Master's Degree Dissertation

Feminized boards of directors in SMEs

Effects on employees' perceptions and firm performance

Author Erola Palau Pinyana

Master of Science in Management UPF Barcelona School of Management

Academic Year 2019 – 2020

Mentor Oriol Amat

BARCELONA SCHOOL OF MANAGEMENT

Abstract

Upper management positions seem to be male-dominated. Research has shown that a positive association exists between firm performance and the presence of women in boards of directors. This study aims to determine the relationship in Catalan SMEs and analyse employees' perceptions on the judgement of their possibilities to move upwards in corporations with feminized and masculinized boards. The results indicate that Catalan SMEs with feminized boards show less potential of financial risk and more satisfied employees than firms with masculinized boards.

Keywords: women on boards, gender studies, glass ceiling, Catalan SMEs, board composition, board of directors, firm performance, feminized boards.

Acknowledgements

The present thesis is the result of a research period in which guidance, help and support of many people have been essential.

First, I would like to thank my supervisor, Professor Oriol Amat, for guiding me in defining the path of this research. It was a privilege to receive his wise and insightful comments. I also want to express my gratitude to Professor Walter Garcia-Fontes, for reviewing the research methodology and results; and to Professor Michael J. Greenacre for sharing his extensive knowledge on the methods for analysing multivariate data.

My heartfelt thanks also go to all the respondents who took the time to participate in the survey. Without them, this project would not have been possible.

I also want to extend my appreciation to Anna-Liisa, Julie, Vince and Todor for constantly driving me to be better; to Clàudia and Jennifer, for their optimism and reassurance; and to Joanna Leszczynska and Jasmina Osinska who pushed me to pursue the Master's degree.

Last but certainly not least, my most deep and sincere gratitude is for my parents, Àngels and Jordi and to my brother, Eloi, for their moral support, encouragement and for showing me that effort and constant work pays back.

Table of Contents

The under-representation of women in boards of directors is a pressing issue which affects enterprises across the whole world. It is widely known that corporate leadership is led by men. We can find proof of that in Bart and McQueen's (2013) study. They claim that around 20 to 25% of women are represented in executive positions and far less (9%) are part of boards of directors in enterprises in their nations.

The topic of women in boards of directors and its relation to performance appeals to me due to several reasons. First and foremost, both firm performance and diversity are two topics that interest me. Therefore, having the chance to study their relationship and impact on employees is thought-provoking. Secondly, while more research has been done on the topic in recent years, the majority of empirical results are based on US data, and on some European companies. Few researchers have taken into consideration the situation in Catalonia, and even less in Catalan small and medium enterprises. Considering the high amount of small and medium enterprises (SME)[1] in the region, there is compelling need for research in the subject. Thirdly, as I am Catalan and all my graduate studies have been abroad, I am keen on increasing my knowledge on the Catalan scene. I aim to reduce the research gap in Catalonia and contribute to the growing number of studies investigating diversity and firm performance outside the US.

Therefore, the goal of this thesis is to add to the steadily increasing amount of research on the situation of gender equality in Catalan small and medium enterprises. In particular, I study the association between women in boards of directors and firm performance, as well as the impact that a feminized board has on employees regarding their opinion on the possibilities to climb the corporate ladder.

In the paper, the reader will first find a conceptual framework where I discuss previous studies done in the field. It sets the context of the situation, it aids in defining the research questions and it prompts speculation. Then, I move on to describe the empirical studies I have undergone to answer the research questions. This part provides the methodology, the details of the data collected and analyses performed. It is followed by a section on the explanation of results. Finally, the paper comes to an end with the discussion and conclusion sections. References and appendices can be found in the last part.

[1] SME: as defined by the European Commission, SME stands for small and medium enterprise. A small enterprise has a staff headcount of less than 50 employees and a turnover of less than €10 million. A medium enterprise has a staff headcount of less than 250 employees and a turnover of less than €50 million (European Commission, 2003). In the paper, reference is made to individually owned SMEs.

2. Conceptual model

A systematic review of existing literature has been done to design how the research will be conducted. Secondary research has been carried out to avoid repetitions on previously done research, to have insight on the theoretical and methodological approaches to study the topic at hand, to know the scope of what has already been studied and to contribute to my understanding of the topic. Up to date and relevant publications have been selected related to corporate leadership, including publications in academic journals, projects presented in congresses and databases, among others.

Overview:

According to the Organisation for Economic Co-operation and Development (OECD) women represent more than 50% of the graduates awarded in business, administration and law in most universities worldwide. In 2016 in Spain, women accounted for approximately 56% of the business degrees holders. The European average was at more than 60% (OECD, 2018). So, we can assume that there is no shortage of well-prepared young women who can start climbing the corporate ladder. However, what happens to them? Why don't they become managers? Based on a 2009 study from C*orporate Governance International,* women were present at around 9% of corporate boards, on average (Van der Walt and Ingley, 2003).

Association between board composition and firm performance:

There is a growing body of literature on the demographics and composition of boards. Johnson, Schnatterly and Hill (2013) demonstrated that board composition has direct impact on firm outcomes. In a popular article published in *Harvard Business Review,* J.A. Sonnenfeld (2002) ascertains that board composition is a relevant aspect in the making of above-average performance boards. Other ingredients that this author points out are that boards must be subject to consistent performance evaluations and be well composed of liable individuals who appreciate the work and respect each other.

The focus on diversity and gender equality[2] studies has also intensified. The results on studies concerning equality in corporate settings argue that women should not have to work harder than

[2] Gender equality (or equality of sexes): state of equal rights, responsibilities, interests, needs and opportunities between women and men. Related to gender balance: equal participation of women and men in all areas of work (EIGE, 2020).

men to gain senior leadership positions and also pose strong arguments in favour of increasing the representation of women in boards of directors. Other studies also suggest that ethnic diversity has positive implications in firm performance (Marimuthu, 2008).

Association between feminized[3] boards of directors and higher organisational performance:

The presence of women in boards of directors has been linked to higher organisational performance. For instance, Joy et al. (2007) state that boards with high female representation experience 53% higher return on equity, 66% higher return on invested capital and 42% higher return on sales (Joy et al., 2007). They also found that North American firms that had just one female director reduced the risk of bankruptcy by 20% (Joy et al., 2007). Additional research showed that when women directors are appointed, boards tend to adopt new governance practices earlier, such as board evaluations or director training (Singh and Vinnicombe, 2003), and they are more likely to ask a higher amount of questions rather than to nod through decisions (Konrad, Kramer and Erkut, 2008).

In the same vein, Campbell and Mínguez-Vera (2008) in the *Journal of Business Ethics* also posit that the gender composition of the board of directors may affect the quality of their monitoring role and thus the financial performance of the firm. Their findings include that gender diversity (as measured by the female percentage on board) has a beneficial effect on firm value. As pointed by the authors, this positive impact occurs if the women bring an additional perspective to board decision making. Conversely, in the case that they are in the board due to the societal pressure for greater equality of sexes, the impact on firm performance may be negative. This is backed up by other researchers such as Van Der Walt and Ingley (2003) who mention that organisational performance is positively related to the abilities of individual directors and their professional background regardless of gender.

Having women directors also influences the amount of strategic change, according to an article published in the peer-reviewed journal *Organization Science* by Triana, Miller and Trzebiatowski (2014). The results from this study show that the relationship between board gender diversity and the amount of strategic change is positive when firm performance is high and women directors have greater power.

Several researchers in the US like Bart and McQueen (2013) agree that there is a positive correlation between the presence of female directors on boards and corporate performance. These results

[3] Feminized company: Enterprise in which the board of directors is composed of 50% or more women.
Masculinized company: Enterprise in which the board of directors is composed of 50% or more men.

suggest that women appear to make better directors than men. They researched the possible reason behind this and established that women made significantly better complex moral reasoning (CMR) decisions than men. Thus, since managers are compelled to make decisions in the best interest of their corporation while taking the viewpoints of multiple stakeholders into account, having a significant portion of female directors (provided they have highly developed CMR skills) on board appears to be an important resource for effective decision-making.

Situation apropos of the glass ceiling:

Glass ceiling, as defined by the *Merriam Webster* dictionary, is an intangible barrier within a hierarchy that prevents women or minorities from obtaining upper-level positions.

The gender gap in the corporate world suggests negative implications in society and unequal rights and opportunities in the labour market, as it implies that women have obstacles to achieve high responsibility positions in firms. The reason behind the existence of such barriers has been closely examined and it essentially revolves around corporate culture and on the fact that, traditionally, managerial statuses are masculinized positions.

The term "homosocial reproduction" refers to the tendency of humans to prefer to select others who are socially similar to themselves and who have similar characteristics in terms of age, gender, background and experience. Arfken, Bellar and Helms (2004) argue that selection on social similarity plays a crucial role in shaping the demographic composition of organizations, as well as the structure of opportunity within them. Along these lines, when corporations have more men than women (or vice versa) in influential positions, the culture tends to adopt attributes that favour the dominant gender (Jackson, 2001). Others consider that evaluation bias against women is the reason behind the glass ceiling phenomenon. Studies suggest that the attitudes held by organizational members (i.e. women not viewed as leaders) contribute to the hindrance of women's career advancement (Broadbridge and Weyer, 2007; Johns, 2013).

To the author's knowledge, the employees' opinion on climbing the corporate ladder has been scarcely studied. Very few publications can be found in regards to how the opinion of men and women differs concerning their potential to become managers. Also very few studies delve into how board composition (feminized or masculinized) influences employees' judgement. One example is the research done by Baumgartner and Schneider (2010) from Michigan University. The sample of women in this study shared the impression that they did possess the knowledge and experience to

evolve vertically in the organisation, but at the same time, considered that they were in a disadvantageous position when compared to their male fellows.

Policies in favour of gender equality in firms are being put in place in some countries. Norway and Canada, for example, have imposed quotas to increase the proportion of women on boards. Other countries, such as Denmark and Sweden, have established a so-called "comply or explain" code which requires that diversity ought to be considered when appointing members of the board (Bart and McQueen, 2013).

Gender inequality Spain and Catalonia:

In Catalonia, men are in the managerial positions of the Catalan companies with higher turnover. According to the SABI database, in 2015, out of 5000 Catalan companies with high turnover, 4020 (80,4%) enterprises were led by men, 312 (6,24%) by women, 188 (3,76%) had mixed boards of directors, and the remaining 480 (9,6%) did not specify the gender composition of the board of director and/or were led by other enterprises (Bureau van Dijk, 2019).

Gender inequality in the region can be seen in the lack of women in managerial positions in Catalan enterprises. Based on the indicator of gender inequality of Catalonia, developed by the Barcelona Chamber of Commerce, gender imbalance in the region had a decreasing tendency from 2005 to 2015. In 2015, it became stagnant and soared up to levels higher than 10 years before. The percentage in 2015 was 36% whereas in 2005 it had been at 35%. In addition, in the year 2017, the percentage of women in managerial positions was 54% below the counterparty (Cambra de Comerç de Barcelona, 2019). Another study by Llorà Bach (2019) on Catalan enterprises also found the same tendency. The sample reflected 41,6% of all Catalan enterprises and summarized that 33,6% of the firms studied had male directors versus 3,2% that had female directors.

A concurrent topic is the repercussion that gender inequality has on salary differences. According to Torns (2004), based on data from 2004, women in managerial positions earned a difference of -20% € per hour compared to men. Torn's report also concludes that even when the woman's capabilities and experience are superior in relation to that of a man, it does not translate into a significant reduction in the inequalities in the labour market.

Vivas et al. (2018) argue that in Catalonia, the aforementioned glass ceiling is rather a "cement roof". Female talent in power positions is not predominant in large Catalan enterprises. A substantial

difference is found between the 81,8% of masculinized boards of directors versus a mere 8,01% of feminized boards.

In terms of the situation across industries in the region, in absolute numbers, the sectors where there are more female managers are (following this order): wholesale trade of food and beverages, other wholesale trade and (against stereotypical thinking) the repair and sale of engine operated vehicles. In percentages, education, health and social services sectors are predominantly led by women, as well as retail trade of clothing, pharmaceutical products, cork and wood. Mixed boards of directors are found in majority in real estate, in extractive industries and in non-metallic mineral products. Masculinized boards of directors are found in manufacturing industries, communication and the wholesale trade of technology and information (Vivas et al., 2018).

In Spain, as explained in an article published by *EFE* (2019), since 2007, all companies exceeding 50 workers are obliged to include a so-called equality plan which guarantees the same professional opportunities between men and women. According to *EFE*, in 2019, there was still a high amount of firms in Spain which did not comply with the plan. It is important to stress on the fact that the equality plan does not oblige companies to split their workforce between an equal amount of men and women, which is a common misunderstanding. The law aims to ensure equal opportunities between the two genders. It is frequently argued that those plans are not effective because firms do not wish to fight against inequality but rather solely care for their individual profitability. It is not uncommon for Spanish companies to prefer to pay the fine from not following such plans rather than actually take action to solve this issue.

Because gender inequality in Catalan firms is a concern, the *Generalitat de Catalunya* developed a law for equality in Catalonia (*llei d'igualtat de Catalunya*), approved in 2015. Its purpose is to promote the effective equality of women and men in companies and institutions (Portal Jurídic de Catalunya, 2019).

Research question and hypothesis:

To reduce the research gap and gain insight on the current situation in Catalan enterprises, an empirical study will be carried to answer the two research questions. Hereby stated:

Research Question I: **Is there is any association between firm performance and feminized boards of directors in Catalan SME's?**

Research Question II: **How does the opinion of employees in Catalan SMEs in regards to their possibilities to move upwards in the enterprise change depending if the company is feminized or masculinized? Is there a difference in opinions between genders?"**

The hypothesis for the first research question, prior to the empirical study, is that there exists a positive (but not strong) relationship between a feminized board of directors and firm performance in Catalan SMEs. My intuition tells me that it is not strong because there are many factors affecting a firm's performance, such as the type of industry or the amount of employees. For the second research question, the hypothesis is that men and women feel differently regarding their vertical direction in the company depending on whether the company is feminized or masculinized. I believe that female employees may feel better about their possibilities in feminized companies.

3. Empirical study

To test the hypotheses and thoroughly answer the research questions, two studies have been carried out. Different datasets and methods were used to answer the two questions.

3.1. Methodology

3.1.1. Study one

Study one was carried out in order to answer the first research question, aimed at finding a possible association between firm performance measures and feminized boards of directors in Catalan SME's. The research approach required a sample of data from which patterns could be identified. The directory of firms was obtained from the *SABI-Amadeus* database (Bureau van Dijk, 2019).

The sample consisted of 200 Catalan enterprises across several industries and from all of the four provinces of Catalonia (Barcelona, Girona, Tarragona and Lleida). They all had between one and fifty employees and operating revenues of less than €1.600.000 (in thousands). From the 200 total enterprises, 100 had feminized boards of directors and 100 had masculinized board of directors. From all the Catalan SMEs in which individuals own at least 50% of a company's shares, a strictly random selection was done. Enterprises are defined as feminized (or woman-owned) if more than 50% of the owners are women. In the same way, when men own more than 50% of the shares, we talk of masculinized enterprises (or men-owned). For the sake of this study, mixed-owned board of directors (the cases where the shares of men and women are the same) were not included.

The data collected included: name of the company, NIF code, city, name of director, number of current directors and managers, number of full time employees, operating revenue (in thousands of Euros), profit after tax, indebtedness and return on assets (ROA). All the information was reported in 2018 and had no missing values. The random sample was ordered alphabetically for the company name. The first few rows of the dataset look as follows:

Figure 1: Data visualisation RQ1

Type	Company Name	NIF Code	City	Director	Nº directors & managers	Nº employees	Operating revenue (th EUR)	Profit after tax	Indebtedness	ROA
0	A G P GESTION INTEGRAL INSTALACIONES Y MANTENIMIENTO SL	B62479555	BARCELONA	Mr Angel Gimenez Gimenez	3	6	829.855 €	425 €	59.71%	0.08%
0	ACRIBIS HYGIA SL.	B66062431	SANT CUGAT DEL VALLES	Mr Ricard Escorihuela Nebra	6	16	1.514.613 €	4.994 €	89.97%	0.62%
0	AGTIC CONSULTING SL.	B66766528	BARCELONA	Mr Raul Rabionet Janssen	1	7	671.862 €	30.487 €	57.07%	7.75%
0	AIR TENA 2004 SL	B63562037	BARCELONA	Mr Eugenio Tena Fernandez	1	8	440.586 €	775 €	91.10%	0.34%
0	AISLATER REVESTIMENTS SA	A17078577	CELRA	Mr Felix Sandonis Martin	1	19	1.313.813 €	69.462 €	26.60%	8.74%
0	ALUGOM BARCELONA SA	A08865206	CERDANYOLA DEL VALLES	Mr Alejandro Lucas Feijoo	1	6	1.337.184 €	- 60.845 €	108.31%	(-3.86%)

Highlighted are the chosen dependent variables analysed. They are the two continuous variables "Indebtedness", calculated as total shareholder's funds and liabilities minus shareholder's equity divided by total shareholder's funds and liabilities, multiplied by 100; and "return on total assets" (ROA), calculated as profit and loss before tax divided by total assets, multiplied by 100. ROA was chosen to analyse economic profitability and indebtedness to analyse the level of debt. The independent variable is a categorical variable named "Type", which has the differentiation of whether the company is masculinized (M, given the value of "0") or feminized (F, given the value of "1").

To test the association between the company's performance and the type of company it is, an independent samples t-test and a one way ANOVA were run. All the statistical analysis to answer the first research question were completed using the SPSS software.

3.1.2. Study two

The objective of study two was to look into one qualitative factor in a small set of companies and to analyse the distance of opinions. A categorical analysis was created to answer the second research question, whose aim is twofold: first, it aims to answer how different male and female employees

feel about the possibilities to move upwards in the companies they currently work; secondly, it aims to see if the answers differ depending on whether the companies are feminized or masculinized.

To get the necessary information, primary data was collected using a survey. It was sent to all employees in a selected sample of 20 Catalan SMEs. After selecting their gender and indicating the name of the company, employees solely had to answer one question: "how happy are you with your opportunities and personal possibilities to move upwards in the company [where you are currently employed]?". The survey was handled using *Google Forms* in Catalan and translated into English a posteriori. You can find the translated survey in Appendix A.

The explanatory variables were the two nominal variables "gender of the employee" (2 categories) and "ID code" (20 categories), which were set in the rows. Please note that due to the sensitivity of the topic, the name of the companies is subject to a privacy policy and the names of the respondents remain anonymous. Because of that, a code is used instead of the company name. The response variable was set in the columns and could take up to 5 values: very happy (VH), happy (H), fairly happy (FH), unhappy (UH) and very unhappy (VUH). When interactively coded, the amount of categories analysed was 200. All the analysis were performed using *R studio*.

The total amount of responses was 247. In order to account for the different amount of respondents in each company, all the analyses were done post data standardization. After manipulation, the data was in a form of a matrix with no missing values. With the standardization, all the data is relative and stated in percentages with row profiles. The first few rows of the dataset look as follows:

Figure 2: Data visualisation RQ2

IDcode	VH	H	F	UH	VUH
C1fM	31.6	34.1	29.1	3.1	2.1
C2fM	32.4	40.0	22.2	4.4	1.0
C3fM	23.6	54.6	17.2	3.8	0.8
C4mM	18.3	43.4	28.5	7.1	2.7
C5fM	38.3	48.5	10.3	2.5	0.4
C6mM	37.2	37.4	20.8	3.8	0.8
C7fM	26.6	41.8	23.7	7.5	0.4
C8mM	18.0	44.6	27.4	8.3	1.7

* ID code: C + company number (1-20) + m/f (masculinized or feminized) + M/W (respondent is male or female)

The study was carried in two steps. First, the analysis of the twenty companies without differentiating between the respondent's genders. Secondly, the analysis with the gender differentiation. For each step, several means of visualizing the level of similarity of all the cases in the dataset were used. Namely, multidimensional scaling, principal component analysis and correspondence analysis. Closer examination is done with gender differentiation performing clustering analytics and the pertinent profiling of clusters.

3.2. Results

3.2.1. Study one

To test the association of the two groups, two hypotheses are detailed for an independent samples t-test. The null hypothesis is that the means for the two groups are equal ($H_0: \mu_{masc.} - \mu_{fem.} = 0$). The alternative hypothesis is that the means for the two groups are not equal ($H_1: \mu_{masc.} - \mu_{fem.} \neq 0$). Accepting the latter would mean that "indebtedness" and "ROA" would be significantly different for masculinized and feminized Catalan SMEs in the sample and, by extension, we could infer that this difference would also exist for all Catalan SMEs. The significance level chosen is *a = 0.05*.

Before running the tests, let's consider the following table with the descriptive statistics:

Figure 3: Descriptive statistics study one

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Mini mum	Maxi mum
						Lower Bound	Upper Bound		
Indebtedness	**M**	100	59,0319	28,46841	2,84684	53,3831	64,6807	5,60	108,31
	F	100	38,3923	26,31345	2,63134	33,1711	43,6135	,25	122,67
	Total	200	48,7121	29,23494	2,06722	44,6356	52,7886	,25	122,67
ROA	**M**	100	4,9156	7,47992	,74799	3,4314	6,3998	-11,01	48,04
	F	100	6,3775	6,76071	,67607	5,0360	7,7190	-7,13	30,31
	Total	200	5,6465	7,14911	,50552	4,6497	6,6434	-11,01	48,04

The mean and standard deviation for "indebtedness" is higher for masculinized companies *($\bar{x}$(M)=59,03; SD(M)=28,46)* in comparison to the feminized counterparts *($\bar{x}$(F) =38,39; SD(F) =26,31)*. It is the opposite for "ROA", for which the mean is higher for the feminized companies in

the sample *(x̄(F) =6,37; SD(F)=6,76)* compared to a lower value for the masculinized companies (*x̄(M)=4,91; SD(M) =7,47*). The values can be easily seen in figures 4-7.

Figure 4: Scatterplot Indebtedness

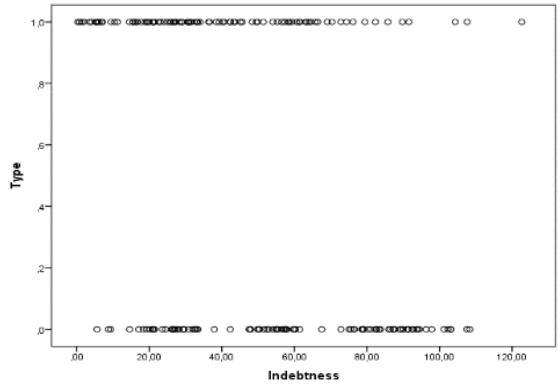


Figure 5: Boxplot Indebtedness

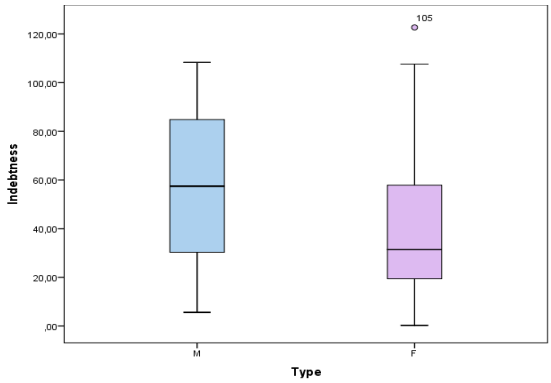


Figure 6: Scatterplot ROA

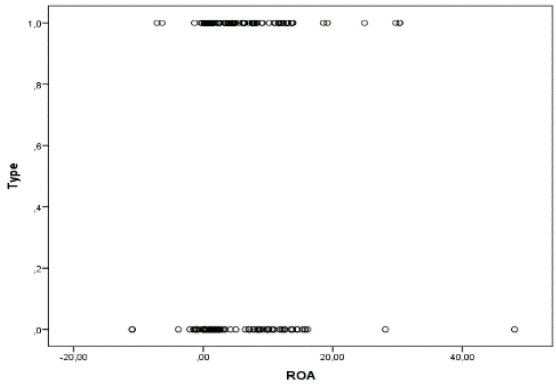
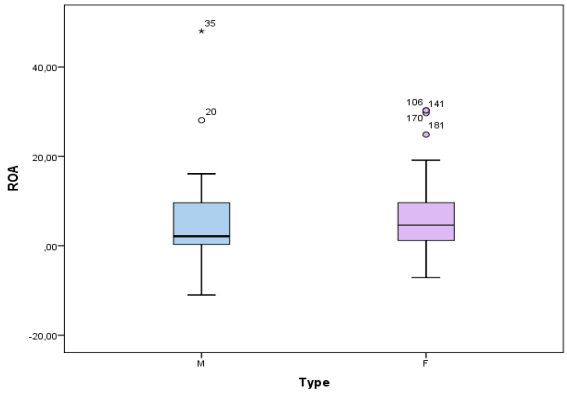


Figure 7: Boxplot ROA



To test the association of the two groups, an independent samples t-test was performed (see figure 8). First, under "Levene's Test for equality of variances" we see whether the variances of the two groups are equal. The null hypothesis is that the variances of both groups are equal, while the alternative hypothesis is that the variances are not equal. The significance of the test statistics of the Levene's Test show that equal variances can be assumed at a 95% confidence level (*F(Indebtedness)=2,671, p<0.104; F(ROA)=0,607, p<0,437).*

Secondly, to test the statistical difference between the means of the two groups, the remaining columns under "t-test for equality of means" are considered. We can reject the null hypothesis for the first variable (t(*Indebtedness)=5,324, p< 0.000 [2,7388e-7]),* as the p-value is less than chosen significance level. We conclude that the mean for the indebtedness of masculinized and feminized Catalan SMEs is significantly different at a 95% confidence level.

On the other hand, the null hypothesis cannot be rejected for return on assets *(t(ROA)=-1,450, p<0.149)* so we conclude that the mean for the return on assets of masculinized and feminized Catalan SMEs is not significantly different at a 95% confidence level.

Figure 8: Independent samples t-test for "indebtedness" and "ROA"

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Indebtedness	Equal variances assumed	2,671	,104	5,324	198	,000	20,63960	3,87	12,99476	28,28444
	Equal variances not assumed			5,324	196,786	,000	20,63960	3,87	12,99447	28,28473
ROA	Equal variances assumed	,607	,437	-1,450	198	,149	-1,46190	1,00	-3,45018	,52638
	Equal variances not assumed			-1,450	196,010	,149	-1,46190	1,00	-3,45031	,52651

The results show consistency when compared to a one way ANOVA. We get a significant value of indebtedness (p<0.000 [*2,7388e-7*]) and a non-significant value for return on assets (*p<0.149).*

Figure 9: ANOVA test for "indebtedness" and "ROA"

		Sum of Squares	df	Mean Square	F	Sig.
Indebtedness	Between Groups	21299,654	1	21299,654	28,346	,000
	Within Groups	148781,962	198	751,424		
	Total	170081,617	199			
ROA	Between Groups	106,858	1	106,858	2,102	,149
	Within Groups	10063,982	198	50,828		
	Total	10170,839	199			

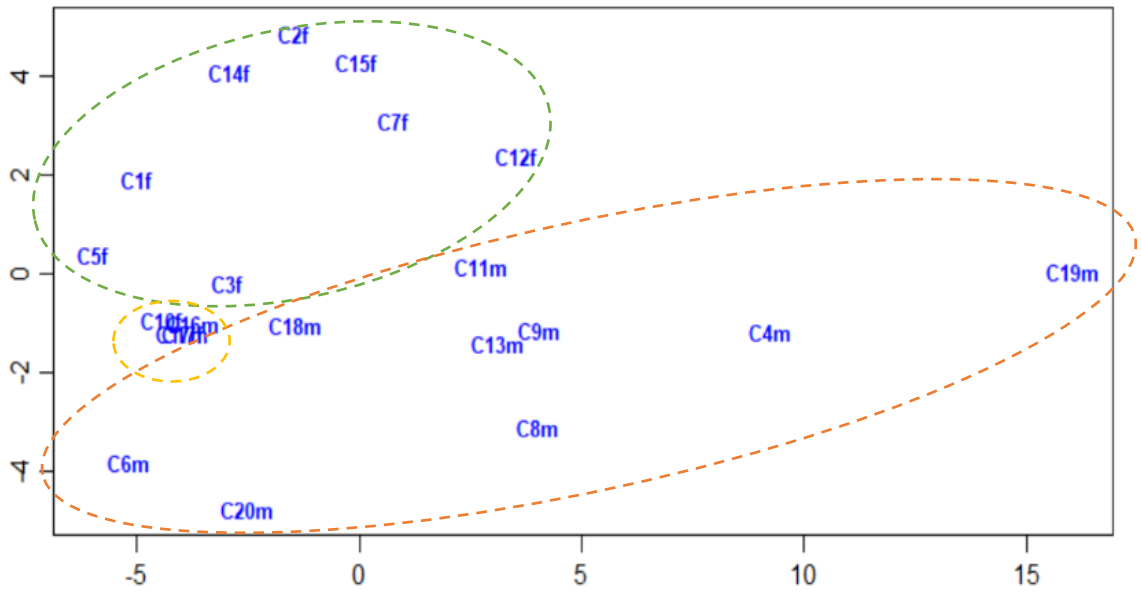
In conclusion, in the sample there is positive and significant association between "indebtedness" and the type of company, as feminized companies show lower level of debt. On the other hand, even though return on assets is higher in the feminized companies in the sample, the difference is not significant. These results give us an idea of the situation but they cannot be generalized for the whole of Catalan SMEs because the sample is small and because there are aspects which influence profitability which are not accounted for.

3.2.2. Study two

3.2.2.1. Distance between firms

To get a first idea on the distances between the companies in the sample, a multidimensional scaling (MDS) to visualize the results was created, see figure 10. Note that the code is composed of the letter "C" indicating company, a number ranging from 1 to 20 to refer to each individual case, and the letter "f" or "m" to identify if the company is feminized or masculinized.

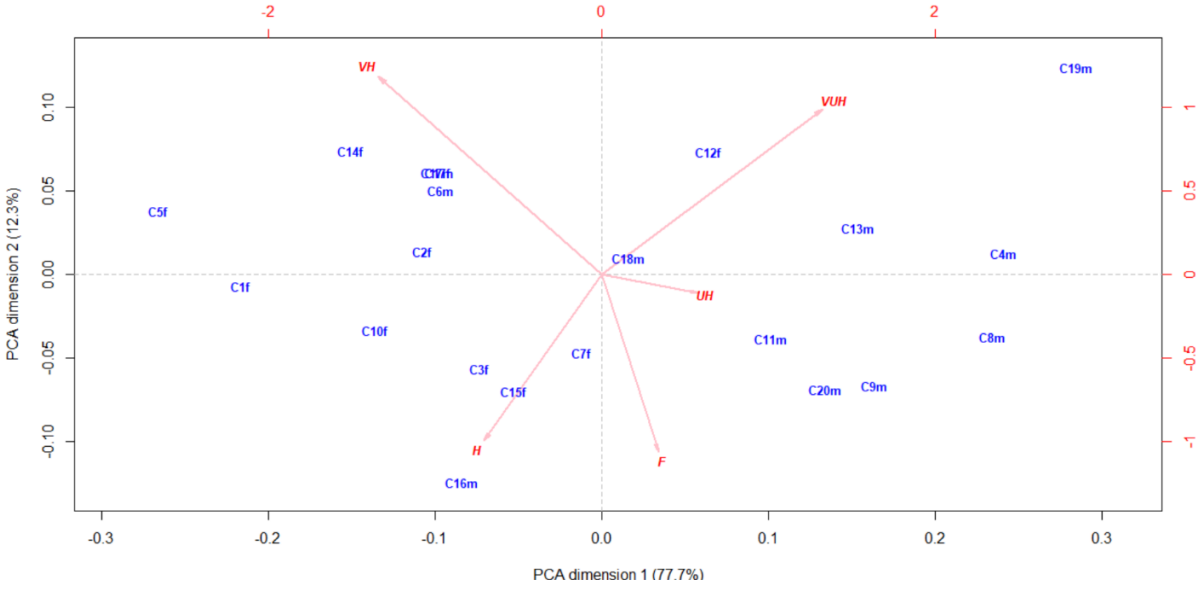
Figure 10: Multidimensional scaling of the distances between companies



Three groupings can be seen in Figure 10. On the top left, the group circled in green is composed of eight companies, which are all feminized. The group in orange in the bottom is formed of nine companies which are masculinized. The three remaining companies, grouped in the yellow circle, fall in between the two. It is formed by two feminized and one masculinized companies. The MDS suggests that there is indeed a difference in the opinions of employees working in feminized and masculinized companies.

To gain better insight, I run a principal component analysis (PCA) and a correspondence analysis (CA). See Figures 11 and 12, respectively.

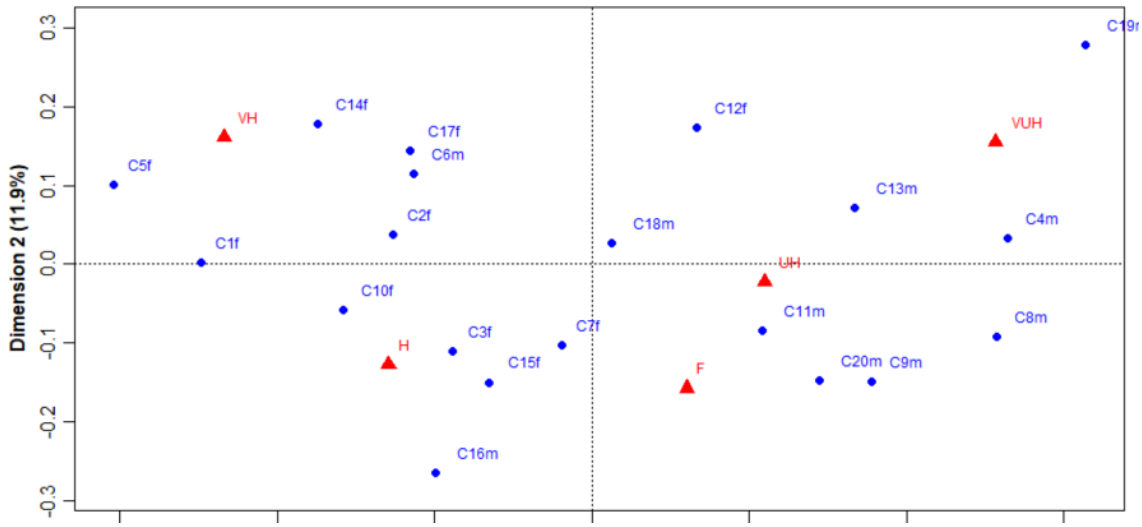
Figure 11: Principal Component Analysis of the distances between companies



The PCA shows where each company falls in depending on the opinion of their employees. The blue data points are the cases and the red arrows show the five opinions employees could choose from. When a data point (i.e. C11m) is closer to a category (i.e. "UH") it means that employees in that company share the same opinion, on average. In that case, the employees of company *#11,* which is masculinized, feel unhappy about their possibilities to move upwards in the company. The PCA explains 77,7% of the variation in the first dimension and 12,3% in the second dimension. With a total of 90% of variation explained, it is an accurate representation of the data collected.

In the correspondence analysis (Figure 12) we see that all the companies on the left side of the matrix are masculinized enterprises, except for company 12. Employees in those companies share the opinion that they are "very unhappy", "unhappy" and "fairly happy" about their possibilities to move upwards in the enterprise. The right side of the matrix refers to the answers "Happy" and "Very happy". All of the feminized companies are in the right side, together with masculinized companies 16 and 17.

Figure 12: Correspondence analysis of the distances between companies



This correspondence analysis explains 89.7% of the variance, so it is an accurate representation of the data. That also means that there is very few variance that comes from randomness in the data, implying that the percentage of men or women in the board of directors is meaningfully related to how employees feel about their vertical possibilities in the company.

3.2.2.2. Distance between male and female respondents

Afterwards, I considered how men and women in Catalan SMEs felt about their possibilities to move upwards in the company, regardless of whether the company was feminized or not. I first analysed the differences in means between the answers of both. The bar plot in figure 13 below shows the distribution of how each gender responded to the question and the boxplots in figure 14 show the variance in each of the five values, in more detail. Male respondents are represented in light blue and female respondents in pink.

Figure 13: Bar plot mean distribution study two

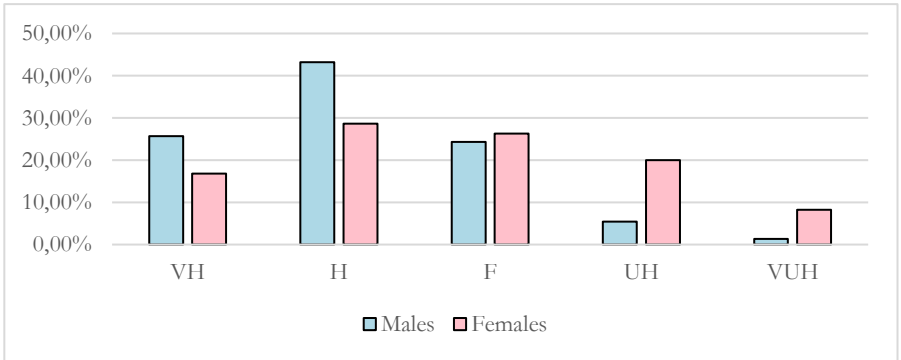
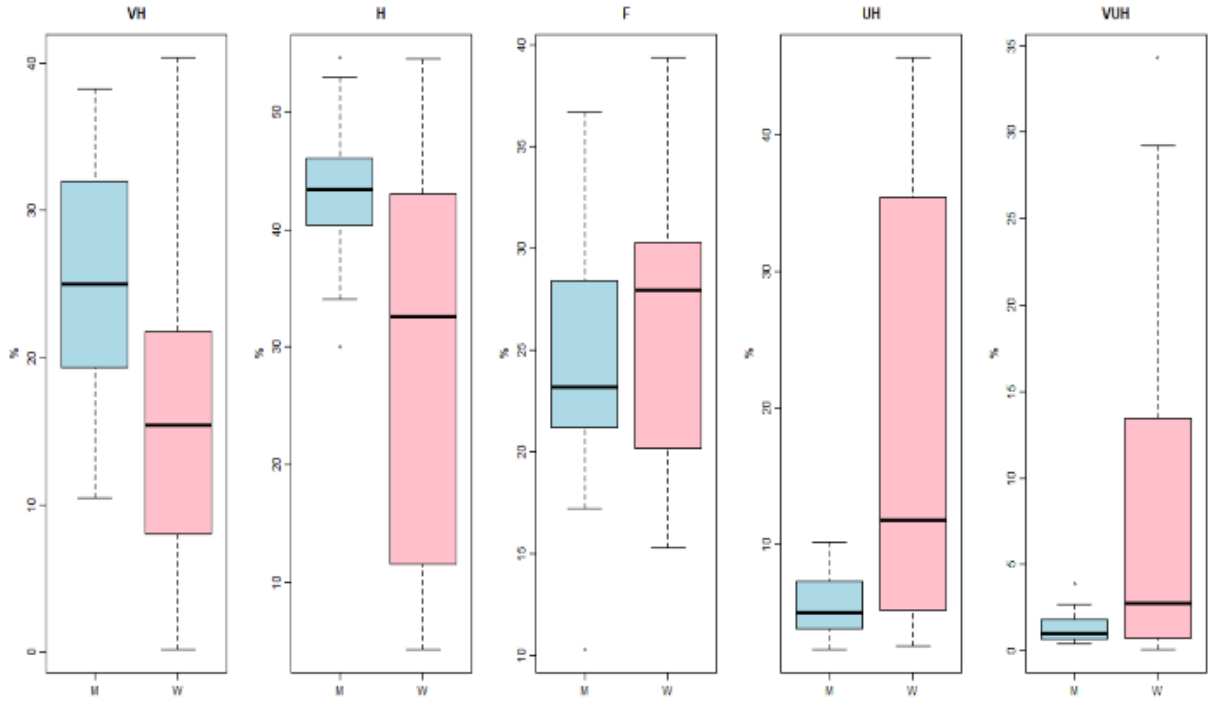


Figure 14: Boxplots mean distribution study two



The majority of respondents (35.93%) reported being happy with their possibilities to move upwards in their company regardless of gender. Approximately 43% of the men were happy versus 28.63% of the women. The second most popular answer was "fairly happy". The results of which are similar for both genders and the mean values have low variance. In the third place, "very happy" was the choice of 21.25% of the respondents, specifically, 25.69% of males and 16.81% of females. "Unhappy" was chosen by 12.73% of the employees. The difference between genders in this category is rather large. There were 5.44% of unhappy males versus a 20.03% of unhappy females. "Very unhappy" was the least recurrent response. It was chosen by 4.78% of employees, 5.44% of the males and 8.23% of the females.

Generally, there is more variance in the responses for women compared to the answers of males. Figure 15 displays a summary of the standardized results.

Figure 15: Standardized results study two

Category	Mean	Variance
Very happy Total	21.25%	.01066
VH male	25.69%	.00561
VH female	16.81%	.01212
Happy Total	35.93%	.02054
H male	43.23%	.00320
H female	28.63%	.02774
Fairly happy Total	25.29%	.00408
F male	24.29%	.00365
F female	26.29%	.00452
Unhappy Total	12.73%	.01852
UH male	5.44%	.00046
UH female	20.03%	.02637
Very unhappy Total	4.78%	.00639
VUH male	1.34%	.00008
VUH female	8.23%	.01054

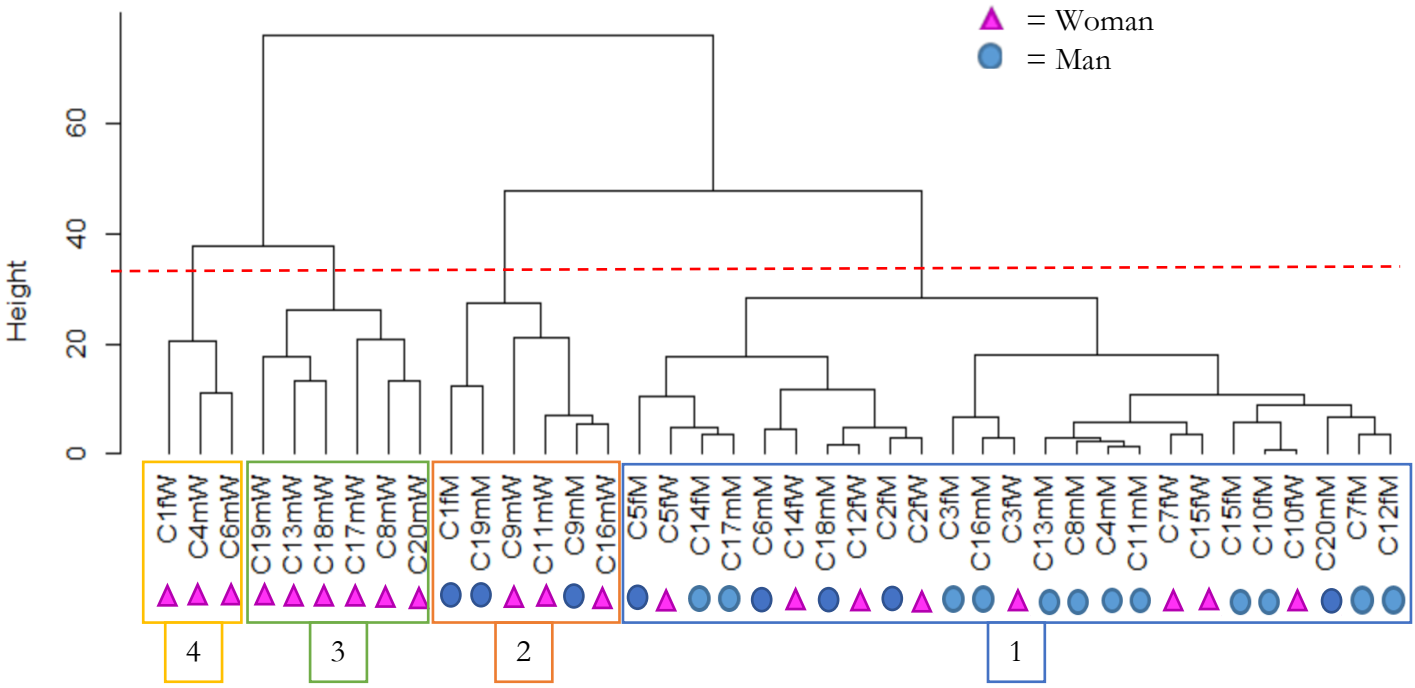
3.2.2.3. Distance between feminized and masculinized firms and gender

To finish, I interactively coded all the values and differentiated between genders and between feminized and masculinized companies. To visualize the results, I first performed hierarchical cluster analysis. It was run on the five variables for the whole set of data using average linkage and squared Euclidean distance as a metric. Please refer to Appendices B and C to see the specific Euclidean Distances between responses. Appendix B contains the distances for the male respondents and Appendix C contains the distances for the female respondents.

The cluster dendrogram in Figure 16 summarizes the distances between the opinions of men and women, accounting for whether the company has a higher percentage of women or men in the board of directors. Female respondents are indicated with a pink triangle and male respondents are indicated with a blue circle. Moreover, it is possible to see the division of the tree and the numbered clusters.

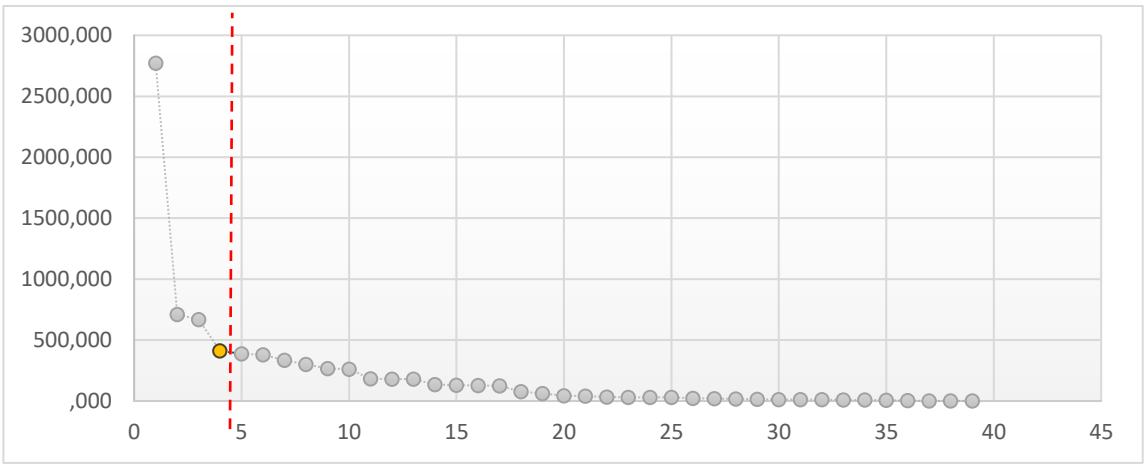
In regards to the significance of these results, a chi-square test was performed which brought up a p-value of $p<2.2e\text{-}16$ with 156 degrees of freedom and an X-squared of 1569.5. Due to the small p-value we can confirm that the results are statistically significant.

Figure 16: Hierarchical cluster analysis



The dendrogram is divided by a dotted red line which indicates the groupings. A total of four clusters has been chosen based on the agglomeration schedule (see Appendix D). The coefficients of the numerical summary in appendix D, are plotted in the Figure 17 which shows how heterogeneity decreases as the amount of clusters increases. Our objective is to maximise heterogeneity between clusters and maximise homogeneity within clusters. If we decide to divide the customers in four groups, a considerable reduction in heterogeneity can be seen but after, the reduction becomes minimal. Therefore, by dividing the responses in four clusters the ideal segmentation is obtained.

Figure 17: Heterogeneity coefficients



Next, the means of each group were checked in order to profile the respondents within the clusters, specified in the table below.

Figure 18: Mean report for profiling of clusters

Average Linkage (Between Groups)	N	VH	H	F	UH	VUH
1	25	25,47 %	43,86 %	24,16 %	5,37 %	1,13 %
2	6	16,90 %	28,60 %	36,00 %	11,25 %	7,25 %
3	3	4,40 %	9,10 %	23,40 %	34,76 %	28,33 %
4	6	10,73 %	13,46 %	28,13 %	37,81 %	9,85 %

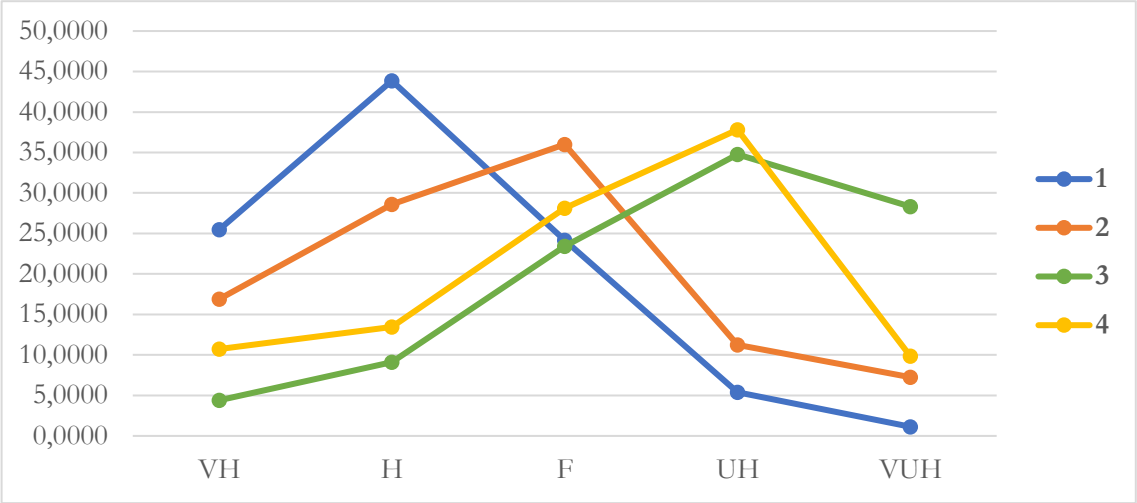
The table contains conditional formatting represented in colours. The darkest green depicts the largest values and moves towards the darkest red which depicts the lowest.

Cluster one is the largest (N=25) and also contains the largest amount of respondents who report being happy with their opportunities within the company. Moreover, over 25% of the respondents report being "Very happy". This group also contains the lowest amount of "very unhappy" employees.

The second cluster (N=6) is formed of 36% of "fairly happy" employees, fewer "happy" employees (28,60%) and slightly less "very happy" employees (16,90%). The negative responses account for 17,50%.

Clusters three and four have a larger amount of unhappy employees. Group three has a small range (N=3) and it is the cluster with the most "very unhappy" employees (28,33%); "unhappy" employees are also substantial (34,76%). The positive responses account for a mere 4,40% who report being very happy and 9,10% for the "happy" option. Cluster four is slightly less extreme. It also contains a large amount of employees who feel unhappy (37,81%) but only 9,85% report being very unhappy. The positive responses for this group total 24,19%. The snake plot below shows the differences explained for each variable.

Figure 19: Snake plot of the differences between means of clusters



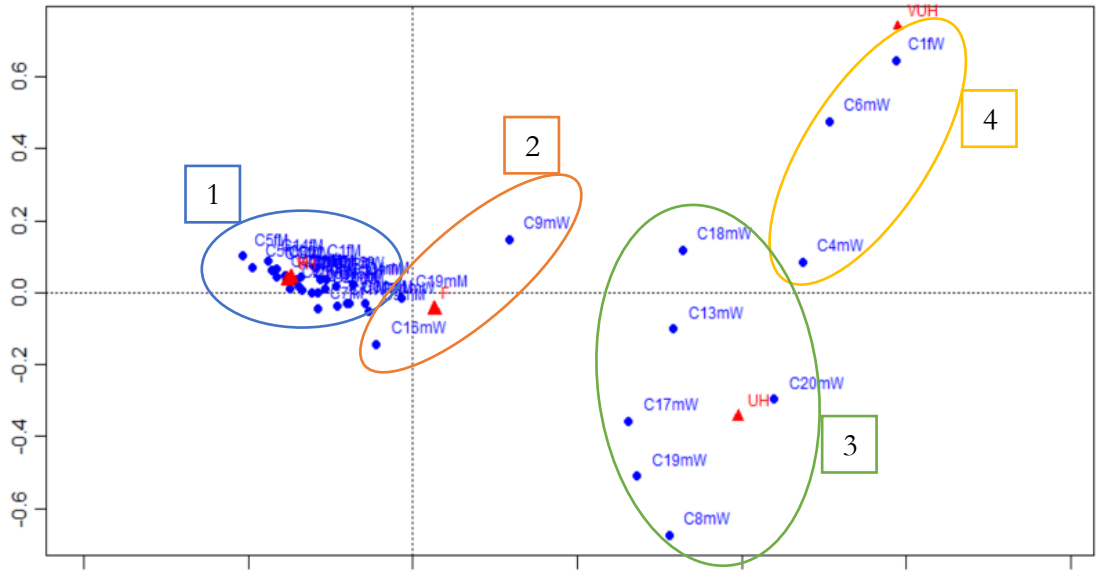
The differences between means are significant (*p<.000*) except for "Fairly Happy" *(F=3.083; p<.039)*, as it can be seen in the ANOVA test output below.

Figure 20: ANOVA test for "Happiness" variables

		Sum of Squares	df	Mean Square	F	Sig.
VH	Between Groups	2070,248	3	690,083	11,903	,000
	Within Groups	2087,171	36	57,977		
	Total	4157,420	39			
H	Between Groups	7119,226	3	2373,075	95,942	,000
	Within Groups	890,442	36	24,734		
	Total	8009,668	39			
F	Between Groups	325,526	3	108,509	3,083	,039
	Within Groups	1267,122	36	35,198		
	Total	1592,648	39			
UH	Between Groups	6807,156	3	2269,052	195,712	,000
	Within Groups	417,378	36	11,594		
	Total	7224,534	39			
VUH	Between Groups	2216,842	3	738,947	96,669	,000
	Within Groups	275,189	36	7,644		
	Total	2492,031	39			

A summary of what was explained in this final part can be seen in the following correspondence analysis, where the gender of the respondent is added[4] .

Figure 21: Correspondence Analysis with clusters



Here we can see how a large and dense cluster 1, which gathers the opinion of employees who are happy, very happy and, to a lesser extent, fairly happy about their possibility to move upwards in the company. Referring back to the dendrogram (figure 16), we can see that it is formed by a majority of male respondents. Cluster two has the largest amount of Fair answers. As pointed by the ANOVA test, conclusions cannot be taken for the "Fairly happy" variable because it is not significant. The data points which can be easily seen on the right side of the matrix are clusters three and four. They are all referring to women working in masculinized companies, who report being very unhappy and unhappy about their possibilities to move upwards in the company.

To conclude, based on these results, women feel unhappier in general about their possibilities to move forward in the enterprise where they currently work. Men are generally happier, both in companies with masculinized and feminized boards. Feminized companies have a larger amount of satisfied employees. Lastly, the employees who are the most unhappy are women working in masculinized companies.

[4] ID code: C + company number (1-20) + m/f (masculinized or feminized) + M/W (respondent is male or female)

4. Discussion

The purpose of this research thesis was to study the association between feminized boards of directors and firm performance, as well as to focus attention on the opinions of employees in regards to their possibilities to move upwards in the enterprise depending on whether the company is feminized or masculinized. Two studies were carried out to answer the research questions. The first study aimed to answer the first research question: "Is there any association between firm performance and feminized boards of directors in Catalan SME's?" The second study was designed to answer the second research question: "How does the opinion of employees in Catalan SMEs in regards to their possibilities to move upwards in the enterprise change depending if the company is feminized or masculinized? Is there a difference in opinions between genders?"

The first study consisted in researching secondary data. A strict random sample of 200 Catalan SMEs was drawn, from which one half had feminized boards of directors and the other half had masculinized boards of directors. Multiple data was collected for the companies in the sample using the SABI database, but the focus of the analysis was on two variables. Namely, "indebtedness" to analyse financial risk and "return on assets" to analyse efficiency. In order to study the association these two continuous variables had to a discrete variable (whether the board is feminized or not), an independent samples t-test was run.

The test led to the conclusion that, in Catalan SMEs, corporations with feminized boards of directors show significant lower levels of indebtedness than corporations with masculinized boards. Part of the results obtained on the first study is consistent with the trends discussed by Joy et al. (2007), as lower level of debt as a measure of firm performance is found in Catalan companies which have female directors. The association with other measures of efficiency such as return on assets is found statistically insignificant in Catalan SMEs. Even if the mean of "return on assets" is higher on the sample of feminized boards, the results do not pinpoint that the difference is meaningful. This is not accordant with studies that suggest that the greater the gender diversity in a board of directors, the larger economic gains the company can generate (Campbell and Mínguez-Vera, 2008). The reason behind this inconsistency may originate from the methodology chosen for the research. It may be that the results obtained would be accordant with past studies if the sample would be larger than 200 enterprises, as it would be more representative of the whole of Catalan SMEs.

Arguments of why corporations led by women have smaller indebtedness are abundant (Bart and McQueen, 2013). One idea involves the notion that women are naturally more risk averse, which

could explain the risk of bankruptcy reduction. Also, that women naturally make better complex decisions than men. Another, is that women come to a board with different ideas, skills and experiences than their male counterparts and that this leads to better judgement when making decisions (Singh and Vinnicombe, 2003).

By any means, in the cases where women become directors, it is good to take into consideration the viewpoint of researchers such as Van Der Walt and Ingley (2003), and Campbell and Mínguez-Vera (2008) who maintain that the link between board composition and firm performance arises from the abilities of individual directors and their professional background, regardless of gender.

Turning the attention to the second study, even though it is an initial exploratory investigation, intriguing findings have emerged, which open an area of inquiry in the arena of gender inequality in Catalan small and medium firms. This study consisted in collecting and analysing primary data on a sample of 20 enterprises with the aid of an online questionnaire. The data collected was categorical and analysed using multidimensional scaling, principal component analysis, correspondence analysis and hierarchical clustering.

The outcome of the study points towards the idea that women in Catalan SMEs are unhappier than men in regards to their opinion on the possibilities they have of climbing the corporate ladder. The analyses also demonstrate that employees of both genders in Catalan SMEs with feminized boards of directors, are generally happier about their possibilities to advance upwards. These results match with Vivas et al.'s (2018) article, who found that 81,8% of the firms they studied had masculinized boards and 8,01% had feminized boards. From the research we can derive that there is a glass ceiling in Catalan firms, mostly in companies with masculinized boards of directors.

The results are coherent with Baumgartner and Schneider's (2010) study, who indicate that the women in their sample felt like they were in a disadvantageous position in comparison to their male fellows, even when they possessed the knowledge and experience to evolve vertically in the organisation. This may imply that women were unhappier than men. Personally, I find it logical that the opinion of employees is contingent on their gender and on the masculinization of the board of directors. It is clear that the results cannot be generalized for the whole body of Catalan SMEs, as they englobe the opinions of several employees in only 20 companies. A larger sample of men and women working in Catalan SMEs is needed for additional examination.

The findings have a number of limitations as there is much room for growth in the research of this field of management. As already mentioned, one of the key constraints of this study is the small-

scale of the sample. In Catalonia, in 2019, there were 237.899 companies with one to nine employees and 25.153 with 10 to 49 employees (IDESCAT, 2019). That comes to a grand total of over 263.052 small and medium companies, from which a mere 200 were studied for the first study and 20 for the second. A larger sample for both studies would allow a generalisation of results.

Further research for both studies could include a differentiation between industries and a comparison of small and medium enterprises with large enterprises (both in Catalonia and at an international level). Another consideration could be to perform a case study to analyse a highly feminized Catalan SME and a highly masculinized one. This way, it would be possible to gain a lot more insight on how employees feel about their possibilities to move upwards in the company and to make sense of the expected judgement disagreement between genders. Moreover, a higher amount of ratios could certainly be analysed, apart from profitability and indebtedness, to evaluate the differences between firms' asset management, solvency, liquidity, costs, among others.

Other topics to take for further study include the impact of homosocial reproduction in boards. It could be explored whether, historically, the boards of directors of the masculinized firms studied had always been masculinized and vice versa. Also, the implications that demographic aspects other than gender (i.e. age and ethnicity) have on firm financial performance could be investigated. Moreover, as it is apparent that women face barriers to climb the corporate ladder, more research should be done on the existing policies for gender equality in Catalonia and on how to effectively apply them to reduce imbalances, achieve greater organisational performance and more satisfied employees.

Finally, on a wider level, it would be interesting to see how the results vary from country to country, as cultural differences between regions may have an impact on the results.

5. Conclusions

This study aimed to identify the association between board composition with a focus on gender and firm performance in Catalan small and medium enterprises, as well as to investigate employees' opinion about their possibilities to climb the corporate ladder in corporations with feminized and masculinized boards of directors.

Based on primary and secondary research, it can be concluded that Catalan small and medium enterprises with feminized boards of directors showcase lower levels of potential financial risk due to lower indebtedness in comparison to companies with masculinized boards. Corporations whose boards have more women than men also exhibit happier employees who feel better about their possibilities to move upwards in the organisation. In addition, the results illustrate that, in regards to moving upwards in the corporation, the most unsatisfied employees are women in masculinized settings.

Overall, the results match the expectations I had before starting the investigations. Nevertheless, for the first study I anticipated a significant relationship between return on assets as an efficiency measure and a feminized board, which was not the case. For the second study, I did not expect such a high amount of female employees to be as unhappy as they are about their possibilities to advance vertically in organisations.

All things considered, to better understand the implications of a feminized board of directors in Catalan SMEs, the same studies could be carried out with larger samples. The research exposes the results explained but also raises the question of which other factors are related to firm performance and to the satisfaction of male and female employees on career advancement. These could be the topics of future studies carried out in Catalan enterprises.

Referring back to the problem statement, (Catalan) enterprises can benefit from female talent in their boards of directors. Research points that committees which fail to ignore the possibility of nominating female employees may conceivably be decreasing their investors' potential for future returns. Appointing well prepared individuals (regardless of gender) seems to be a straightforward way to increase a board's effectiveness and an organisation's probability for success. In short, Catalan small and medium enterprises can benefit from having feminized boards of directors, not only to reduce financial risk but also to achieve more satisfied employees.

6. References and bibliography

Amat, O. and Soriano, M.J., 2016. *Finance and accounting for managers.* ACCID, Barcelona.

Arfken, D.E., Bellar, S.L. and Helms, M.M., 2004. The ultimate glass ceiling revisited: The presence of women on corporate boards. *Journal of Business Ethics*, 50(2), pp.177-186.

Baumgartner, M.S. and Schneider, D.E., 2010. Perceptions of women in management: A thematic analysis of razing the glass ceiling. *Journal of Career Development*, 37(2), pp.559-576.

Barberá Heredia, E., Ramos, A., Sarrió, M. and Candela, C., 2002. Más allá del" techo de cristal". Diversidad de género. *Revista del ministerio de trabajo y asuntos sociales*, 40, pp.55-68.

Bart, C. and McQueen, G., 2013. Why women make better directors. *International Journal of Business Governance and Ethics*, *8*(1), pp.93-99.

Broadbridge, A. and Weyer, B., 2007. Twenty years later: explaining the persistence of the glass ceiling for women leaders. *Women in management Review.*

Bureau van Dijk, 2019. SABI: Sistema de Análisis de Balances Ibéricos [database].

Cambra de Comerç de Barcelona, 2019. Estudis Econòmics i d'Infraestructures: *Observatori de Barcelona.* Barcelona.

Campbell, K. and Mínguez-Vera, A., 2008. Gender diversity in the boardroom and firm financial performance. *Journal of business ethics*, *83*(3), pp.435-451.

EFE, 2019. *Más de la mitad de las empresas que debe tener Plan de Igualdad no lo tiene*. La Vanguardia. Available at:https://www.lavanguardia.com/vida/20190730/463785517102/mas-de-la-mitad-de-las-empresas-que-debe-tener-plan-de-igualdad-no-lo-tiene.html. (Accessed: 03 February 2020)

European Commission, 2003. Internal Market, Industry, Entrepreneurship and SMEs: *What is an SME?*

European Institute for Gender Equality (EIGE), 2020. *Gender mainstreaming: concepts and definitions.*

Governance Metrics International (GMI), 2009. *Women on Boards: A Statistical Review by Country, Region, Sector and Market Index*.

Greenacre, M., 2017. *Correspondence analysis in practice*. CRC press.

Jackson, J.C., 2001. Women middle managers' perception of the glass ceiling. *Women in management review*.

Johns, M.L., 2013. Breaking the glass ceiling: Structural, cultural, and organizational barriers preventing women from achieving senior and executive positions. *Perspectives in Health Information Management/AHIMA, American Health Information Management Association, 10*(Winter).

Johnson, S.G., Schnatterly, K. and Hill, A.D., 2013. Board composition beyond independence: Social capital, human capital, and demographics. *Journal of management*, *39*(1), pp.232-262.

Joy, L., Carter, N.M., Wagner, H.M. and Narayanan, S., 2007. The bottom line: Corporate performance and women's representation on boards. *Catalyst*, *3*(1).

Konrad, A.M., Kramer, V. and Erkut, S., 2008. The impact of three or more women on corporate boards. *Organizational dynamics*, *37*(2), pp.145-164.

Llorà Bach, A. (2019), Comparació de les desigualtats de gènere al mercat laboral a Catalunya. *Universitat Oberta de Catalunya*.

Marimuthu, M., 2008. Ethnic Diversity on Boards of Directors and Its Implications on Firm Financial Performance. *Journal of International Social Research*, *1*(4).

Merriam-Webster, 2002. Dictionary, Available at: *http://www. mw. com/home. htm*. (Accessed: 12 March 2020)

Organisation for Economic Co-operation and Development (OECD), 2018. Social policy division [database]. *Education at a glance 2018: OECD indicators*. Paris: OECD.

Portal Jurídic de Catalunya, 2019. Llei d'Igualtat de Catalunya. © Generalitat de Catalunya. *Online at: https://portaljuridic.gencat.cat*

Singh, V. and Vinnicombe, S., 2003. The 2002 female FTSE index and women directors. *Women in Management Review,* Vol. 18, No. 7, pp.349–358.

Sonnenfeld, J.A., 2002. What makes great boards great. *Harvard business review*, *80*(9), pp.106-113. (Sonnenfeld, 2002)

Statistical Institute of Catalonia (IDESCAT), 2019. Companies and Establishments: *Companies with head offices in Catalonia by sector and employees*. Available at: https://www.idescat.cat/pub/?id=ee&n=10913&lang=en (Accessed: 10 February 2020)

Torns, T., 2004. *La situació laboral de les dones a Catalunya*. Fundació Rafael Campalans.

Triana, M.D.C., Miller, T.L. and Trzebiatowski, T.M., 2014. The double-edged nature of board gender diversity: Diversity, firm performance, and the power of women directors as predictors of strategic change. *Organization Science*, *25*(2), pp.609-632.

Van der Walt, N. and Ingley, C., 2003. Board dynamics and the influence of professional background, gender and ethnic diversity of directors. *Corporate Governance: An International Review*, *11*(3), pp.218-234.

Vivas, E., Galilea, S., Brufau, L., & Bellver, C., 2018. *Només el 10% de les grans empreses catalanes estan liderades per dones*. Barcelona.

List of figures

Appendices

Appendix A: Master Thesis Research survey (translated)

Hello, Thank you for your interest in doing this survey. It is composed of three very short questions. Your participation in this project is voluntary and your answers are anonymous. Please note that your consent to participate in the questionnaire is implied by your participation. You are advised that participation is entirely voluntary, and you may withdraw your participation at any time.

To start, please mark the following boxes:

- ☐ I hereby consent to participate as a subject in the research study.
- ☐ The research program in which I am being asked to participate has been explained fully to me, in writing, and any matters on which I have sought information have been answered to my satisfaction.
- ☐ I understand that:
    - My responses are anonymous and confidential.
    - Aggregated results will be used for research purposes only.
    - I am free to withdraw my consent at any time during the study in which event my participation in the research study will immediately cease and information/data obtained from it will not be used.

Thank you in advance for your help. Feel free to contact me for any doubt you might have or if you would be interested in reading the final results of the study.

[Page 2]

1. Please indicate your gender:
- Male
- Female

2. What is the name of the company where you currently work?

3. Thinking about the company where you currently work, please answer:

How happy are you with your opportunities and personal possibilities to move upwards in the company? (i.e. possibilities to become manager/executive)

☐ Very happy ☐ Happy ☐ Fairly Happy ☐ Unhappy ☐ Very Unhappy

Appendix B: Euclidean Distances – Survey answers from males

	C1fM	C2fM	C3fM	C4mM	C5fM	C6mM	C7fM	C8mM	C9mM	C10fM	C11mM	C12fM
C2fM	9.2714616											
C3fM	25.0607262	17.7763888										
C4mM	16.7361883	16.1319559	17.1965113									
C5fM	24.6767097	15.8946532	17.4000000	27.9946423								
C6mM	10.6451867	5.6709788	22.2207111	21.6101828	15.3792067							
C7fM	11.6490343	7.0071392	15.1307634	9.9969995	19.6555336	12.4088678						
C8mM	18.0360750	16.4699727	16.0143685	2.2759613	27.4779912	22.0249858	9.8903994					
C9mM	24.6941289	26.6889490	26.3199544	11.3639782	39.0356248	31.8926324	20.8024037	12.0283000				
C10fM	16.1932085	13.7273450	13.2000000	5.9076222	24.1085047	19.3142434	8.5650452	5.9110067	15.2000000			
C11mM	16.6643332	16.1319559	17.5054277	1.3341664	28.1694870	21.5861066	9.8173316	2.1354157	11.1758669	5.9715995		
C12fM	13.7608139	7.5379042	12.2987804	10.6254412	17.6419954	12.9761319	3.4583233	10.3353761	21.8920077	8.4391943	10.7777549	
C13mM	18.0587929	16.7547008	15.6230599	2.5768197	27.6210065	22.3588908	10.7377838	2.7166155	11.5143389	4.4631827	2.9732137	10.8876076
C14fM	14.2288439	5.8497863	16.8136849	20.4220469	10.4919016	6.2849025	11.4778047	20.4958532	31.2550796	16.9629007	20.5329004	10.5176043
C15fM	16.0978259	10.4947606	9.4688965	9.7621719	18.6638688	15.9743544	6.4560050	9.2790086	20.4386888	5.7096410	9.9869915	4.2941821
C16mM	22.9534311	17.7848250	6.6917860	12.0066648	22.4049102	23.0854933	13.4320512	10.9142109	19.9444228	8.0622577	12.3004065	11.4350339
C17mM	16.0430670	6.8352030	14.1548578	19.3033676	9.4815611	8.7977270	10.3633971	19.0194637	30.3815734	15.8770274	19.3932978	8.8351570
C18mM	9.4180677	2.6419690	17.4453432	14.3429425	17.2609386	7.5960516	4.8887626	14.5691455	24.9903982	12.6150704	14.2807563	6.0630026
C19mM	12.3125952	18.2488356	29.8827710	15.2453272	33.7057859	20.9231929	15.7759310	16.6355042	19.2712221	18.7429987	15.0053324	18.4086936
C20mM	9.5425364	8.8645361	17.4682569	8.0299440	23.0620901	14.0577381	4.6754679	8.8814413	17.8723250	7.1274119	7.8727378	6.8585713

...

	C13mM	C14fM	C15fM	C16mM	C17mM	C18mM	C19mM	C20mM
C2fM								
C3fM								
C4mM								
C5fM								
C6mM								
C7fM								
C8mM								
C9mM								
C10fM								
C11mM								
C12fM								
C13mM								
C14fM	20.5314393							
C15fM	8.9944427	12.4907966						
C16mM	9.9166527	18.7520666	7.4390860					
C17mM	19.2883384	3.5524639	10.7814656	16.6793285				
C18mM	15.1874949	7.9435508	9.6260064	17.0276246	7.9208585			
C19mM	17.6164696	24.0345585	20.6997585	26.2007633	24.4503579	16.5843300		
C20mM	8.9966660	13.9010791	8.0137382	14.2239235	13.6967149	7.4067537	13.2800602	

...

Appendix C: Euclidean Distances – Survey answers from females

	C1fw	C2fw	C3fw	C4mw
C2fw	66.1517951			
C3fw	69.6361975	17.3441633		
C4mw	20.5192592	57.0976357	60.4473324	
C5fw	72.3740285	7.8396428	18.4889156	62.9653873
C6mw	15.7257750	56.7950702	61.2840926	11.1865991
C7fw	59.2444090	13.6000000	15.8606431	51.3277703
C8mw	37.7605614	56.7275947	63.5771972	23.8876537
C9mw	40.3995049	34.8915463	36.9396806	38.2073291
C10fw	64.4775930	13.6506410	11.1373246	56.8344966
C11mw	56.4132963	22.1485891	20.0539273	49.8916827
C12fw	61.6284025	4.7010637	18.6359867	52.9363769
C13mw	26.6214199	49.0204039	56.2634873	18.9784088
C14fw	69.3306570	9.7118484	26.3180546	60.6120450
C15fw	61.0455568	14.8323970	13.9592263	53.6343174
C16mw	57.0864257	26.1063211	20.1549001	49.3422740
C17mw	37.6422635	43.4817203	47.1102961	19.3613016
C18mw	23.0620901	45.9634638	49.4914134	16.4335024
C19mw	33.8585292	51.7406996	54.6951552	23.1499460
C20mw	26.6777060	60.0774500	64.9676843	12.1119775

…

	C5fw	C6mw	C7fw	C8mw	C9mw	C10fw	C11mw	C12fw	C13mw	C14fw	C15fw	C16mw	C17mw	C18mw	C19mw
C2fw															
C3fw															
C4mw															
C5fw															
C6mw	62.3125990														
C7fw	20.5207212	52.0964490													
C8mw	63.1152913	31.1579845	51.8842943												
C9mw	42.3320210	38.6354759	23.6883938	41.5372122											
C10fw	18.7339264	57.3925082	6.4389440	58.1248656	28.5748141										
C11mw	28.8357417	51.1925776	8.5976741	51.3916336	18.4613109	11.4725760									
C12fw	12.2449990	52.5781323	10.9990909	52.8513008	30.5604319	13.0545011	19.3499354								
C13mw	55.8120059	21.1404825	43.4329368	16.8979289	29.2950508	49.7141831	42.4553884	44.5728617							
C14fw	9.8010204	59.3666573	22.3073979	58.9528625	40.8347891	22.8538837	30.6551790	11.8237050	51.3082839						
C15fw	20.9704554	54.2903306	3.4727511	54.9053731	24.8334452	3.8262253	8.1055537	12.9992307	46.2274810	23.8314918					
C16mw	32.2158346	51.8055982	13.1324027	51.3854065	20.9757002	14.8895937	6.9209826	23.7166608	43.8504276	35.2425879	12.4233651				
C17mw	49.1440739	26.3753673	38.7484193	20.8312266	33.5392308	44.2282715	38.8973007	39.8848342	20.8916251	47.5013684	41.4217334	37.7629448			
C18mw	52.7528198	18.5105375	38.2264306	26.0445772	21.9872690	43.9215209	35.7180627	41.4347680	13.3723596	50.2800159	40.3774690	36.1137093	19.5228072		
C19mw	58.9019524	31.0138679	43.0216225	18.2827788	28.6125846	48.8974437	39.8283818	47.5686872	17.6640879	56.5690728	45.3523980	38.7213120	19.8378426	17.0593083	
C20mw	66.3721327	20.6702685	54.3133501	13.4298176	41.0353506	60.3173275	52.9477101	55.9197639	16.1344352	63.0724980	56.9777149	52.5061901	20.1295802	20.6305599	18.6745817

…

Appendix D: Agglomeration schedule

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	10	30	,540	0	0	17
2	4	11	1,780	0	0	4
3	18	32	2,460	0	0	11
4	4	8	4,870	2	0	5
5	4	13	7,620	4	0	12
6	2	22	9,300	0	0	11
7	16	23	9,500	0	0	18
8	7	12	11,960	0	0	16
9	27	35	12,060	0	0	12
10	14	17	12,620	0	0	13
11	2	18	14,240	6	3	21
12	4	27	18,078	5	9	17
13	14	25	19,760	10	0	22
14	6	34	21,660	0	0	22
15	9	36	29,300	0	0	19
16	7	15	30,060	8	0	20
17	4	10	31,763	12	1	25
18	3	16	33,200	0	7	30
19	9	31	40,920	15	0	25
20	7	20	44,373	16	0	21
21	2	7	63,036	11	20	26
22	6	14	77,977	14	13	24
23	24	26	125,140	0	0	33
24	5	6	128,016	0	22	29
25	4	9	130,702	17	19	30
26	1	2	136,555	0	21	29
27	33	38	178,820	0	0	32
28	28	40	180,360	0	0	35
29	1	5	181,617	26	24	34
30	3	4	260,682	18	25	34
31	19	29	267,220	0	0	38
32	33	39	301,520	27	0	35
33	21	24	334,170	0	23	37
34	1	3	380,657	29	30	38

35	28	33	388,800	28	32	36
36	28	37	410,056	35	0	37
37	21	28	669,164	33	36	39
38	1	19	711,150	34	31	39
39	1	21	2772,592	38	37	0