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Combating gender inequality in management
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Abstract

Gender inequality is still a relevant problem in the workplace. Especially in management roles, a clear inequality in gender representation still exists (SER, 2019). Many solutions have been put forward for this problem. The oldest and most well-known solution for this problem are Equal Opportunity (EO) policies. They have a rich history starting from the 1963 Equal Pay act in the United States. Their impact is often debated. Goldin (1990) stated that the Equal Pay act failed in its goal. But new research from Bailey et al. (2022) provides compelling empirical evidence otherwise. Many other researchers find positive effects of EO policies on inequality (Anderson et al. 2004)(Dickens, 2005)(Groeneveld and Verbeek, 2012). Their effect on inequality in management is not clear though. This research will try to answer the question: “what is the effect of having equal opportunity policies on the percentage of women in management?”. This effect will be estimated using three multivariate regressions. In these regressions the percentage of female managers and the percentage of female employees will be regressed against if the establishment has EO policies, control variables, time dummies and interaction terms. The data for this analysis comes from the Worker Employer Relations Survey (WERS) time series dataset. This research will look at the data from the years 1998 until 2011. This paper finds that there is a positive trend with time in the percentage of both female managers and employees. This trend is due to underlying factors related to time, as this analysis finds barely an effect of having EO policies but a significant effect of time. Furthermore, this research shows some surprising results of the effect of some control conditions. This paper also provides some possible explanation for the results of the analysis.

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Introduction

On the 20th of September 2019, the Social Economic Council of the Netherlands concluded that there are still not enough women in the top management of companies. At the top 5000 companies only 13 percent of the directors were women and 22 percent of the Supervisory board members were women in 2019 (SER, 2019). Showing that there is an inequality in representation in top management of companies. It shows that men still dominate the higher management positions. With time and the rise of the feminist movement it became clearer that this inequality was a significant problem. As diversity within companies is related to performance increases (Herring, 2009)(Hunt et al, 2020) . This comes from having more perspectives and different skills within your workforce (Liff, 1997). By not having a diverse management, the company is not only contributing to inequality in society but is also not using the available resources in the most efficient way. Therefore, discrimination, does not only come with a societal cost but also an economic cost.

We all strive for economic growth which requires us to use every resource as efficiently as possible. It is then also important to have diversity in your company so companies can make the most efficient use of the human capital that is out there.

This benefit is also recognized by different government institutions. For example, the US government put in effort to decrease inequality. It first put the Equal Pay act of 1963 into force and later established the Equal Opportunity Commission in 1964. This commission had the goal to combat inequality in opportunity within the United States. What followed was a first wave of legislation and policy recommendation. These policies are called Equal Opportunity (EO) Policies. These are certain policies designed to ensure that employees exerting the same amount of effort will obtain the same payoff. Disregarding any other differences that are not related to performance such as gender and race.

The effectiveness of these policies is debated. Groeneveld and Verbeek (2012) note that only specific policies related to management have a positive impact on inequality in representation. Beller (1982) also concluded a positive impact of certain policies. Despite this the Social Economic Council of the Netherlands still observes a great inequality between men and women (SER, 2019). The question arises if these policies are ineffective for higher management positions. It can also be that there are other explanations for the discrepancy between men and women in their professional careers.

To come a little closer to an answer on the effectiveness of EO policies on representation in managerial positions this research will ask the question 'what is the effect of having equal opportunity policies on the percentage of women in management'. Based on the current literature it seems that EO policies can have a positive effect on the representation of women if there are

implemented correctly. It is not clear if this also holds for management positions. Though, it seems plausible that this would still be the case at higher managerial levels. Based on the current status quo there is much more room for improvement. It could be the case that the current EO policies are sufficient but require more time or that they are not effective at all.

The hypothesis is that having equal opportunity policies do have a positive effect on the percentage of women representation in management. This research will try and add to the existing research by trying to establish quantitative evidence on the effectiveness of equal opportunity policies. Where most current research only vaguely finds a correlation such as Dickens (2005) and Anderson (2004) or is theoretical such as Liff (1997).

The hypothesis will be tested using the time series dataset from the Worker Employment Relationship survey of the UK data service (2014). This is a very extensive dataset formed from data collected from employers, employees and employee representatives. Based on this dataset the effect of having EO policies regarding gender and the percentage of female managers will be estimated by performing three multivariate regressions. The first regression will add control variables, the second will add time dummies to control for a possible trend in time and the third will add interaction term to search and control for possible heterogeneity in the dataset. In the following parts the state of the current literature on this topic will be explored. After which the data used will be described. Then the methods used will be discussed after which the results can be seen. Then a conclusion will be made based on the results and finally the conclusion will be discussed in the discussion.

Literature review

First the theory of Equal Opportunity (EO) policies. They are policies that in principle try and make sure that similar people will have the same opportunities. It does this by counteracting or eliminating prejudices. An example of an EO policy during recruitment is the removal of name and gender of resumes. Many other forms of EO policies are possible. They generally come in two forms. One set of policies tries to give the same chances to people who are alike. The other set tries to give disadvantaged people a better chance. This is called equality based on sameness and equality based on differences (Liff, 1997). The first approach is based on anti-discrimination legislation. It means that people must be judged independently from their gender or ethnicity and only focus on job-related characteristics. Equality based on differences is based on achieving diversity within the company. It focusses on policies to try and recruit people from under-represented groups. The idea is that more diversity brings more strength and resilience to the company (Liff, 1997)(Hunt et al, 2020). Both policies are relevant for women as both can be argued to be beneficial for women in different

situations. Then, the interaction between these two approaches could be the most productive in achieving equality (Ferguson, 1993). As the first perspective of EO policies will ensure that people, independent from gender, have the same chance of getting promoted or recruited. The second perspective will promote female representation making up for the current inequality in representation. In the dataset used for this research the EO policy relating gender can be of either form.

These EO policies have a rich history. It all started with the passage of the 1963 Equal Pay Act by the United States Congress. This law provided that equal work needed to get equal pay (U.S. Congress, 1963). This can be seen as acting on equality based on differences. This new law was then heavily enforced by the courts. This act was then followed by the Equal Employment Opportunity act of 1972. This new act was more focussed on the first perspective of EO policies, equality based on sameness. The purpose of the US congress was to give equal opportunities regarding of sex or race. It is basically a ban on discrimination. Discrimination was already banned before, but this act also granted the Equal Employment Opportunity commission the right to sue private sector actors. This in turn lead to more employment discrimination cases based on sex (Beller, 1982).

With the rise of these EO policies and their new presence in law, the question arises if they have any effect. The Equal Pay act of 1962 was seen as not having any effect on the wages of female workers. Goldin (1990) concluded that the new law just resulted in segregating workers across occupations or establishments. Which in turn maintained the discriminatory practices. Gunderson's (1989) analysis of the policy concluded that the new act was not a resounding success. New research from Bailey et al. (2022) provides empirical evidence that this act did have a significant effect. By using multiple research designs and data sources they have given evidence that women wages increase with around 12%. Due to the techniques used this increase is independent from other differential labor-market changes. Providing proof for the effectiveness of one of the first EO policies.

There is more proof for the positive impact of EO policies. The researcher Beller (1982) tried to estimate the empirical effects of the new policies from the 1972 act. In her research, Beller looked at the impact of two events. First, she looked at the impact of prohibiting discrimination by law. Second, she looked at the impact of empowering the commission to pursue legal action on discrimination cases. Beller (1982) showed that both policies lowered the sex differences when it came to earnings and increased the chances of females entering male occupations. The empowering of the committee had the strongest effect though, especially when it comes to the employment probability.

EO policies were not only gaining ground in the United States. They were also present in Europe. Researchers also found positive impacts of EO policies in Europe. Anderson et al (2004) found a possible positive impact of EO policies in the United Kingdom. They did a secondary analysis of the Worker Employer Relationship Survey (WERS) of 1998 and concluded that two thirds of employers with more than 10 employees in the UK reported to have EO policies. They also concluded, just like Beller, that having these policies may have a positive effect in decreasing workforce segregation. There result do have their limitations as the researchers only show a correlation.

At the same time Hibbert and Meager (2003) concluded that the proportion of woman who are economically active rose with seven percent between 1984 and 2003 in the UK. This was based on the labour market trends in the UK. This trend does run parallel with the introduction of EO policies. Indicating that EO policies could have a positive impact on the labour market participation of women. Noon and Hoque (2001) also conclude, based on the WERS of 1998, that EO policies do have a positive impact on the equal treatment of minorities within a company. They used an empirical approach to estimate, among other things the effect of formally written EO policies on equal treatment of minorities. They found that EO policies are effective in ensuring equal treatment of minorities (Noon and Hoque, 2001). This result then also holds for establishments where women are the minority.

Despite, all of this research showing the positive impact of EO polices, inequality in top management is still being found (SER, 2019). This shows that despite the positive impact of the EO policies they are still lacking in some areas. The EO policies seem to be the most lacking in getting female employees an equal chance for a management position. Casarico and Lattanzio (2019) find, based on Italian linked employer-employee data, that woman have a lower probability moving into higher paying firms. The inequality in representation in management is also seen among US corporations. In the US, 48% of entry-level employees are woman which falls to 38% when looking at middle management. This further falls to 22% in the top levels of management. When it comes to the CEO level only 5% women representation can be found (Madgavkar et al, 2019). Showing an ineffectiveness of EO policies when looking at management positions. Dickens (2005) also concludes, when looking at the US, that the female representation has gone up overall, but this rise was not reflected in the higher levels within a company. Finally, Hibbert and Meager (2003) found that 10% of the female employees worked in a manager position against 18% of men.

This ineffectiveness of EO policies for management roles can be due to the nature of the policies. It can also be ineffective due to other factors such as bad implementation, the scope and the design of the policy. Dickens (2005) tells us, that based on the IRS of 1995, nine out of ten companies with

more than 7000 employees had EO policies based on gender. This is a lot, but Dickens (2003) also notes that the policies were only implemented in around half of these companies. The same can be observed in the UK. Cully et al (1998) found, based on the WERS of 1998, that 27% of the employers claiming to have EO policies didn't practice any of the stated policies. The practice that was stated to be implemented the most was collecting statistics on positions held by men and women.

Unfortunately, only 43% of the surveyed companies actually collected this data (Cully et al, 1998).

Dickens (2005) looked further into the implementation of EO policies. He especially looked at the public sector in the UK. The researcher states that in 1994 among 98% of the public sector corporations had EO policies. The policies and their implementation varied widely across the corporations though. If you don't implement the policies which are made to solve inequality, it is hard for the policies to have any effect. Therefore, it is possible that the lack of effectiveness of EO policies on inequality in management role is partly because these policies are not well implemented.

Dickens (2005) states that monitoring by gender was undertaken by nine out of ten corporations but exclusively on job applicants. This shows that the stated EO policies have problems with scope. If you would widen the scope of these policies to also monitor data on promotions by gender, this can make the policy more effective for management positions.

Groeneveld and Verbeek (2012) also note that only policies specifically designed to improve diversity in management will improve the inequality observed in companies. Further providing evidence that also the scope of a policy is important.

The Dickens (2005) also notes other practices undertaken by companies to give equal opportunities. These are Monitoring of job promotion, trainings and pay data by gender. But these practices were only performed by 30% of the corporations. From these corporations who monitored 35% mentioned that they did not make a report on the collected data (Dickens, 2005). Meaning that an inequality could be observed by the monitored data but never acted upon as no one ever looks at the data. Showing that not only does the implementation and the scope of EO policies are lacking but also a proper reflection on collected data. This makes it difficult to assess the effectiveness of these policies. When policies are not implemented, designed and reflected upon correctly, it is hard for them to realize their full potential. It could be that these are the problems stopping EO policies from having their positive effect on representation of women in management.

More evidence for the crucial importance of good design and implementation comes from a cross national statistical test by Schwindt-Bayer (2009). This research provides evidence that candidate quotas can increase woman's representation. The research is focussed on gender quota to increase the number of women elected to legislatures. The researcher concludes that if a quota has

placement mandates and strong enforcement rules, the quota will be effective (Schwindt-Bayer, 2009). This sounds like a familiar story considering the research of Dickens (2003). As quotas and EO policies are both related methods of trying to counteract inequality, it can be argued that this is evidence that strong enforcement and implementation are key for the effectiveness of EO policies. The current research therefore seems to support the hypothesis that EO policies will have a positive effect on the percentage of female managers. The first part of this literature review showed the positive potential of EO policies. The second part showed why EO policies are not realizing their potential on higher level positions within companies. If this is really the case, you will see a positive impact of having EO policies on percentage of female managers in the dataset. The magnitude of this impact then depends on the amount of establishments correctly designing and implementing these policies.

Data description

The data used in this research comes from two datasets. The main dataset used is the third version of the time series dataset from the Worker Employment Relationship Survey (WERS) of the UK data service published in 2014. This data consists out of the data from the different surveys since 1980. These surveys were held in 1980, 1984, 1990, 1998, 2004 and 2011. The second dataset is the dataset from the 2011 WERS. This dataset is used to fill-in holes that are present in the time series dataset. The time series dataset does include data from the 2011 WERS, but it is not complete. Some variables in the time series dataset are stated as 'not yet derived' for the year 2011. While the data for these variables are available in the dataset from the Worker Employment Relations Survey of 2011. So, the 2011 WERS dataset is used to fill in the holes in the 2011 data in the time series dataset.

The time series dataset is derived from the results of the seven administered Worker Employment Relationship Surveys. The goal of this is to acquire a representative sample of the employment relations within the United Kingdom over time. For this, each WERS collects data from employers, employee representatives and employees from all sectors. It does this in the most consistent and representative manner possible.

Where there are discrepancies between the surveys of different time cohorts, the researchers derived variables from existing data. This results in a relatively consistent time series dataset that can show trends in worker employer relations.

The data collected for the WERS comes from survey answers gathered in three different ways. First a company, from all registered companies in the UK, is selected for interview based on random

probability. Then the data is collected using three surveys. The first survey is administered during a face-to-face structured interview with the most senior manager. This manager must be the one that is responsible for employment relations and personal issues. Before this interview a self-completion questionnaire is sent to gather basic characteristics on the workforce. Finalizing this first survey is a short self-completion survey sent to the manager about the financial performance of the company.

The second survey would be administered by interviewing one trade union employee representative from the same workplace. The senior manager did need to approve this interview beforehand. Then the third survey would be a self-completion survey that is distributed among a randomly selected sample of employees. This survey would only be distributed if the manager gave permission and the establishment had 25 or more employees. This leads to the time series data being split in two datasets of workplaces where up to 24 employees work and workplaces where 25 or more employees work. For this research I will be looking solely at the second dataset with 25 or more employees. The reason for this is that only larger companies will have complex management structures. A small company often consists of employees who are being managed by the owner or owners. In these smaller companies the gender of the management would not be so much influenced by equal opportunity policies. Therefore, it makes more sense to just look at the 25 or more-employee survey.

The time series dataset that comes from all these surveys consists of 13,284 cases¹. Every case is a company that is surveyed in one of the years the surveys were held. The total number of surveyed companies were roughly the same each year. The data in this dataset is cross-sectional. So, it is not the case that companies are being followed through time.

The researchers did everything possible to make the dataset as consistent as possible through the years. Still, changes in survey questions asked and the way they are formulated have changed over time. Resulting in some missing values. This results in not being able to use all the possible control variables from this dataset. Because of this, I will only look at data from the years 1998, 2004 and 2011. For these time cohorts the most data is available that is relevant for answering the research question. For example, only the above-mentioned cohorts include data about if establishments have EO policies. The other time cohorts in combination with observations containing missing values in one of the variables of interest will be dropped for this analysis. The same goes for values like “*Don’t know*” or “*Not answered*” these have also been dropped for a more accurate result.

The 2011 survey was conducted in the same way as the ones before. With just some changes in the formulation of questions and some questions added. This means that to integrate this data into the

¹ See appendix table 1

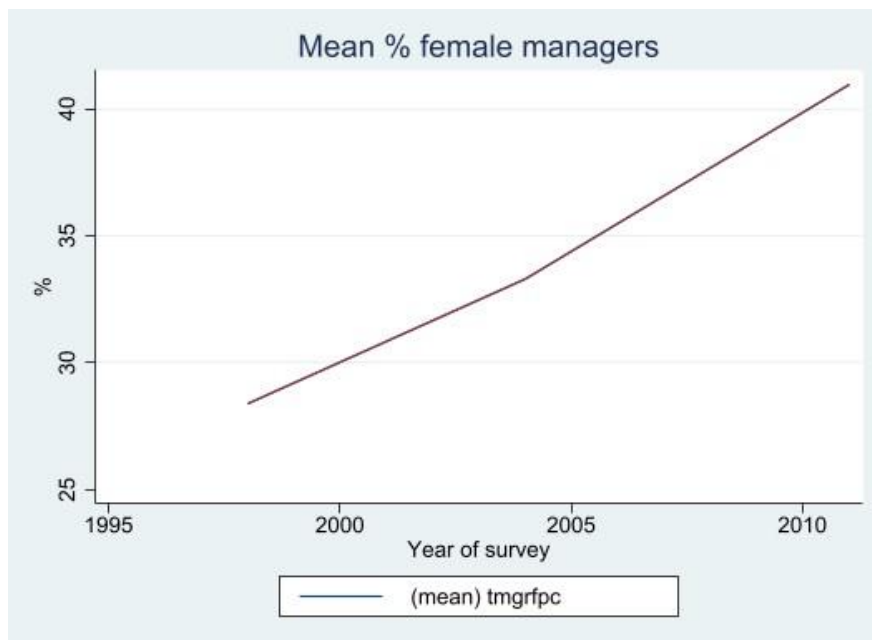
time series dataset some derivation of variables was needed. The integration of these derived variables was done by first searching for the variables in the 2011 dataset that matched the variables of interest that missed information for 2011 in the time series dataset. This was done by careful examination of the variable map related to the time series WERS dataset and the questions on the questionnaire that was administered to the senior manager. Then the serial numbers were adjusted so they would match to the serial numbers of the time series dataset observations from 2011. For this, simply '40' needed to be added to the front of the serial number in the 2011 WERS dataset. After the serial number adjustment, new variables were made that matched the formatting of the variables of interest out of the time series dataset. Then these new variables were integrated by matching the serial numbers resulting in less missing values for the 2011 cohort. Which variables these are exactly and how I derived them will be explained in the following sections.

The main dependent variable will be the percentage of managers who are female. In the dataset this variable is called 'TMGRFPC'. It is derived from the question in the survey regarding the number of managers and their genders. The definition of a manager is based on the Standard Occupational Classification system. The data is available for all the years of interest. The variable is a continuous variable formatted as a percentage. This variable has a positive trend in time which can be seen in graph 1.1.

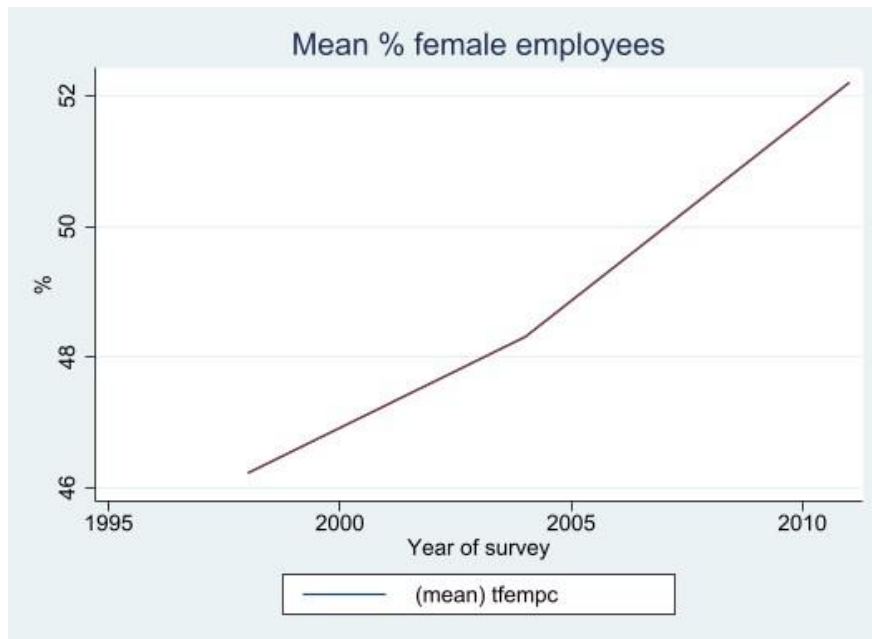
The second variable is a second dependent variable. This variable is called 'tfempc' and it consists of the percentage of female employees working at the establishment. This variable is a continuous variable which is rounded to an integer. It is derived from the answers of the managers, where the questionnaire asked for the total of employees and the total female employees at the establishment. It is available for all the years of interest. This dependent variable also has a positive trend in time which can be seen in graph 1.2. The mean and median of these two dependent variables and the number of cases and the median can be found in table 1.1 below.

Descriptive statistics of the two dependent variables % female managers and % female employees	Total amount of cases	Median numbers of employees	Mean % of female managers	Median % of female managers	Mean % of female employees	Median % female employees
1998	932	212	28%	21%	46%	50%
2004	761	245	33%	27%	48%	52%
2011	1072	263	41%	41%	52%	57%
Total	2765	237	35%	30%	49%	57%
<i>N</i>	2765					

Table 1.1: The table above shows the total amount of cases for each year, the median numbers of employees for each year, the average percentage of female managers for each year, the median percentage of female managers for each year, the average percentage of female employees for each year and the median percentage of female employees for each year. The percentages were rounded to an integer. This is after the integration of the 2011 WERS dataset with the adjusted time series dataset.



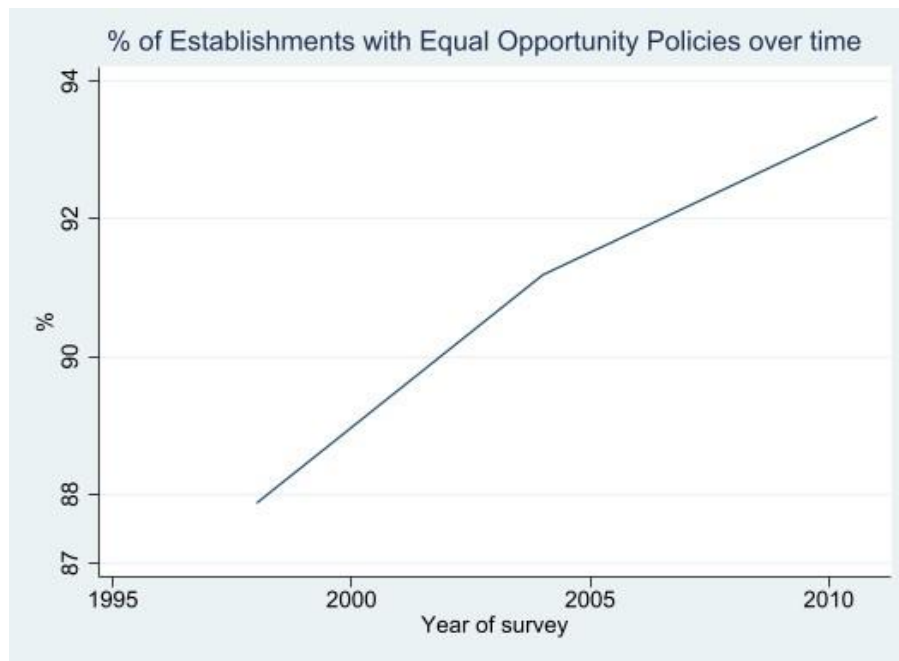
Graph 1.1: The figure above shows the mean of the percentage of female managers (y-axis) plotted for each year (x-axis). A positive trend in time can be seen. Data comes from the integrated dataset consisting of data from the time series dataset and the 2011 WERS dataset.



Graph 1.2 The figure above shows the mean of the percentage of female employees (y-axis) plotted for each year (x-axis). A positive trend in time can be seen. Data comes from the integrated dataset consisting of data from the time series dataset and the 2011 WERS dataset.

The third variable, called 'teopol1', is a binary independent variable that is true if the manager states that the company has formally written equal opportunity policies related to gender. This variable is the independent variable. For this variable only the series 1998 to 2004 exists in the time series dataset. The 2011 data had not been derived for this variable yet. This data does exist in the dataset of the WERS of 2011. Here the variable is called 'lgroun'. This variable comes from the interviewer asking the senior manager if written EO policies exists in the establishment on ten different subjects. This creates 10 categorical 'lgroun'² variables. To integrate these observations from 2011, I created a single variable that is true if the manager mentioned sex in one of these 'lgroun' variables. This way the newly created variable has the same format as 'teopol1' so it can be integrated into the time series dataset. The number of establishments that state to have EO policies increases with time in the dataset. This trend can be seen in graph 1.3. The descriptive statistics of this variable can be found in table 1.2.

² See appendix for the different categories



Graph 1.3: The figure above shows the percentage of establishments that cite to have EO policies (y-axis) plotted for each year (x-axis). A positive trend with time can be seen. Data comes from the integrated dataset consisting of data from the time series dataset and the 2011 WERS dataset.

The variables of interests include four control variables. The first control variable is a categorical variable called 'tsector3' describing the broad sector the establishment is in. There are three categories: private manufacturing, private services and the public sector. This data is available in the main dataset for all the time cohorts of interest. The observations are quite balanced between private sector and public sector with around 50% of the observations in either one. When it comes to within the private sector there are significantly less observations of establishments working in manufacturing. This can be seen in table 1.3. The summary statistics for this variable can be found in table 1.4.

The second control variable is named 'turep'. It is a binary control variable that notes if there are any representatives of a union present at the establishment. The time series dataset has data for this variable for the years 1998 and 2004. The data for 2011 has not yet been integrated into the time series dataset. It is available in the 2011 WERS dataset under the name 'esteward'. To integrate these variables I bundled the values besides "yes" and "no" into a missing value. The format then matched with the format of 'turep' so I could merge the two variables. The descriptive statistics of this variable can be found in table 1.5.

Descriptive statistics of if the establishment notes having EO policies	Count	Percentage in year	Percentage total
<hr/>			
1998			
Yes	819	88%	30%
No	113	12%	4%
Total	932	100%	34%
<hr/>			
2004			
Yes	694	91%	25%
No	67	9%	2%
Total	761	100%	27%
<hr/>			
2011			
Yes	1002	93%	36%
No	70	7%	3%
Total	1072	100%	39%
<hr/>			
Total			
Yes	2515	91%	100
No	250	9%	100
Total	2765	100	100
<i>N</i>	2765		

Table 1.2: The table above shows the number of establishment stating that they have EO policies related to gender, the corresponding percentage for each year and the percentage it represents in the total dataset. Data comes from the integrated dataset of the 2011 WERS and the time series WERS dataset. The percentages were rounded to an integer

Descriptive statistics of the sector variable for each year	Count	Representation of the industry per year
Private sector manufacturing		
1998	147	16%
2004	128	17%
2011	163	15%
Total in dataset	438	16%
Private sector services		
1998	358	38%
2004	269	35%
2011	276	26%
Total in dataset	903	33%
Public sector		
1998	427	46%
2004	364	48%
2011	633	59%
Total in dataset	1424	52%

Table 1.3: The table above shows the amount of observations for each sector type for each year and there relevant percentages. The percentages were rounded to an integer. Data comes from the integrated dataset of the 2011 WERS and the time series WERS dataset

Summary statistics of female managers/employees	Mean % female managers	Mean % female employees
Private sector manufacturing	15%	23%
Private sector services	29%	45%
Public sector	44%	60%
Average total dataset	35%	50%

Table 1.4: The table above shows the mean value for each sector of the percentage of female managers and the percentage of female employees. The percentages were rounded to an integer. Data comes from the integrated dataset of the 2011 WERS and the time series

The third control variable is a binary variable called 'tintpref' that notes if an establishment has a preference to promote employees into management positions or source them externally. This variable is available in the main dataset for the years 1998 and 2004. The data for 2011 needed to be derived from the 2011 WERS dataset. In the 2011 WERS the corresponding variable had four possible values. Namely, Internal promotion only, preference for internal promotion, external promotion and preference for external promotion. For the integration I bundled the answers 'Internal promotion only' and 'internal promotion preference' as they both show a preference for internal promotion. Then I bundled the other two possibilities as it shows the contrary. This format then was the same as the binary variable 'tintpref' in the main dataset. The 2011 observations were then easily merged with the time series dataset. Descriptive statistics of this variable can be found in table 1.5

the fourth control variable is a binary variable called 'tadvice1' noting if the establishment has sought advice at the Advisory, Conciliation and Arbitration Service (ACAS). This is a government body with the goal to give establishments and employees advice on worker relations. The descriptive statistics for this control variable can be found in table 1.5.

After the merge of the datasets, the dropping of certain years and the dropping of the missing values the dataset used for analysis consists out of 2765 observations. These observations are quite well distributed among the years 1998, 2004 and 2011. This can be seen in the descriptive statistics of the variables.

Descriptive statistics of the three control variables	Are there union representatives at the establishment?			Does the company prefer internal promotion?			Did the company seek advice from the ACAS?		
	Yes	No	% Yes	Yes	No	% Yes	Yes	No	% Yes
Year of survey									
1998	776	156	83%	384	548	41%	333	599	36%
2004	620	141	81%	237	524	31%	505	256	66%
2011	876	196	82%	409	656	38%	687	385	64%
Total	2272	493	82%	1030	1728	37%	1525	1240	2765

Table 1.5: This table shows the number of observations for each category of the binary control variables and the percentage of establishment that answered yes for each year. The percentage were rounded to an integer. Data comes from the integrated dataset.

Method

First, a simple regression will be performed of the dependent variable on variables of interest. This is done to get a better view of the correlation between the variables. The equation (1.1) used has the following form:

$$\% \text{ female managers}_{it} \% \text{ female employees}_{it} = \text{constant}_{it} + \text{variable of interest}_{it} \quad (1.1)$$

After these simple regressions, three different multivariate regressions across the three time cohorts of interest will be performed. EO policies can have an effect on both the percentage of female employees as the percentage of female managers. At the same time the percentage of female managers is also a product of the percentage of female employees. Therefore, I have chosen to use two dependent variables. This will give a better view on how the different variables of interest influence the observed inequality in representation.

The first Multivariate regression will be performed with all the control variables. Where the percentage of female managers and the percentage of female employees will be the dependent variables. The independent variable will be if the company cites having EO policies based on gender. The control variables will be the sector the establishment runs in, if there are any union representatives present at the establishment, if the company prefers internal promotion and if the company had sought advice from ACAS. This results in the following equation (1.2)

$$\begin{aligned} & \% \text{ Female managers}_{it} \% \text{ female employees}_{it} \\ & = \alpha_{it} + \beta \text{ EO policies}_{it} + \gamma \text{ sector}_{it} + \delta \text{ Union representatives}_{it} \\ & + \varepsilon \text{ internal promotion preference}_{it} + \zeta \text{ sought advice}_{it} + \epsilon_{it} \end{aligned} \quad (1.2)$$

The first control variable is the type of sector. This variable was added for two reasons. First the percentage of female employees differs significantly between manufacturing and services private industries³. This could create a wrong view if not controlled for. As there is a higher chance of having more female employees when more of the applicable workforce are female. The second reason is that Anderson et al (2004) and Groeneveld and Verbeek (2012) both concluded that EO policies are way more prevalent in public establishments.

The second control variable is added as a union representative will have the best interest of the employees in mind. The representative is there to protect the employees' collective interest and the individual interest. Making an employer more aware of employee situations and opinions could possibly already influence the % of female managers. Especially as a union representative can communicate specific needs female employees might need. This also follows from Anderson et al

³ See table 1.4

(2004) who indicated that the equal treatment of workers was positively correlated with union representation.

The third control variable was added because a company having a preference to recruit management externally then internally could influence the % of female managers. The data already shows that overall, the workforce is quite equally divided between the sexes⁴. As the average total mean of female employees is 50%. Showing that the female labour supply for manager positions is there. But this supply could be hold back by a preference for external recruitment. The economic model of Becker (1957) theorizes that discrimination is based on prejudice by the employer. Prejudice is a form of asymmetrical information and can be counteracted by having more information such as knowing the worker already. Becker (1957) also theorizes this by stating that more diverse companies will have less prejudice. As Beckers theories (1957) has been confirmed by an empirical assessment of Charles & Guryan (2008), it seems likely this can also be the case with gender discrimination. Therefore, it seems likely that women have a higher chance to become a manager in an establishment that prefers internal promotion.

The final control variable was added as the ACAS actively promotes good recruitment and Human Relations (HR) practices. Including in these practices is a focus on diversity and equal opportunity. It is likely that companies seeking advice from them will have a higher probability for having good practices towards equal opportunity then companies who have not sought advice. Possibly influencing the percentage of female managers and the percentage of female employees.

The second multivariate regression will be the same as the first one but three time dummies will be added for the years 1998, 2004 and 2011. By adding these time variables, the overall trend in time can be captured by these variables. This is important as with time the attention and awareness for gender equality has risen. The data also indicates that there is already a positive trend over time for the percentage of female managers⁵. This results in equation (2) where the year variable is a time dummy for the years 2004 and 2011.

$$\begin{aligned}
 & \% \text{ Female managers}_{it} \% \text{ female employees}_{it} \\
 = & \alpha_{it} + \beta \text{ EO policies}_{it} + \gamma \text{ sector}_{it} + \delta \text{ Union representatives}_{it} \\
 & + \varepsilon \text{ internal promotion preference}_{it} + \zeta \text{ seeked advice}_{it} + \eta i.\text{year}_t \epsilon_{it}
 \end{aligned} \tag{2}$$

The third multivariate regression will be the same as the second but will add interaction terms for the sectors. The interaction terms will be added for the private sector services and the public sector category. This has been done as heterogeneity is suspected in the dataset. As Anderson et al (2004) (3)

⁴ See table 1.4

⁵ See graph 1.1, 1.2 and 1.3

and Groeneveld and Verbeek (2012) already indicated EO policies are way more prevalent in public companies. This could be due to underlying reasons specific to the sector. For example, maybe public sector companies are more likely to have a more equal promotion and recruitment system because of their nature. Public institutions are a product of our democracies and therefore it could be theorized that equality in their workforce is even more important for them. If so, heterogeneity will be detected in the following equation (3)

$$\begin{aligned}
 & \% \text{ Female managers}_{it} \% \text{ female employees}_{it} \\
 = & \alpha_{it} + \beta \text{ EO policies}_{it} + \gamma \text{ sector}_{it} + \delta \text{ Union representatives}_{it} \\
 & + \varepsilon \text{ internal promotion preference}_{it} + \theta \text{ seeked ad vice}_{it} + \mu \text{ year}_t \\
 & + \theta i. \text{ sector}_{it} + \iota \text{ EO policies} * \text{ private sector manufacturing}_{it} \\
 & + \kappa \text{ EO policies} * \text{ private sector services}_{it} + \lambda \text{ EO policies} * \text{ public sector}_{it} \\
 & + \epsilon_{it}
 \end{aligned}$$

These models assume that the error term is independent from having EO policies so that the conditional mean assumption holds. Furthermore, we assume that the observations are identically distributed and that the observations are independent from each other. Also, we assume that there are no big outliers. Lastly, we assume that there is no perfect multicollinearity.

Results

The simple regression of the dependent variables on the other variables of interest can be found below in table 2.1 and 2.2. They show that having EO policies increases the percentage of female managers with 9% and the percentage of female employees with 11%. Both estimates are significant below the 1% level. Indicating a positive correlation. The estimates for the sector variable show that there are indeed significant differences in the percentages among the sectors. Showing a positive correlation between the type of sector and the dependent variables. The estimates of having union representatives at the establishment shows an interesting result. The estimate has a negative sign. Indicating a negative correlation. The variable for having preference for internal promotion seems to be negatively correlated to the dependent variables while the seeking of advice does not seem to correlate with the dependent variables.

Regression of % female managers on independent and control variables	Column 1	Column 2	Column 3	Column 4	column 5
EO policy citing gender	9.160*** (1.939)				
Any union rep at the establishment?		-10.57*** (1.445)			
Private sector, services			14.41*** (1.590)		
Public sector			29.20*** (1.492)		
Approach to filling vacancies				-9.227*** (1.143)	
Sought advice from ACAS or other government agency					0.525 (1.123)
Constant	26.29*** (1.850)	43.31*** (1.310)	14.88*** (1.304)	38.07*** (0.699)	34.33*** (0.834)
Observations	2765	2765	2765	2758	2765

Table 2.1: Shows the simple regression results of the percentage of female managers on the independent variable and the control variables separately. In regression of % female managers on sector the standard sector is: "Private sector, manufacturing". Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Data comes from the integrated dataset of the time series dataset with the 2011 WERS dataset.

Regression of % female employees on independent and control variables	Column 1	Column 2	Column 3	Column 4	column 5
EO policy citing gender	10.88*** (1.876)				
Any union rep at the establishment?		-14.21*** (1.388)			
Private sector, services			22.52*** (1.473)		
Public sector			36.74*** (1.382)		
Approach to filling vacancies				-11.18*** (1.101)	
Sought advice from ACAS or other government agency					-1.672 (1.088)
Constant	39.22*** (1.789)	60.80*** (1.258)	22.84*** (1.209)	53.30*** (0.673)	50.04*** (0.808)
Observations	2765	2765	2765	2758	2765

Table 2.2: Shows the simple regression results of the percentage of female employees on the independent variable and the control variables separately. In regression of % female managers on sector the standard sector is: "Private sector, manufacturing". Standard errors in parentheses

** p < 0.05, ** p < 0.01, *** p < 0.001*

Data comes from the integrated dataset of the time series dataset with the 2011 WERS dataset.

When combining all the control variables in the first multivariate regression⁶ we can start and draw some conclusions. The regression can be found in table 3.

By adding the control variables, the coefficient for EO policies has decreased significantly for both of the dependent variables. The simple regression coefficient shows that having EO policies increases the percentage of female employers on average by 10% and the percentage of female employees on average by 11% at a 1% significant level⁷. After adding the control variables this coefficient does not only go down to 3.6% and 4.3% respectively, but the significance also goes down. The new coefficients are only significant at 5%. At the same time most of the control variables have a large and significant effect (significant at below 1% in most cases). Showing that there is significant omitted variable bias in the simple regression of having EO policies on the dependent variables.

The constant shows that a company without EO policies, without having a union representative present with a preference for external promotion, who did not sought advice at the ACAS and who operates in the private manufacturing sector have on average 22% female managers and 33% female employees. This result is significant below the 1% level.

The sector control variables have a significant and large effect on both the percentage of female managers and the percentage of female employees. It is possible that this is due to the larger number of females working in the services and the public sector⁸. It is also very plausible that there are other factors that are inherent of these sectors that influence the dependent variables.

The variable that controls for having union representatives at an establishment has a significant and large negative effect on the two dependent variables. Going against the hypothesised impact this control variable would have. This result also goes against the stated positive relation between union representation and equal treatment by Anderson et al (2004).

The third control variable that controls for preferring internal promotion shows an interesting result. I theorized that having such a preference could increase the percentage of female managers based on the discrimination model of Becker (1957). The regression shows a negative impact that is significant at a 1% level. This could mean that the discrimination model can be disproved in this setting. It could also mean that legislation and awareness on equal opportunity has advanced enough in recruitment that a female has a higher chance to be recruited then internally promoted. The negative and significant effect on the percentage of female employees could be explained by the fact

⁶ See equation 1.2

⁷ See table 2.1 and 2.2

⁸ See table 1.4

that most companies in the dataset consists mostly out of men⁹. A preference for internal promotion would then maintain this status quo within the company.

The coefficient of the fourth control variable is only significant at a 5% level for the percentage of female managers. The coefficient is also not that large in comparison with the other variables. Showing that the establishment seeking advice from the ACAS does not explain a significant portion of the variance in the first dependent variable. The coefficient for this control variable is not significant in the regression on percentage of female employees. This could for example be due to the advice from the ACAS not being productive to get more female employees. It could also be that as seeking advice is just an indication that an establishment might implement some new practices, the real variance is captured by the actual implementation.

⁹ See table 1.4

Multivariate regression of % female managers and % female employees on control variables	Female managers as % of all managers	Percentage female employees
EO policy citing gender	3.663* (1.832)	4.296* (1.680)
Any union rep at the establishment?	-9.214*** (1.362)	-11.75*** (1.249)
Private sector, services	12.26*** (1.605)	19.62*** (1.471)
Public sector	26.66*** (1.537)	33.40*** (1.409)
Preference for internal promotion	-5.083*** (1.084)	-6.253*** (0.994)
Sought advice from ACAS or other government agency	2.367* (1.043)	0.684 (0.956)
Constant	21.74*** (2.363)	33.24*** (2.166)
Observations	2758	

Table 3: The figure above shows the result of the first multivariate regression from equation 1.2. It regresses the dependent variables on the control variables of interest. The constant can be interpreted as a company without citing to have EO policies, without having a union representative present with a preference for external promotion, who did not sought advice at the ACAS and who operates in the private manufacturing sector have on average 22% female managers and 33% female employees (significant below the 1% level).

*Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$*

The second multivariate regression¹⁰ added time dummies to the first regression with the control variables. In this regression the base year is 1998. The addition of the time dummies resulted in significant changes in the regression result which can be seen in table 4. The statistical significance of the effect of having EO policies citing gender on the percentage of female managers has disappeared. The variance is apparently better explained by the time dummies. As the coefficients of the time dummies both have a high statistical significance at a 1% and below the 1% level for 2004 and 2011 respectively. The magnitudes for these years are 3.9% and 10.3% respectively. At the same time the coefficients of the other control variables have not changed much. Only the variable controlling for the seeking of advice has become irrelevant. This shows that there are underlying factors related to time that highly influence the percentage of female managers.

The positive correlation with the passing of time can be explained due to the delayed effect of having EO policies. Policies need time to be implemented and then need more time to create an effect.

The story for the regression with the second dependent variable is a bit different though. Here the addition of the time dummies did not reduce the significance level of the independent variable. It only reduced its magnitude slightly. The time dummy for 2004 does not show a significant effect. The 2011 time dummy on the other hand is significant at the 1% level but its magnitude is relatively small. Showing that the underlying time factor only seems to significantly influence the percentage of female managers. The constant shows that a company which is operating in the private manufacturing sector and who does not fill any of the control conditions will have on average 18% female managers and 32% female employees in the year 1998.

¹⁰ See equation 3

Multivariate regression of % female managers and % female employees on control variables and time dummies	Female managers as % of all managers	Percentage female employees
EO policy citing gender	2.747 (1.813)	3.978* (1.680)
Any union rep at the establishment?	-8.677*** (1.348)	-11.57*** (1.249)
Private sector, services	12.93*** (1.587)	19.85*** (1.471)
Public sector	26.07*** (1.520)	33.18*** (1.409)
Preference for internal promotion	-5.105*** (1.075)	-6.288*** (0.997)
Sought advice from ACAS or other government agency	0.410 (1.074)	0.0418 (0.995)
Year of survey=2004	3.914** (1.350)	1.036 (1.251)
Year of survey=2011	10.31*** (1.247)	3.603** (1.156)
Constant	18.24*** (2.405)	32.11*** (2.229)
Observations	2758	

Table 4: The figure above shows the result of the second multivariate regression from equation 2. It regresses the dependent variables on the control variables of interest and it adds two time dummies for the years 2004 and 2011. The constant can be interpreted as a company without citing to have EO policies, without having a union representative present with a preference for external promotion, who did not sought advice at the ACAS and who operates in the private manufacturing sector in 1998 have on average 18% female managers and 32% female employees (significant below the 1% level).

*Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$*

In the final regression two interaction terms were added for the private services sector and the public sector. The result of this regression can be found in table 5.

The addition of the interaction term was done to check if there was heterogeneity in the dataset. It was suspected due to the significant differences in the percentage of both female managers and employees in each sector¹¹, that the different sectors might reacted differently on having EO policies. The coefficients of the interaction terms are not significant for both the dependent variables. Therefore, the combination of having EO policies and the sector the establishment operated in does not have a significant effect on the percentage of female managers or female employees. Disproving the hypothesis that there is heterogeneity in the dataset between the sectors. The coefficients of the control variables also remain the same in comparison with the second regression. The only difference is that this third regression shows that EO policies does not explain the variance in the percentage of female employees. The coefficient has lost its significance. This goes to show that having EO policy does not seem to affect the percentage of female managers and the percentage of female employees any differently in different sectors.

¹¹ See table 1.4

Multivariate regression of % female managers and % female employees on control variables and time dummies with interaction terms for the sectors	Female managers as % of all managers	Percentage female employees
Having EO policies	3.651 (3.209)	2.833 (2.974)
Private sector, services	16.38*** (4.070)	18.57*** (3.772)
Public sector	24.57*** (4.221)	31.62*** (3.913)
Yes # Private sector, services	-3.912 (4.400)	1.544 (4.078)
Yes # Public sector	1.456 (4.499)	1.820 (4.170)
Any union rep at the establishment?	-8.656*** (1.349)	-11.59*** (1.250)
Approach to filling vacancies	-5.094*** (1.076)	-6.279*** (0.997)
Sought advice from ACAS or other government agency	0.386 (1.075)	0.0235 (0.997)
Year of survey=2004	3.937** (1.351)	1.064 (1.253)
Year of survey=2011	10.36*** (1.251)	3.642** (1.160)
Constant	17.48*** (3.214)	33.03*** (2.979)
Observations	2758	2758

Table 5: The figure above shows the result of the third multivariate regression from equation 3. It regresses the dependent variables on the control variables of interest, the time dummies and two interaction terms. The interaction terms are the interaction between having EO policies and the sectors "private sector, services" and "public sector". The constant can be interpreted as a company without citing to have EO policies, without having a union representative present with a preference for external promotion, who did not sought advice at the ACAS and who operates in the private manufacturing sector in 1998 have on average 18% female managers and 33% female employees (significant below the 1% level).

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

discussion

The external validity of this research is quite high. It is based on an extensive dataset that cooperates data from all sectors and all kind of establishments. Every observation has been randomly chosen so the dataset shows a representative view of the worker employer relations within the UK.

These observations were made before Brexit. As the EU provides policies on equal opportunity in recruitment, there is an argument to be made that this analysis is also representative for other EU countries.

There are problems with the internal validity of this research. Although the regression analysis shows statistically significant coefficients there are quite some problems with internal validity. It seems unlikely that the assumptions of the model will hold. The assumption that will probably hold is the assumption of no perfect multicollinearity. There does not seem to be a perfect relationship between two variables in this analysis. Otherwise, the results would have been omitted in the regression.

The other assumptions are not so likely to hold. First the conditional mean assumption will probably not hold. The addition of control variables show that the regression suffers from severe omitted variable bias. It is therefore highly likely that there are other underlying factors that are correlated with having EO policies. For example, the practices that the EO policy prescribes. Therefore, the conditional mean assumption likely will not hold. Which negatively influences the reliability of the regression results.

There is also the problem that the observations are not independent from each other. The first concern is that of granger causality in this dataset. It could be argued that having more female managers and female employees will influence the chance of having EO policies. As these females can draw attention to the need for those policies. Therefore, the dependent variable could influence the independent variables. To test this a probit regression has been performed which can be seen in table 6. It shows that having 1% more female managers increases the chance of having EO policies with a statistically significant amount. Raising the suspicion of the existence of granger causality between these two variables. This shows that the observed variables are not independent from each other which violates one of the assumptions of the model. This further reduces the reliability of the estimates.

Probit regression of the chance of having EO policies on the percentage of female managers	Z score of EO policy citing gender
Female managers as % of all managers	0.00563*** (0.001)
Constant	1.161*** (0.049)
Observations	2765

Table 6: The figure above shows the result of a Probit regression of having EO policies on the percentage of female managers. It shows the influence 1% chance of female managers has on the Z-score of having EO policies.

*Standard errors in parentheses
* p < 0.05, ** p < 0.01, *** p < 0.001*

Autocorrelation could also show that the variables are not independent from each other. It can be argued that having more female managers has a significant effect on the percentage of female managers in the future. As these new managers do not have the same prejudice as male managers can have towards other females. This could increase the chance of a viable female candidate fulfilling a manager position. If this is true. the lagged version of the dependent variable must influence the dependent variable. Unfortunately, due to the data not being panel data, this cannot be tested with this dataset on an individual level. It can be tested on an aggregate level. When testing on the mean value of the percentage of female managers by year there does not seem to be evidence of autocorrelation¹². As the coefficient for the lagged value of tmgrfpc is not significant at a 5% significance level. Autocorrelation cannot be proved neither can it be ruled out in this dataset.

¹² See table 7

Regression of (mean) % female managers on the lagged value of this variable to test for autocorrelation	(mean) % female managers
Lag_% female managers	0.0629 (1.660)
Constant	64.51 (120.514)
Observations	3

Table 7: The figure above shows the result of a regression of the lagged variable of the mean of the percentage of female managers on the mean of the percentage of female managers. The lag is the observation of the mean of the percentage of female managers the year before.

*Standard errors in parentheses
 * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$*

The assumption of no big outliers also does not hold in this analysis. Looking at a density histogram of the percentage of female managers (figure 1) shows that on both sides of the spectrum there are big outliers. Both the 0% female managers and the 100% female managers are more frequent than expected. This is not the case for percentage of female employees as that density histogram (figure 2) does not show any clear outliers.

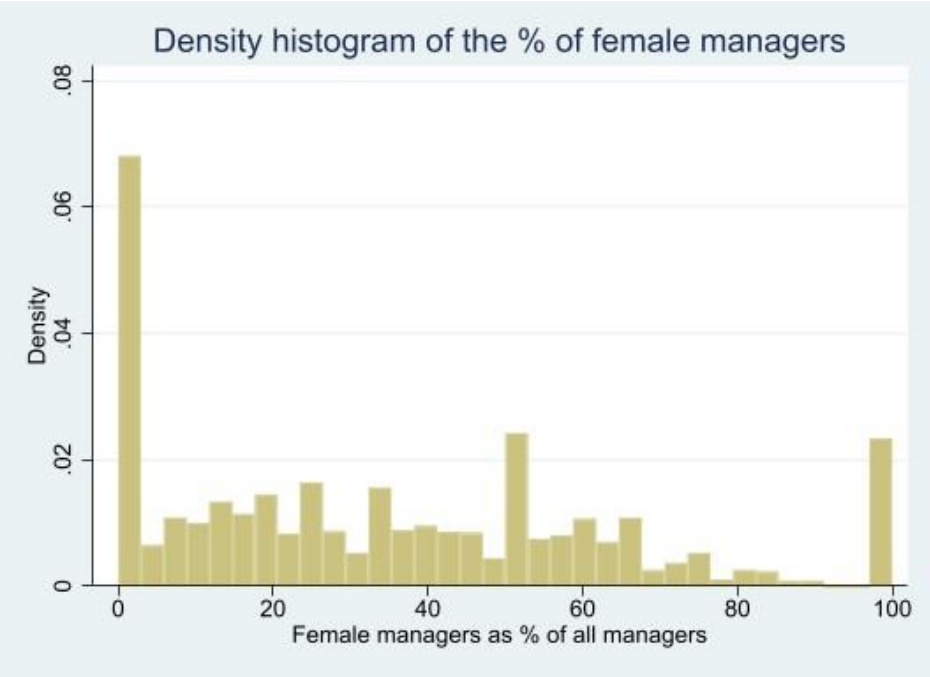


Figure 1: The figure above shows a density histogram of the variable percentage of female managers for the whole integrated and adjusted dataset. It shows the observations of the percentage of female managers for the years 1998 until 2011.

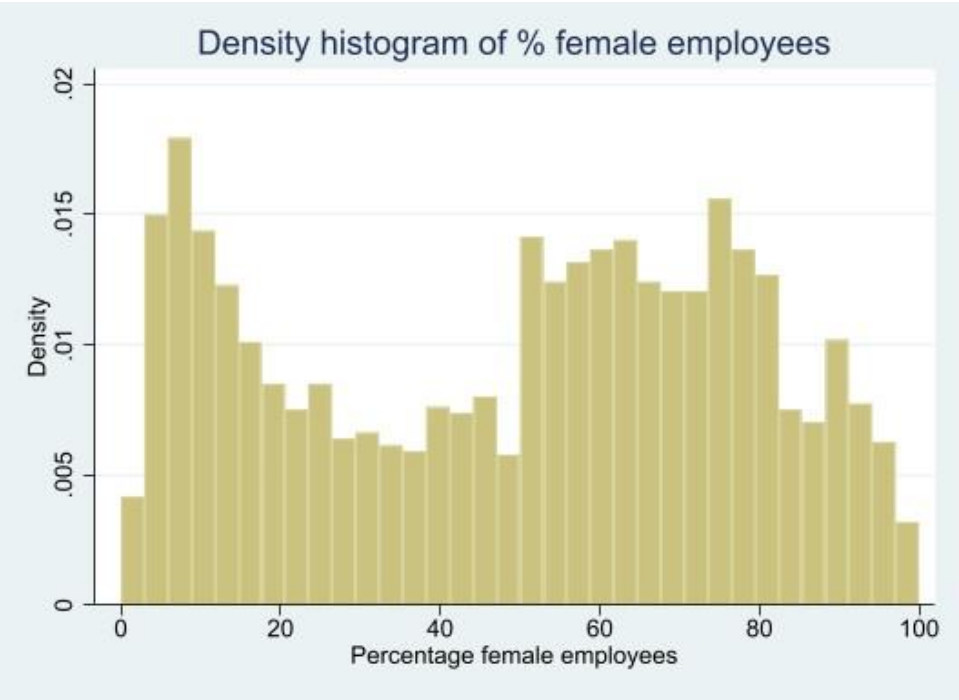


Figure 2: The figure above shows a density histogram of the variable percentage of female employees for the whole integrated and adjusted dataset. It shows the observations of the percentage of female managers for the years 1998 until 2011.

The assumptions of the conditional mean independence, independent observed variables and no outliers do not hold in this research design. These problems with internal validity show that further research is needed to properly assess the effect of EO policies on the percentage of women in management. An event study where a company is followed through time before and after implementing EO policies could provide more robust estimates. Also, a deeper look at the effect of the implemented policies of the EO policies relating to gender could be interesting. In the end it is not the policy that creates the effect but the actual practices that comes from this policy. A formally written policy can easily be ignored as shown by Dickens (2005).

Limiting the study to a better-defined definition of management such as executives or board members could also provide interesting results. The Dutch government has provided a good research opportunity by their implementation of 'Wet ingroeiquotum en streefcijfers' (art. 2:142b, 2:166 and 2:276 BW) on the first of January of 2022 . This new law states that the board of stock listed companies need to consist of at least one third women or one third men. Using an extensive dataset and a difference in difference method with the passing of this law as the treatment provides a great opportunity. You could get relatively robust estimates of the effects of having a more diverse management on gender inequality.

Conclusion

It is good to see in a big representative dataset that there is a general positive trend in the percentage of female managers and the percentage of female employees¹³. It shows that we are in a general trend towards a more gender equal society. Due to the shortcomings in the internal validity not much can be said on the impact of having EO policies on the percentage of women as managers or other employees. It becomes clear from the first regression that there is a significant omitted variable bias when just regressing the percentage of female managers and female employees on having EO policies. The control variables have decreased the magnitude and the statistical significance of the independent variable coefficient. Showing that having formally written EO policies barely has an effect. The underlying factors are way more significant in determining the percentage of female managers and employees. This coincides with the observations of Groeneveld and Verbeek (2012) and Dickens (2005) that only specific designed policies will positively influence inequality.

The second regression shows that these underlying factors are heavily correlated with time. The time dummies explained a significant amount of variance within the percentage of female managers in the dataset. The coefficient of these dummies also grows with time. Potentially showing that the underlying factors are not only correlated with time, but their impact also increases with time. This result seems logical as the effect of awareness for inequality takes time to gain momentum. The same holds for practices coming from EO policy. Such kind of things generally do not have an immediate effect but a delayed one.

The third regression shows that there is no heterogeneity among the sectors in the dataset. Among the three sectors it seems that having EO policies does not influence the percentage of female managers or female employees any differently than in other sectors. This also shows when you look at the ratio of the means of both dependent variables. The ratio is very consistent $2/3$ for every sector. Meaning that, if the establishment has 60% female employees, they will be represented in 40% of management on average. Which shows that female employees still do not enter into management positions with the same probability as male employees.

From this research it cannot be concluded if having EO policies has a positive impact on the percentage of female managers. It is clear that something correlated to time is having an impact in reducing the inequality in representation. This could be the result of successful implementation of EO policy but could also be from other underlying factors. These factors can be the creation of EO policies, legislation or raised awareness. What these factors precisely are cannot be said from this research. Logic and life experience tells us that it is probably a combination of the three. But without

¹³ See table 1.4

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any empirical evidence we cannot be sure. More research is needed on this topic with better designed research. But if there is one take away from this research it is that we are on a good path towards a more gender equal society.

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Appendix

Composition of the WERS time series dataset.	Cases	Percentage
1980	2040	15.36%
1984	2019	15,20%
1990	2061	15,51%
1991	1693	12,74%
1998	1929	14,52%
2004	1648	12,41%
2011	1894	14,26%
Total	13284	100%
<i>N</i>	13284	

Table 1 shows the number of cases per year and there representing percentages in the WERS time series dataset for 25 employees or more before adjustment,

Igroun categories:

- 1) Sex Sex/Gender
- 2) ethnic, Ethnic group
- 3) Religion Religion or belief
- 4) Marital Marital status
- 5) Disabili Disability
- 6) Age
- 7) Orient Sexual orientation
- 8) Union Trade Union membership
- 9) Other Other type of discrimination
- 10) None Our policy does not specify particular groups