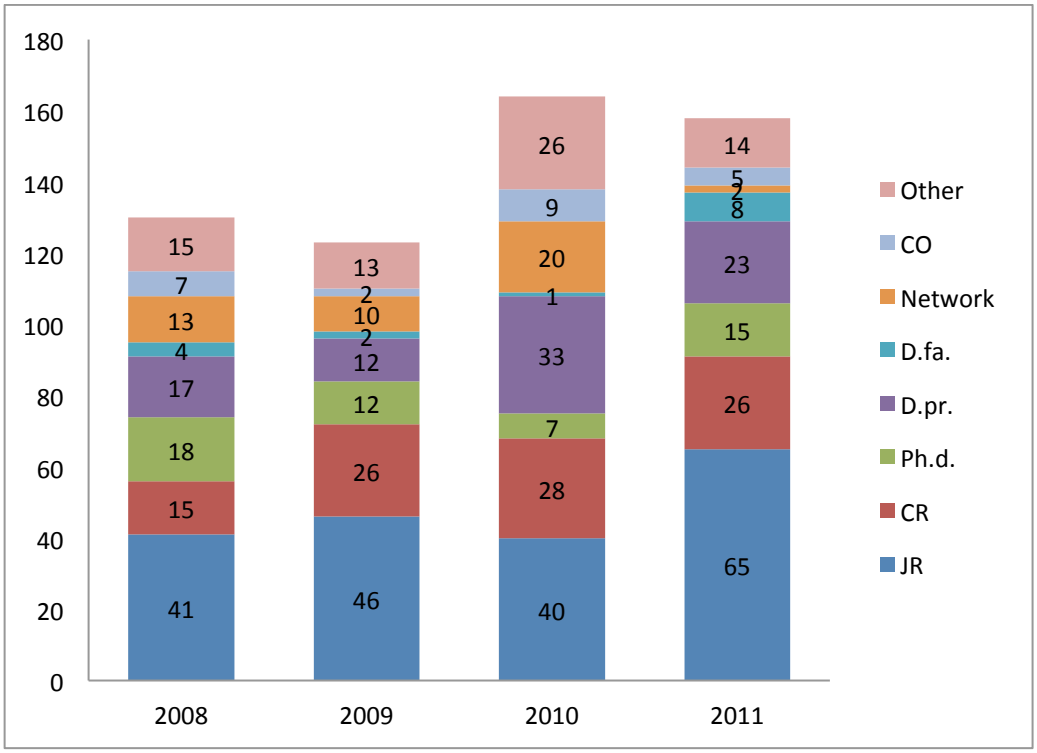

Table 9: Number of agreements per type of agreement without foundations/associations

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
2008	28.428.705	909.498	11.154.883	10.014.390	4.319.987	407.000	2.001.154	1.275.000	58.510.61
2009	18.935.839	1.586.323	4.151.650	19.036.952	5.505.387	1.562.500	2.491.964	175.000	53.445.61
2010	37.421.559	2.578.816	2.760.379	17.982.452	38.084.345	1.657.910	443.168	557.632	101.486.26
2011	13.747.398	916.917	8.827.949	25.894.847	30.658.045	25.000	2.557.554	1.600.000	84.227.71
Total	98.533.501	5.991.554	26.894.861	72.928.641	78.567.763	3.652.410	7.493.840	3.607.632	**297.670.20**

Table 10: Size of agreements per type of agreement

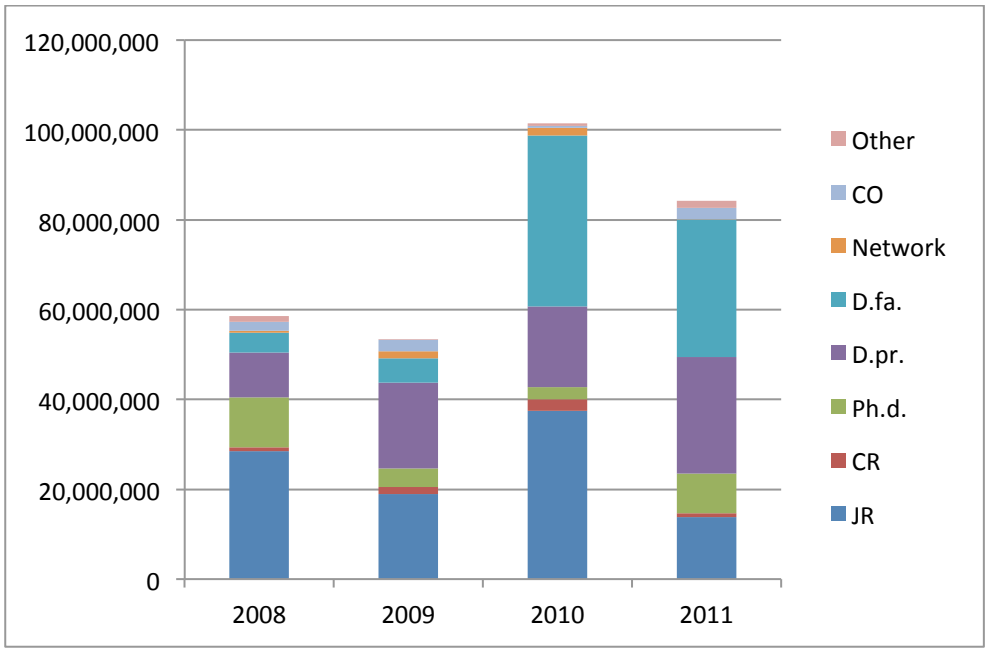

Table 11: Size of agreements per type of agreement

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
2008	49%	2%	19%	17%	7%	1%	3%	2%	100%
2009	35%	3%	8%	36%	10%	3%	5%	0%	100%
2010	37%	3%	3%	18%	38%	2%	0%	1%	100%
2011	16%	1%	10%	31%	36%	0%	3%	2%	100%
Avg.	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
2008	28.328.703	909.498	11.154.883	5.964.990	355.000	407.000	2.001.154	1.275.000	50.396.228
2009	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
2010	37.421.559	1.718.816	2.760.379	13.734.190	23.202	1.657.910	443.168	557.632	58.316.856
2011	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
Total	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

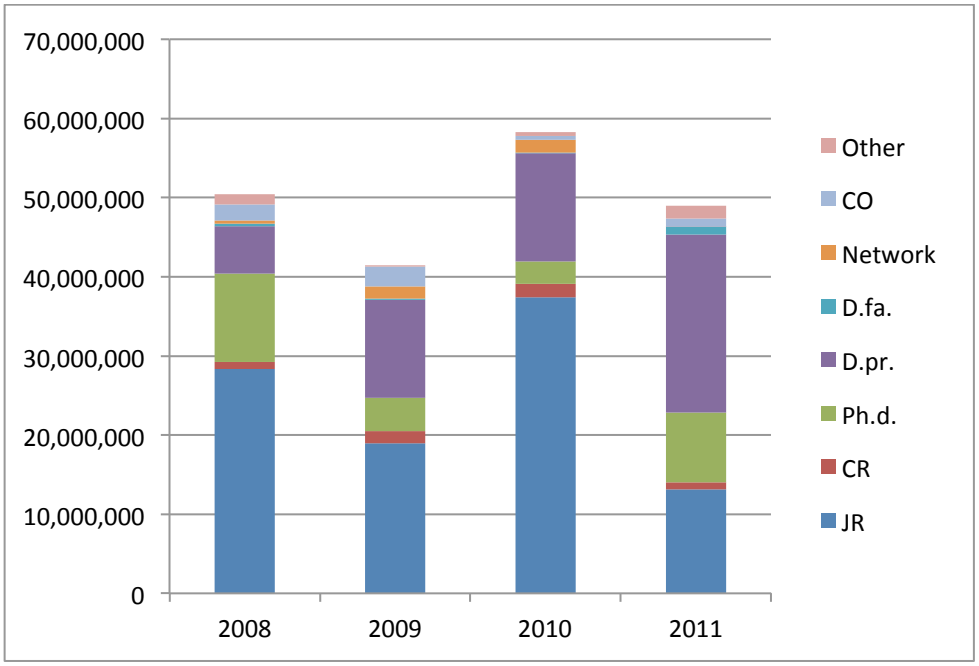

Table 14: Size of agreements per type of agreement without foundations/associations

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
2008	56%	2%	22%	12%	1%	1%	4%	3%	100%
2009	46%	4%	10%	30%	0%	4%	6%	0%	100%
2010	64%	3%	5%	24%	0%	3%	1%	1%	100%
2011	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
2008	676.874	60.633	619.716	217.704	172.799	31.308	285.879	85.000	323.263
2009	411.649	61.012	345.971	453.261	220.215	156.250	1.245.982	13.462	303.668
2010	935.539	88.925	394.340	268.395	1.154.071	82.896	49.241	19.915	435.563
2011	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.

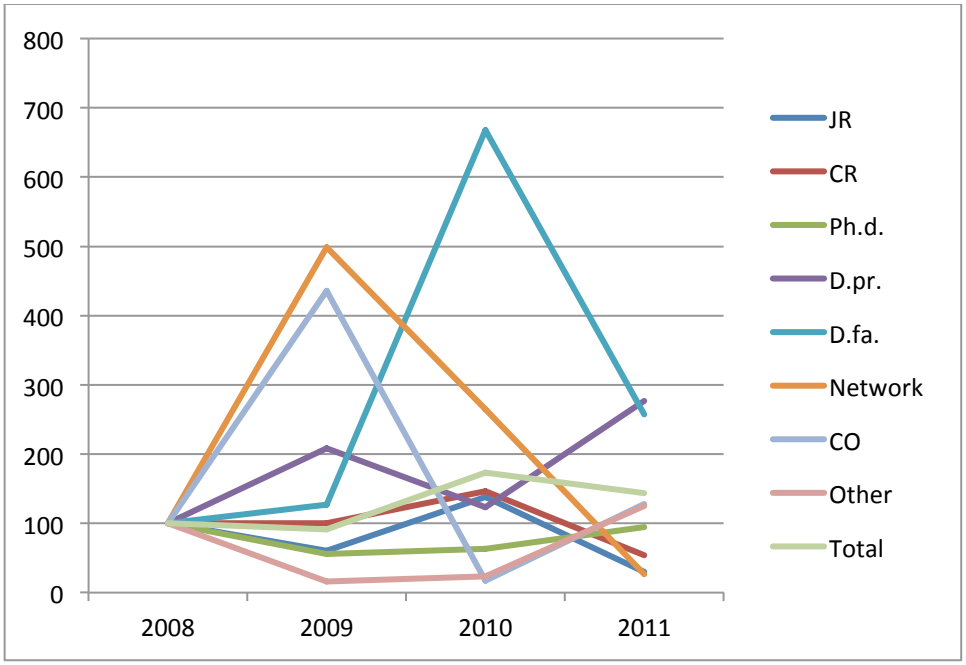

Table 17: The development in average size of agreements per type of agreement

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
2008	674.493	60.633	619.716	129.674	14.200	31.308	285.879	85.000	278.432
2009	411.649	61.012	345.971	296.121	4.600	156.250	1.245.982	13.462	235.542
2010	935.539	59.270	394.340	204.988	703	82.896	49.241	19.915	250.287
2011	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.

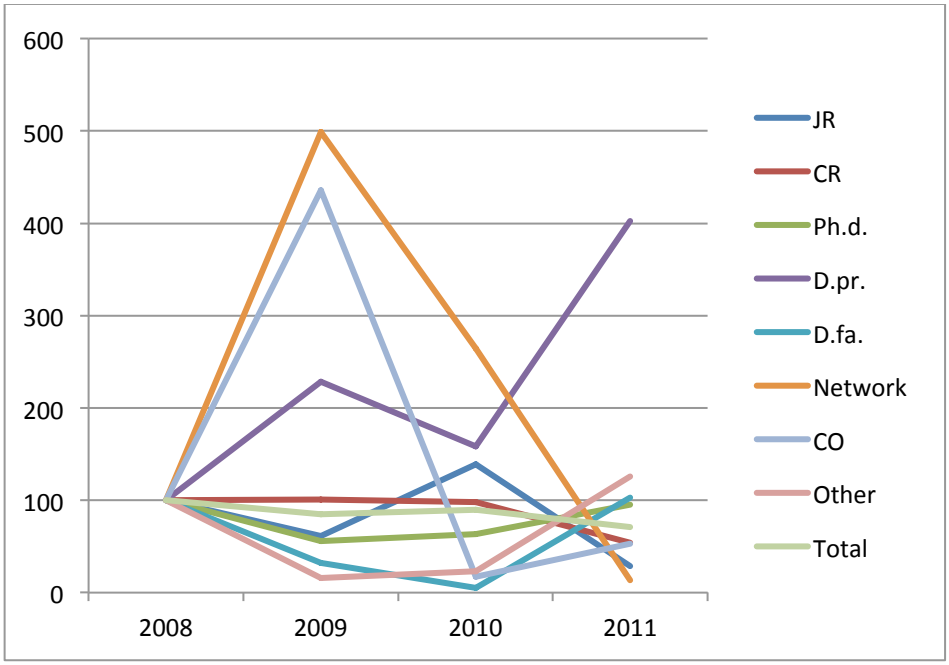

Table 19: The development in average size of agreements per type of agreement without foundations/associations

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:

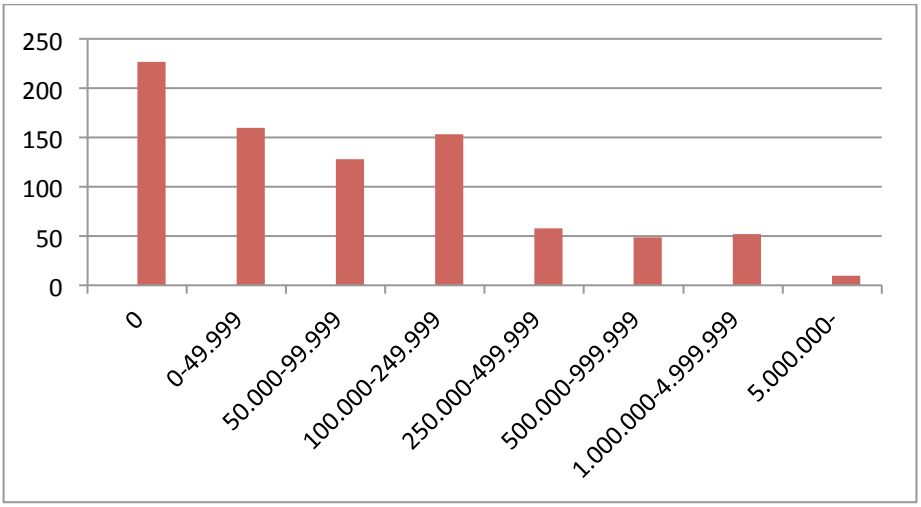

Table 20: The distribution of the sizes of funding

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:

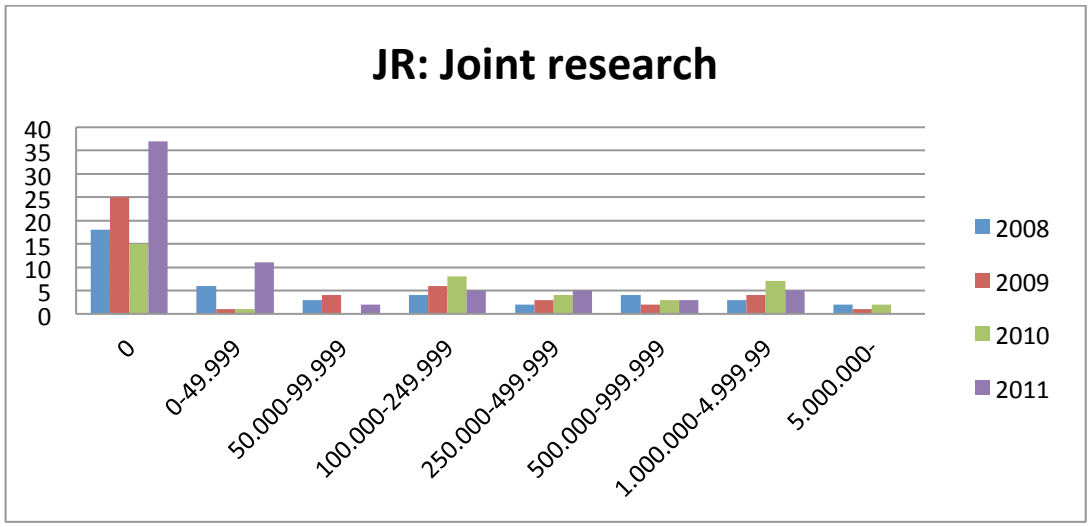

Table 21: The development in the number of joint research contracts

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.

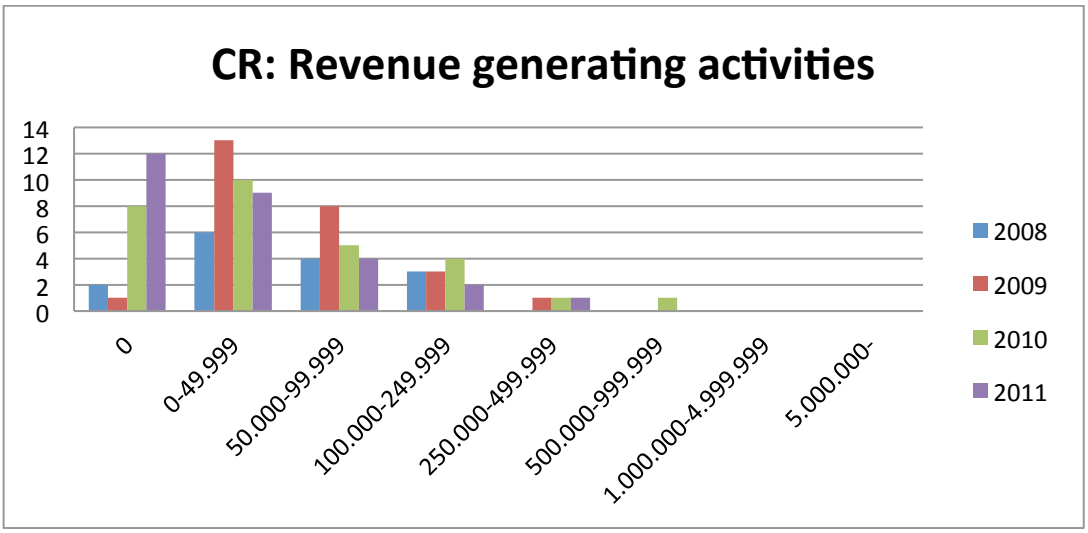

Table 22: The development in the number of CR contracts

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.

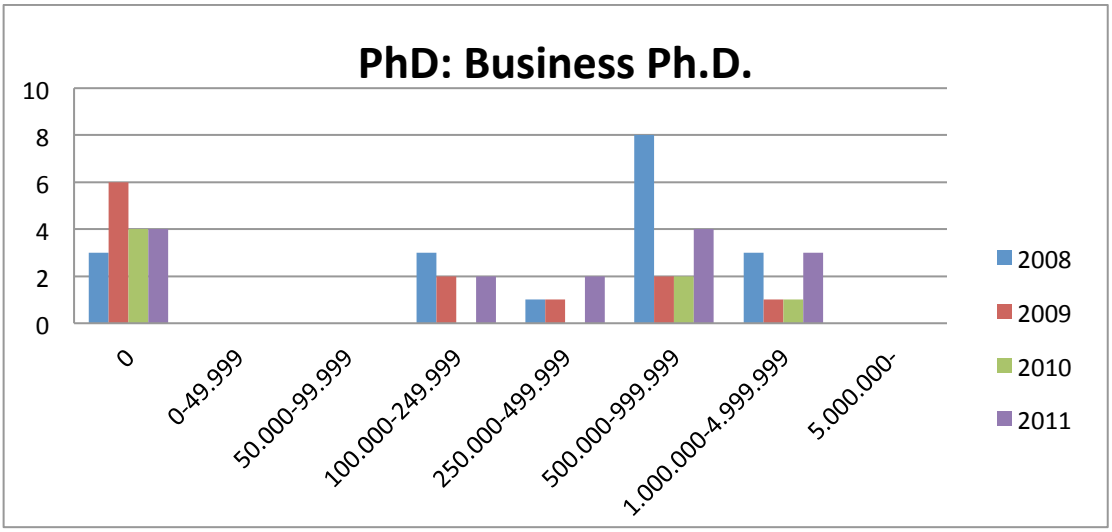

Table 23: The development in the number of Ph.D.'s

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.

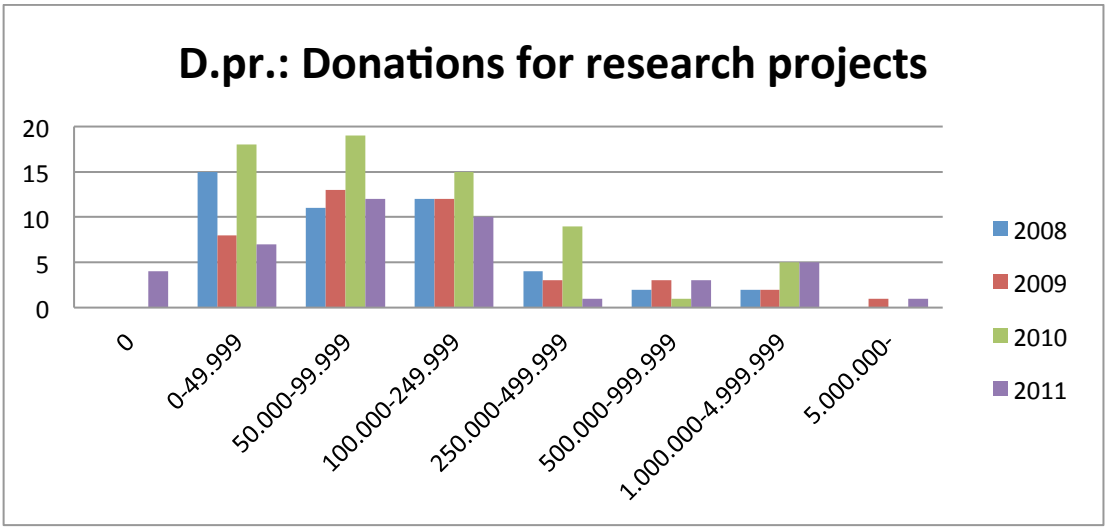

Table 24: The development in the number of D.pr. contracts

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.

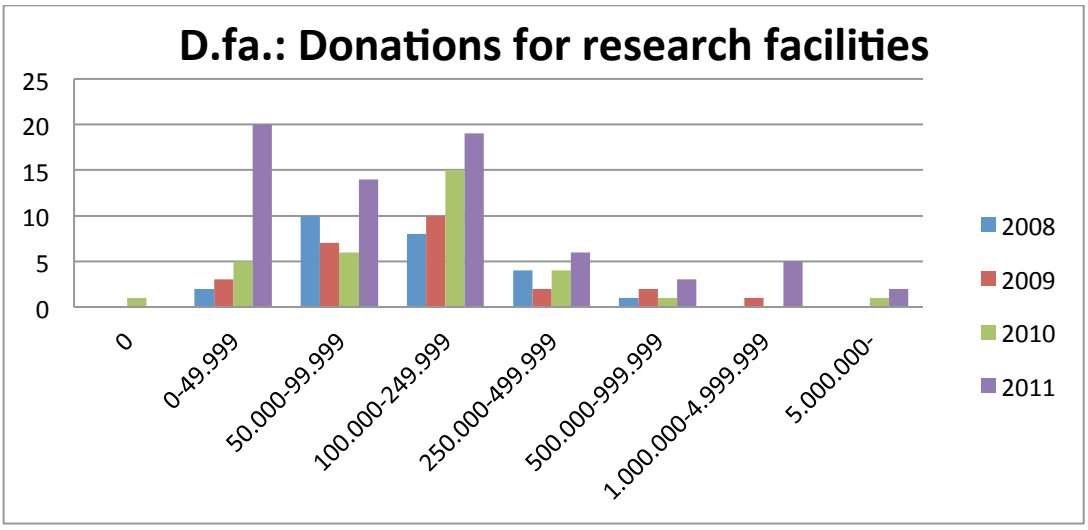

Table 25: The development in the number of D.fa. contracts

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.

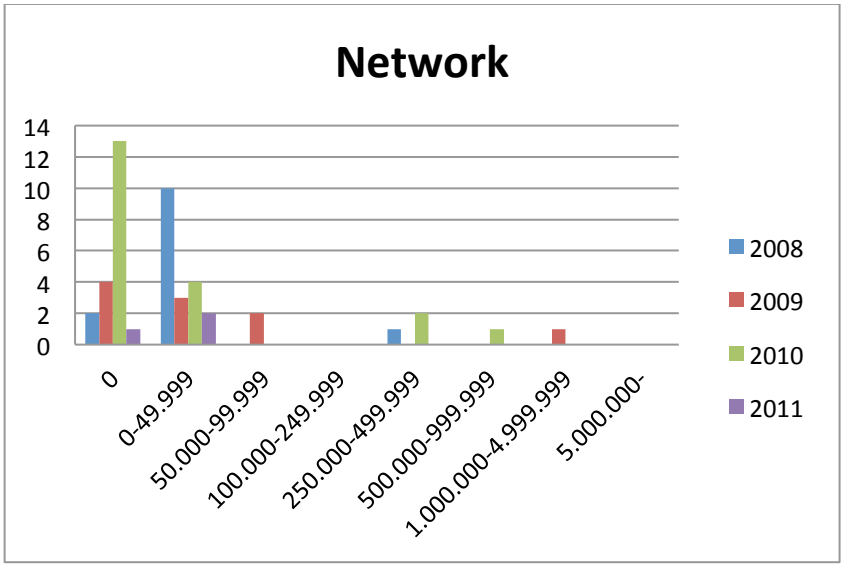

Table 26: The development in the number of network

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.

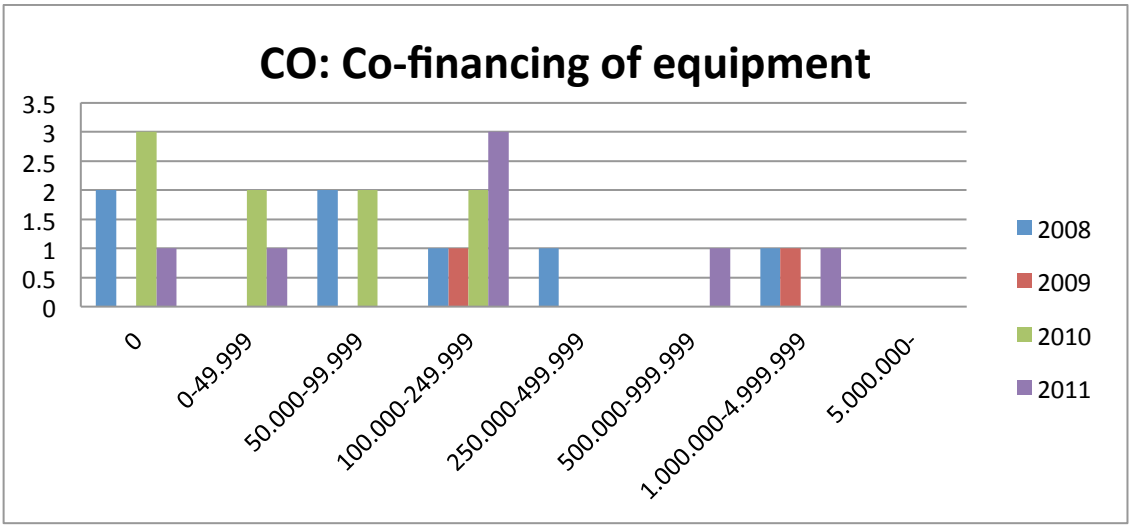

Table 27: The development in the number of Co-financing of equipment contracts

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.

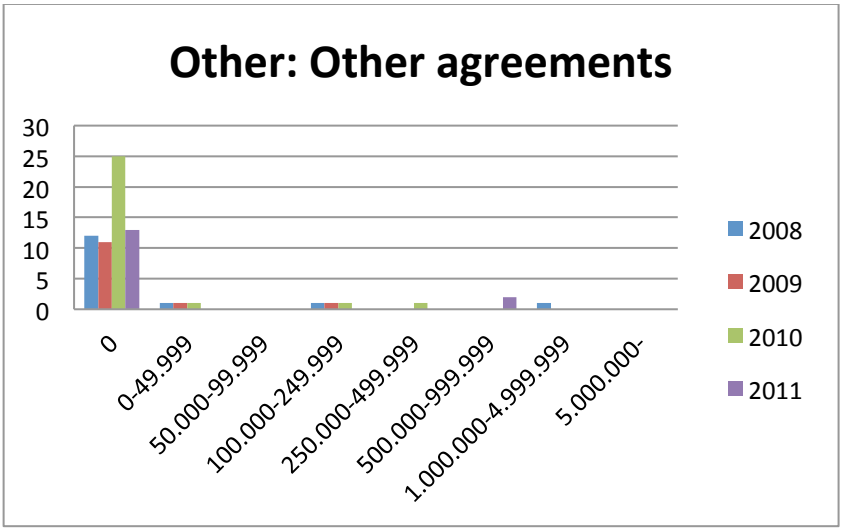

Table 28: The development in the number of other agreements

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
Total	488	100	206	**794**

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

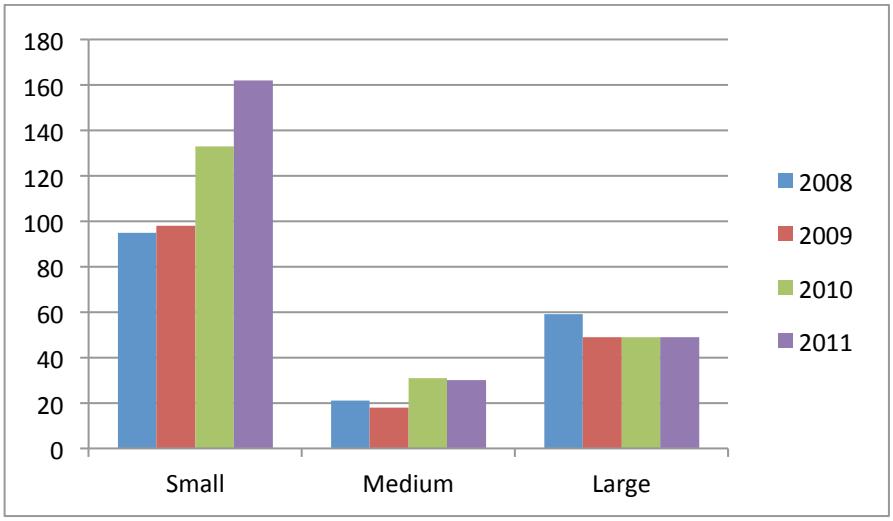

Table 30: The number of companies that have signed agreements with Aalborg University according to their size

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

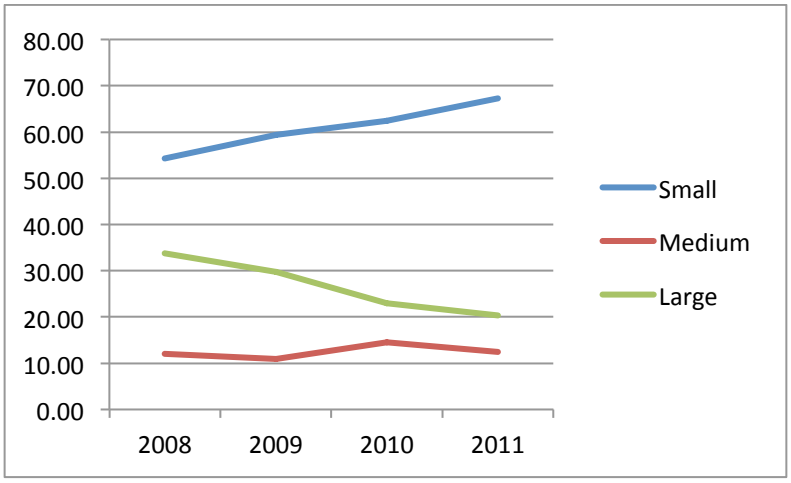

Table 32: Percentage of companies that have signed agreements with Aalborg University according to their size

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
Total	256	3	3	**262**

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
Total	232	97	203	**532**

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

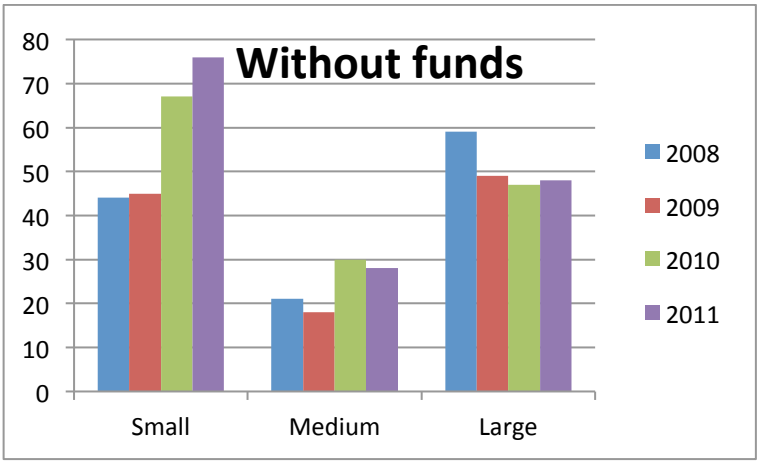

Table 35: The number of companies without foundations/associations based on company size

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	**100**

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

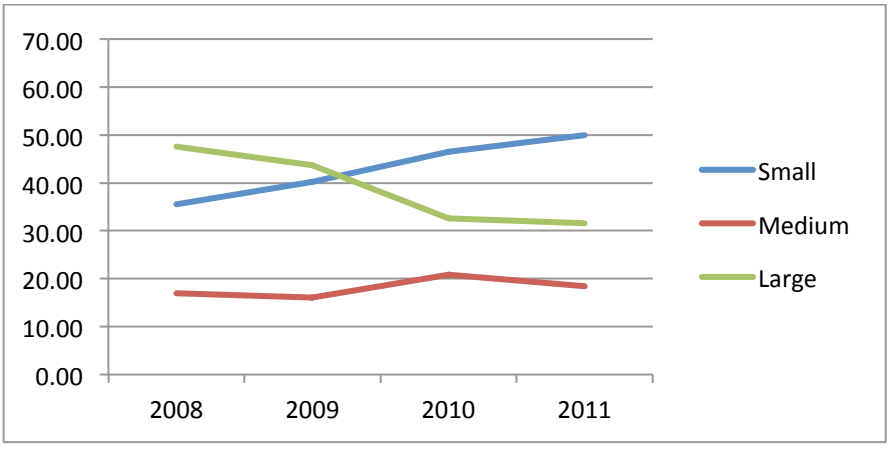

Table 37: The development in companies without foundations/associations based on company size

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

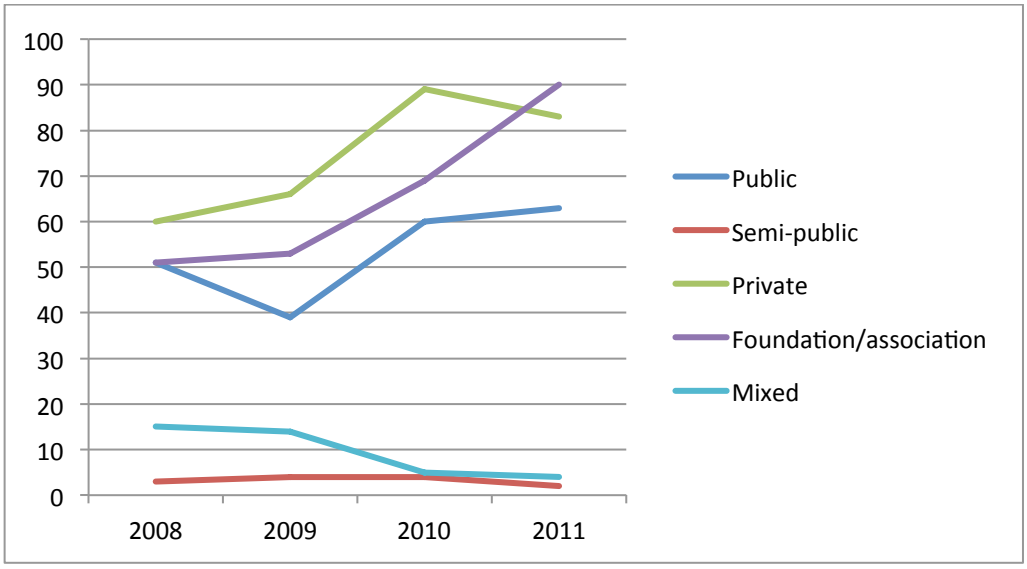

Table 39: The development in different types of companies signing contracts with Aalborg University

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

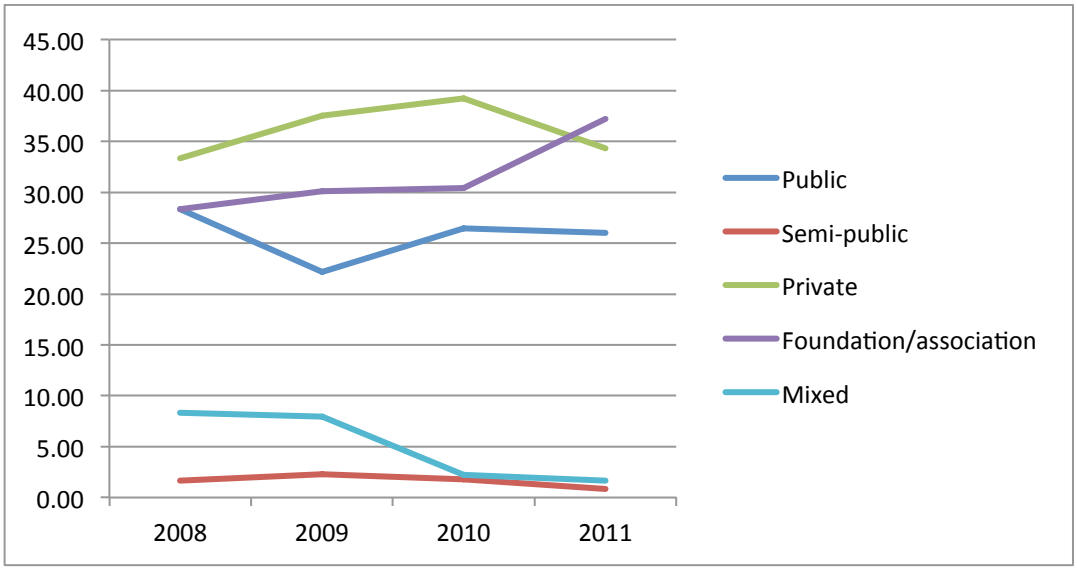

Table 41: The distribution of the different types of companies signing contracts with Aalborg University

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
Total	143.903.725	26.235.900	108.314.370	**278.453.995**

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.

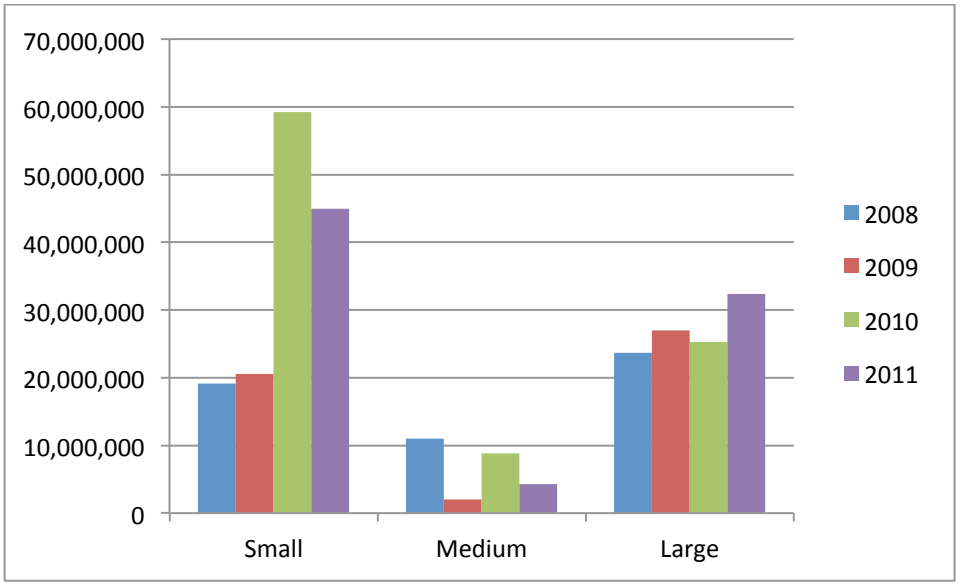

Table 43: The development in funding size based on company size

	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
Avg.	51,68	9,42	38,90	100,00

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
Total	97.834.569	419.583	260.600	**98.514.752**

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
Total	46.069.156	25.816.317	108.053.770	**179.939.243**

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

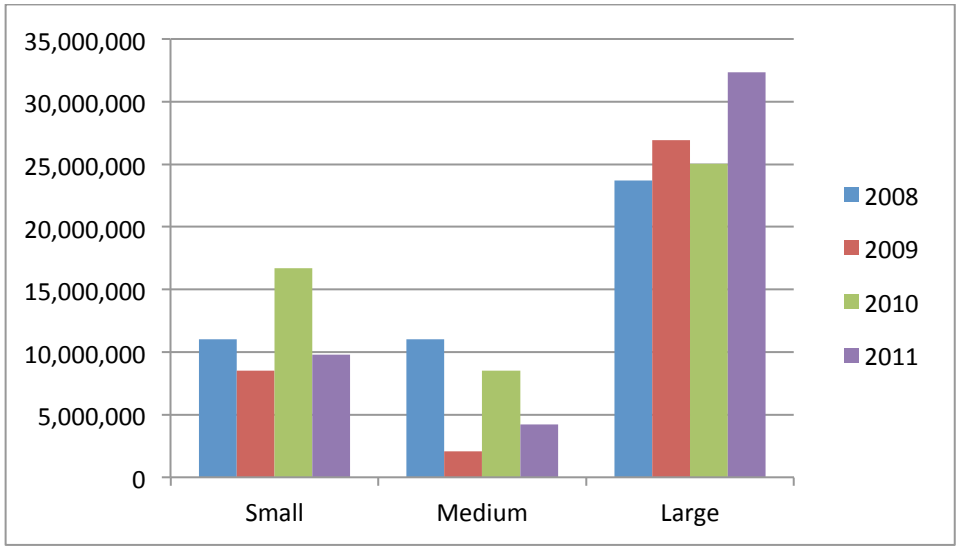

Table 47: The development in funding size without foundations/associations based on company size

	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	**100**

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.

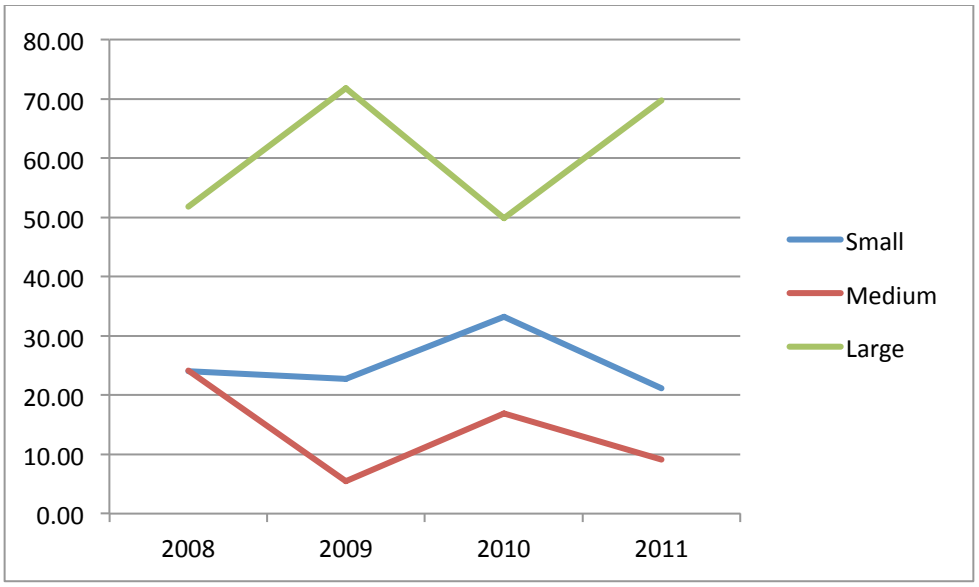

Table 49: The development in funding based on company size without foundations/associations

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

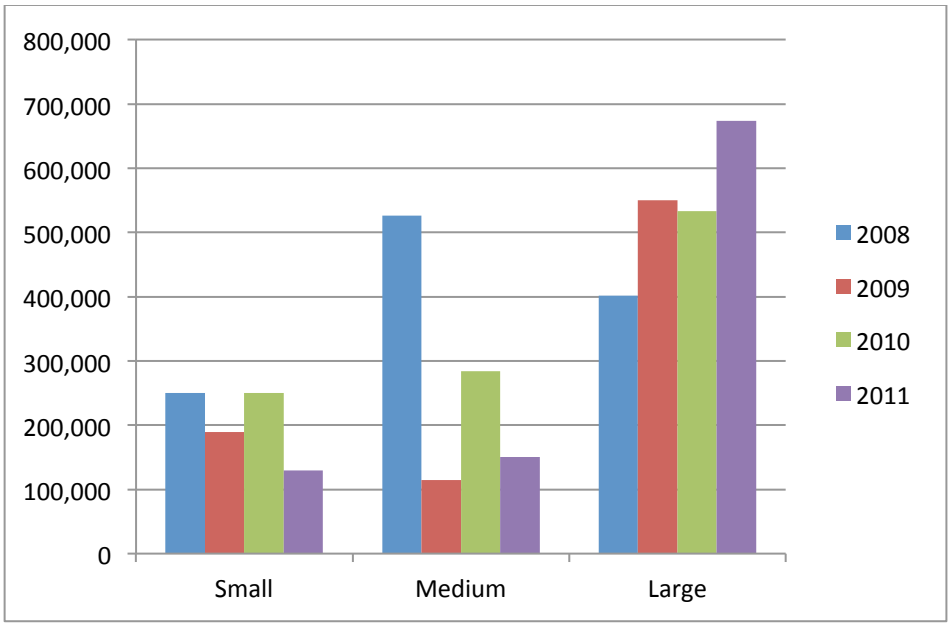

Table 51: The average grant size based on company size

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
Total	**120**	**122**	**145**	**166**	**553**

Table 52: Number of agreements based on industries

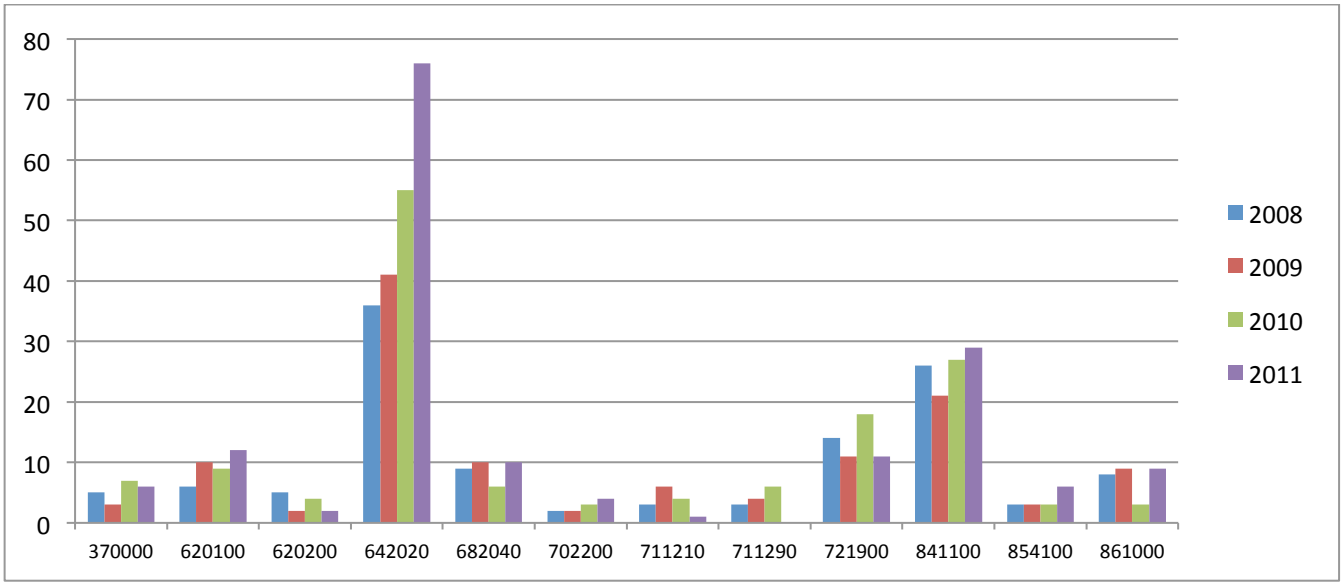

Table 53: Distribution of agreements based on industries

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
Total	**29.858.567**	**40.018.274**	**70.214.339**	**68.728.778**	**208.819.957**

Table 54: Size of agreement based on industry

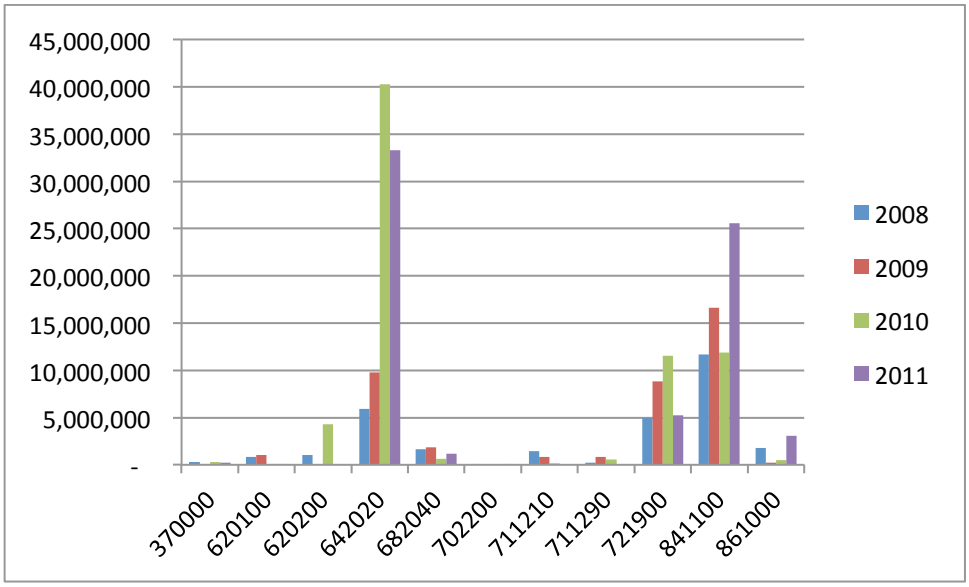

Table 55: Distribution of size of agreement based on industry

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

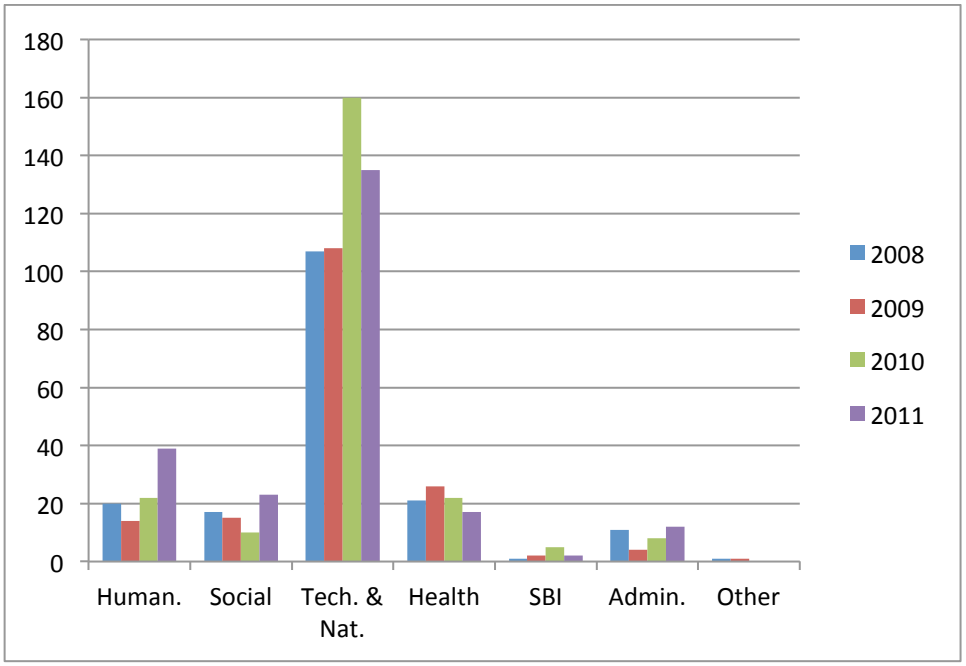

Table 57: Distribution of number of funding agreements based on faculties

	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

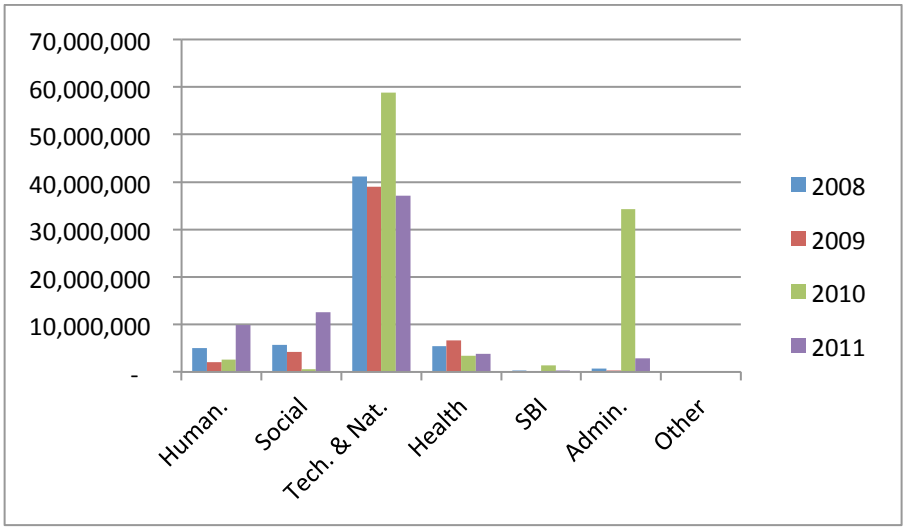

Table 59: Distribution of the size of funding agreements based on faculty

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
Total	160	159	201	233	188,25	753

Table 60: Number of agreement based on zip codes

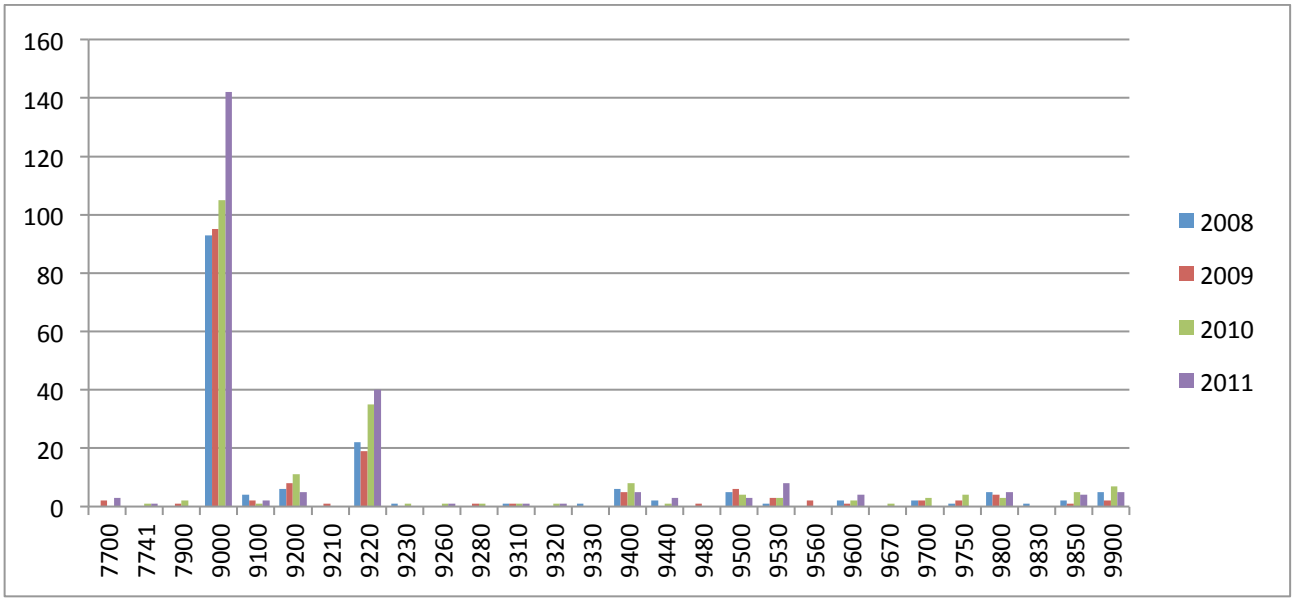

Table 61: The distribution of the number of agreements based on zip codes

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
Total	51	53	67	87	258

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:

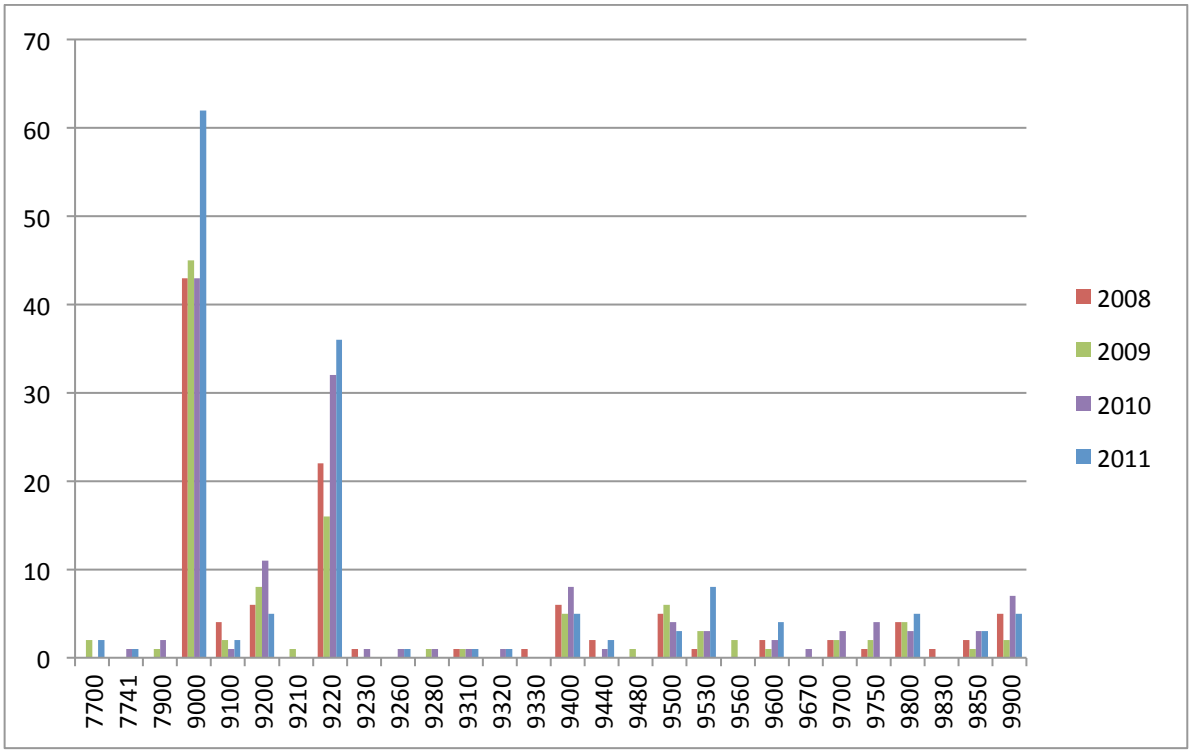

Table 63: The distribution of the number of agreements without foundations based on zip codes

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

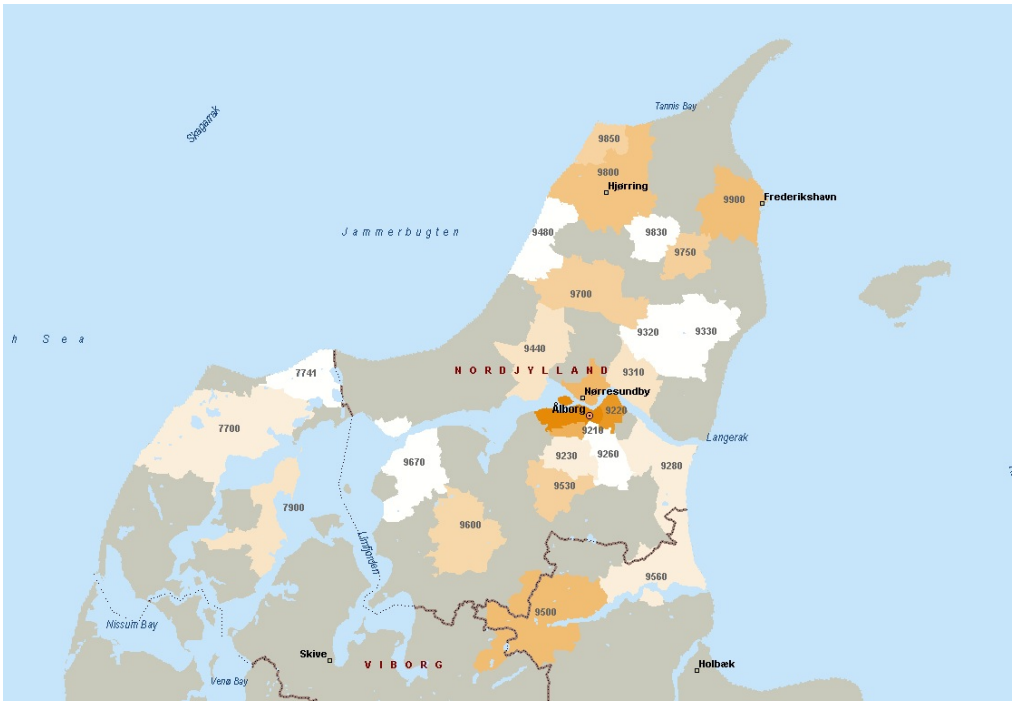

Table 64: Heat map of collaboration based on zip codes

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