Norwegian School of Economics
Bergen, Fall 2022

A Seat at the Table

The Norwegian Board Gender Quota: A Study on Indirect Effects

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Abstract

Twenty years ago, Norway led the way with the first board gender quota on ASA[1] and is now considering extending the legislation to AS. This paper examines if the existing board gender quota has fulfilled one of its main objectives – increasing opportunities for all women, also those outside the boardroom. First, we find little to no evidence of an external spillover onto AS boards, as the quota had a negligible impact on increasing the gender ratio for AS. Second, we find some evidence of internal spillover from the quota onto management, causing a slight short-term boost of increased female representation in management, but with modest long-term effects. However, comparing with Sweden, neither of these findings are likely to be significant due to a probable underlying societal trend. Third, we fail to find a general internal spillover effect from boards to management or vice versa. An AS quota will undoubtingly increase the number of female seats in the boardroom. Hence, if the main objective of the quota is to increase the female share of AS boards, we recommend that the policymakers implement a quota for AS companies. However, based on our findings, we urge them not to use increased labour opportunities for women as a motivation for enacting such a quota.

[1] Norwegian ASA compares to UK Public Limited Companies (PLCs), whereas Norwegian AS compares to UK Private Limited Companies (Ltd)

Acknowledgements

We want to express our gratitude to our supervisor Francisco Santos for the support and guidance throughout this process. We appreciate the valuable discussions and comments towards earlier versions of this thesis.

In addition, we want to thank Karin Thorburn for taking the time to answer questions about the process of their own papers as well as challenging us on the insights we presented.

We would also like to thank Hedwige Nuyens and the European Women on Boards, a non-profit international organisation aiming to promote gender equality in decision-making, for sharing data and insights on the matter.

Lastly, we thank Aksel Mjøs for his guidance and help retrieving necessary data from licensed databases at NHH.

Bergen, December 2022

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1. Introduction

> "In the future, there will be no female leaders. There will just be leaders."
> - Sheryl Sandberg, COO of Meta (Corby, 2018).

For a long time, politicians and economists have discussed the phenomenon that women are vastly under-represented in top management positions and boardrooms. Obstacles such as stereotypes and prevailing attitudes likely pose an invisible barrier for women, making it harder to obtain positions of power. The barrier is often referred to as the "glass ceiling" and can be observed even in countries perceived as pioneers in gender equality. The "glass ceiling" is described as a systematic demand-based or institutional barrier (Matsa & Miller, 2011), which could be one explanation as to why a European study of 668 companies found that only 7% of the CEOs are female and that women represent just above one-third of the boardroom (European Women on Boards, 2021). Many countries have taken measures to reduce the disparity between the genders. In 2003, Norway led the way by introducing the Gender Balance Law (GBL from now on) for boards, requiring all Publicly Limited Companies to have at least 40% of each gender on the board of directors (Barne- og familiedepartementet, 2003). The primary purpose was to improve labour market opportunities for all professional women, not just those sitting on boards (Bertrand, Black, Jensen, & Lleras-Muney, 2019).

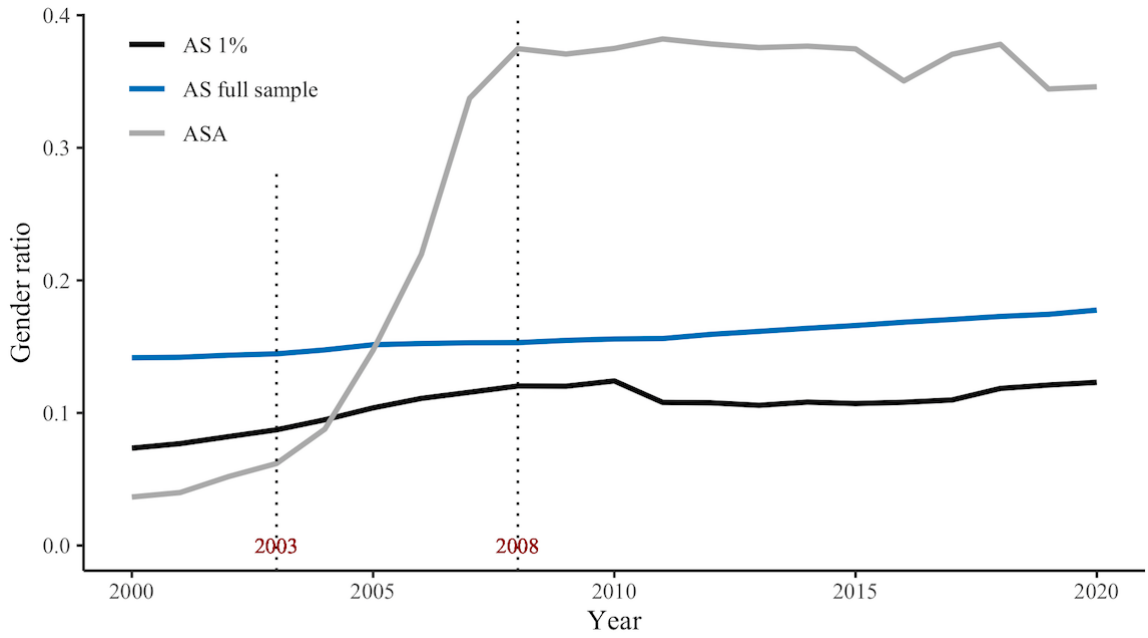
Figure 1 illustrates the dramatic increase in female board representation in Norwegian ASA from 2003, when the quota was first introduced, to 2008, when companies faced forced liquidation if they not complied. In the graph, we have also included the development for AS companies, which were not directly affected by the quota legislation. Additionally, a subset for the 1% largest AS is included, as these companies are more similar to ASA than the vast amount of smaller private limited companies. *Figure 1* illustrates a weak upwards trend in gender ratio[2] for private limited companies, yet the disparity between ASA and AS is considerable. In light of the slow progress for female representation in AS boards over the past two decades, the Norwegian government is now contemplating a board gender quota for AS

[2] When presenting the gender ratio throughout this thesis, we refer to the *female* gender ratio as the number of women divided by the number of board members. We will discuss the theme of gender as "men" and "women". We have chosen to use the traditional gender specifications; however, we acknowledge that there are other denotations of gender, exempli gratia "unspecified" or plural.

companies as well. A quota diminishes the systematic, demand-based barriers for the board of directors by seating more women in the boardroom by law. Throughout this paper, we mainly look at the demand-side effects. However, we acknowledge that there could also be a lack of women with the desire to fill board and management positions, conversely, a supply-side issue.

Figure 1: Development of average gender ratio for ASA and AS 2000-2020

The dotted lines illustrates when the quota was first formally introduced (2003) and when the quota became mandatory (2008). The other lines show the average percent of female board representation for Norwegian ASA, Norwegian AS, and a subset of the 1% largest AS companies in terms of revenue.



Source: SNF & BoardEx

Many consider political and legislative efforts necessary to reduce the disparity between genders. Earlier this year, the European Commission welcomed a political agreement between the European Parliament and the Council (European Commission, 2022). This directive introduced a binding objective of at least 40% gender balance among non-executive directors of listed companies by 2026, a proposal first presented by the commission back in 2012. The recent EU agreement indicates that gender balancing in boards is still highly relevant.

When first introduced, the Norwegian quota was controversial, meeting harsh criticism in the corporate landscape. One of the main arguments against the law was that the shareholders themselves should be able to choose their directorship without any statutory law affecting one of their core decisions. However, with time passing, Norway has been met with international

praise for enhancing female directorship in public limited companies. With the poor development of gender balance in AS board, the question stands whether private limited companies should have similar legislation. The topic has been up for heavy debate as of late, and earlier this year, the Norwegian Minister of Trade, Jan Christian Vestre of the Labour party ("Arbeiderpartiet"), notified that requirements would be imposed for private limited companies (Nærings- og fiskeridepartementet, 2022). An official hearing[3] from The Ministry was published on the 12th of December 2022 (Regjeringen, 2022).

News about a potential AS quota has faced both criticism and support from the public. The ongoing debate has motivated us to investigate to what extent the GBL has actually fulfilled one of its initial goals, namely, to improve labour opportunities for all professional women, also those outside the boardroom. We have yet to see a study explicitly looking at this; instead, most previous studies look at the effect of the quota in terms of firm value or behaviour. The research on this is divergent[4], and we will refrain from attempting to dispute previous research on these matters. Instead, this paper examines if the GBL in isolation has indirectly improved opportunities for women through internal and external spillover effects. We find this topic extremely relevant given the ongoing debate for a potential quota affecting AS companies. With most companies in Norway registered as private limited companies, approximately 400,000 AS companies of all sizes are awaiting the outcome of the hearing (Brønnøysundregistrene, 2022).

In all sections, we supplement the analysis with a Swedish subset. This serves as robustness to investigate whether there is a general trend in the corporate world of increased female presence in the boardrooms and top management. There are currently no requirements for board composition in Sweden, so the subset poses as an important control group. Norway and Sweden share a multitude of common social, cultural and political factors (Stein, 2019), making the comparison a reasonable methodical approach. When comparing the gender ratios on the boards of ASA and AS with a subset from Sweden, we find that Sweden and ASA over

[3] Hearing is a type of process for gathering perspectives and information in the handling of political proposals. Hearings often allow affected parties, such as interest organisations to express their opinion before decisions are made by Parliament.

[4] Ahern & Dittmar (2012) and Matsa & Miller (2013) find negative effects of the quota on firm performance, while Eckbo, Nygaard & Thorburn (2020) counter these findings, stating that there is no significant effect.

time have reached similar levels of board gender ratios, both far above AS. This is interesting as neither Sweden nor AS have any restrictions on board composition.

This paper seeks to offer policymakers insight into whether a board quota is an appropriate measure to reduce corporate gender disparity. Our contribution is threefold, and we have coherently divided our research into three separate parts. We find these contributions useful for policymakers when debating the broader impacts of a board quota.

First, we examine the external spillover effects between Norwegian public and private limited companies. In our context, the external spillover refers to the indirect spillover observed from the Norwegian ASA quota to AS regarding gender representation in boardrooms. In other words, we investigate if the reform has encouraged AS to comply with the quota voluntarily or if any significant trends could prove a legislation unnecessary in the medium to long term. Looking at the 1% largest AS companies in terms of revenue against ASA, we find that the quota likely has had a negligible impact on increasing the gender ratio for AS. If the desired proportion of women does not come naturally in AS boardrooms, an external shock, such as a board gender quota, may be necessary to achieve more gender diversity.

Second, we examine the internal spillover observed from the Norwegian ASA quota onto the top management composition. We refer to top management as the reported executives in our dataset, mainly consisting of the C-suite, partners and managers. In other words, we investigate if the board quota, in isolation, indirectly affected female representation in top management. In our analysis, we found little to no evidence of this. It appears the quota caused a slight short-term boost of increased female representation in top management in Norway, but with modest long-term effects. Furthermore, looking at industry differences, we get divergent results, making it hard to draw a firm conclusion on whether traditionally male-dominated industries were more affected than those not. We conclude that a board quota is a weak tool to increase labour opportunities for women beyond the boardroom.

Third, and closely linked to the above, we investigate if more women on the corporate boards generally lead to more women in top management, regardless of any legislative quota. We study whether female directors tend to choose women for top management positions more often than their male counterparts. In other words – is there a general internal spillover from boards to management? Our findings suggest an insignificant relationship in Norway. Hence,

the government should be careful about using impact outside the boardroom as a motivation for implementing a board quota for AS.

Our thesis is structured as the following. In section 2, we provide thorough information on the Norwegian board gender quota and the current ASA and AS situation, before presenting relevant literature on this subject. In section 3, we present our data and the characteristics of our samples. Furthermore, section 4 is dedicated to analysing the external and internal spillover effects of the GBL and board-to-management relationship in general. We conclude our study in section 5.

2. Background and existing literature

In this section, we begin by presenting background information on the Norwegian GBL for ASA and give context to the recent hearing for AS companies. We then present relevant literature and discuss how our thesis contributes to the existing literature.

2.1 The Norwegian quota

In the early 2000s, Norwegian authorities slowly began to show signs of a desire to increase female representation in corporate boards through two white papers in October 1999 and July 2001. The GBL was finally proposed by the policymaker on the 13th of June 2003 (Ot.prp. nr. 97 (2002-2003)), stating that all public limited companies and state-owned companies must have at least 40% of each gender at the table of the board of directors within two years. The quota only applies to shareholder-elected directors and not employee-elected. This is to avoid employees taking the "burden" of the quota if the general assembly should fail to fulfil the quota with their shareholder-elected representatives, thereby shifting the issue upon their employees (Ot.prp. nr. 97 (2002-2003)).

For smaller-sized boards exemptions from the 40% requirement would apply. As shown in *Table 1* below, the quota mandates that in a board with three directors, at least one male or woman would have to hold a seat, underlining that the gender-balancing requirements hold for both genders. Moreover, there must be at least two women on boards with four to five directors, three with six to eight directors, and four women on nine-member boards. Firms

could meet the criteria by replacing a male representative or by changing the board size altogether. Ultimately, the minimum requirement of a 40% fraction applies to boards with ten or more members.

Table 1: Quota requirements

Mandated gender representation for shareholder-elected directors in ASA board compositions as of 2008, referring to §6-11a in the GBL.

Number of shareholder-elected board directors	Required representation of each gender
2 to 3	1
4 to 5	2
6 to 8	3
9	4
10 +	40 %

The proposal included a provision that it would be cancelled if all ASA voluntarily complied by 2005. Although many companies began filling female seats, the effort was ultimately deemed insufficient by the newly elected coalition party, led by the Labour party ("Arbeiderpartiet"). By July 2005, the legal process commenced, and the government decided to implement the law. The Conservative party ("Høyre") continuously opposed the mandated quota and suggested a softer approach. Nevertheless, by December 9th, 2005, the Norwegian Parliament enacted the GBL, imposed with the sanction of forced liquidation by non-compliance, a penalty not previously seen in any other country. The GBL, induced in article §6-11a in "The Norwegian Public Limited Liability Companies Act", was finally implemented with a two-year grace period to achieve compliance, implying full implementation by January 1st, 2008 (Eckbo, Nygaard, & Thorburn, 2019).

One reasoning for the mandatory quota lies in the numbers. As of September 2002, 76% of the ASA corporate boards consisted solely of male board directors (ECON, 2003), highlighting a significantly skewed gender representation. The objectives for the proposition were, first and foremost, to improve labour market opportunities for all professional women, not just for those sitting on boards (Bertrand, Black, Jensen, & Lleras-Muney, 2019), and thereby achieve more gender equality in leadership positions (Strøm, 2019). The Ministry stated that "Norwegian companies do not make use of the valuable expertise that women have" (Ot.prp. nr. 97 (2002-2003)). They further reasoned that women did not hold top management

positions, although they carried both the educational background and sufficient competence. As a second promise, the government argued that increased diversity in the boardroom could improve firm performance through efficiency and innovation. This has been widely studied, and we will therefore not analyse the degree of fulfilment of the second promise in this paper.

Today, the quota for ASA is widely accepted in Norway, and similar regulations have been introduced in other European countries such as Spain, Italy, Germany, and France (Mensi-Klarbach & Cathrine, 2020). As mentioned, the current quota in Norway applies to the boards of ASA but not to the many AS companies. In the initial proposition from 2003, the rationale behind the exclusion was that the AS firms were mostly small family-owned companies, where the owners themselves were members of the board. The hearing stated that "For these companies, laws regarding gender representation might not be as appropriate" (Ot.prp. nr. 97 (2002-2003)).

The topic of quotas for AS has also been up for debate in the past. Already back in 2011, former state secretary Rikke Lund (also from the Norwegian Labour party) welcomed a quota for AS, while the opposition in the Conservative party then called it a "declaration of war against small businesses" (Voll & Trøite, 2011). In the recent publication of the hearing on December 12th, 2022, the Ministry of Trade emphasised that it is a political goal that men and women are equally represented where power is exercised (Ministry of Trade, Industry and Fisheries, 2022). As very little has happened in the boardrooms of AS companies, measures are deemed necessary by the sitting government, again causing a widespread debate.

One of the main arguments when the GBL was introduced in 2003, was supply-side issues of obtaining enough qualified women. Similarly, these concerns are still present today. Heidi Nordby Lunde, a parliamentary politician for the Conservative party ("Høyre") recently stated that it would be impossible to find enough qualified women for all the AS boards (NRK, 2022). However, studies show that the supply of qualified female candidates was, in fact, high enough (Eckbo, Nygaard, & Thorburn, 2022). In 2008, the newly reserved seats were filled by women even more qualified along many dimensions (Bertrand, Black, Jensen, & Lleras-Muney, 2019).

Another concern with an AS quota regards the vast size differences between AS companies. Finance professor at NHH, Karin Thorburn, has researched the effect of the Norwegian GBL on boards and argues that one must distinguish between large and small private limited liability companies (Borkamo & Sandblom, 2022). Thorburn says she opposes requirements for small companies but argues a quota can say something about the kind of society we want. "Do we want a society where the old, male-dominated social structure persists? Or do we want to keep up with the times, change and have equality in boards as well?" (Borkamo & Sandblom, 2022). "Dagens Næringsliv" (DN) also published an editorial article stating that "female board quota for AS is a hopeless idea", arguing that it will lead to unnecessary and formalistic looting and hassle for small and medium-sized businesses (DN, 2022). They oppose the quota even for large AS companies, arguing that these probably have guidelines in place for gender balancing already (DN Editorial, 2022).

When asked if the potential quota requirements would be mandatory regardless of size, the sitting Minister of Trade, Jan Christian Vestre, replied that "it is possible to begin with the large and medium companies, but since most AS are small, they would have to be considered" (Brekke & Schwenke, 2022). In the hearing, the ministry proposes certain criteria regarding size in terms of income[5] and the number of full-time employees (Ministry of Trade, Industry and Fisheries, 2022). The recommended threshold criteria for the latter is more than 30 full-time equivalents. For reference, the directive from the European Commission, states that companies with fewer than 250 employees are exempt (European Commission, 2022).

In short, the hearing concludes that legislation on gender representation in companies can benefit society by ensuring access to the expertise of women (Ministry of Trade, Industry and Fisheries, 2022). A hard quota for AS will provide rapid change by "forcing" more women to take on board positions and participate in high-level decision-making. The ministry states that an increased proportion of women on boards is a common good, even if it is achieved through legal requirements rather than naturally. In their view, the challenge is not a lack of competent women but rather a lack of assessment and recognition of their competence.

[5] The threshold criteria mainly discussed for income is if operating- and financial income exceeds NOK 50, 70 or 100 million.

2.2 Literature review

The academic debate on the strategic importance of female directors is widely recognised and still open. As noted, most studies regarding gender diversity in the boardroom seek to analyse the links between female presence on the board and firm performance metrics. However, looking at several papers, it seems complicated to find solid evidence of significant changes in neither firm performance nor firm value.

A much-cited study by Ahern & Dittmar found that the quota caused a significant drop in the stock price at the announcement of the law and led to younger and less experienced boards resulting in deterioration in operating performance (Ahern & Dittmar, 2012). Matsa & Miller back this up in their study, stating that the operating performance of ASA drops significantly relative to AS (Matsa & Miller, 2013). However, in a more recent study, Eckbo, Nygaard & Thorburn countered that the quota-induced changes in market valuations and operating performance were both economically and statically negligible (Eckbo, Nygaard, & Thorburn, 2022). Our paper does not argue these findings but instead seeks to supplement current literature and contribute valuable insight to policymakers debating whether a quota should be implemented for AS companies based on its ability to increase career opportunities for women outside the boardroom.

We ask ourselves, why is gender balance in leadership positions important? We look to John Christian Langli, who argues that one should examine how the GBL has affected society, firms, and individuals separately (Langli, 2011). Looking at the impact from different angles and levels can provide deeper insight before introducing quotas for AS. Langli states that from a societal perspective, the arguments for gender balancing are linked to justice, democracy, participation, and equality. At the company level, the argument is related to better board decisions and subsequently increased profitability because there will be more diversity in boardrooms and society's resources will be better utilised. At the individual level, the reason is that women do not have the same career opportunities as men, often referred to as the glass ceiling (Langli, 2011). This paper aims to investigate the effect of the quota on the individual level and will not consider the impact from a societal or company level due to large amounts of research on these topics. Instead, we ask if quotas on gender balance have been able to break the glass ceiling or have the potential to do so. Furthermore, does a more gender-diverse board

indirectly contribute to diminishing the glass ceiling outside the boardroom by making top management positions more accessible for women? Most of the discussion of internal spillover in this paper challenges the first promise of the GBL, namely that the law would contribute to increased gender equality and female representation in influential positions.

As mentioned, there was extensive debate when the first quota was enacted in 2003, with one of the main arguments against the quota being the lack of qualified women to fill the seats. In other words, there was worry about a supply-side issue. However, in their study, Bertrand et al. conclude that the newly reserved seats were actually filled by women of better qualifications along many dimensions (Bertrand, Black, Jensen, & Lleras-Muney, 2019). Hence, one of the main arguments against the GBL fell short. The newly published hearing concludes that a quota for AS will require approximately 10,800[6] women to be recruited (Ministry of Trade, Industry and Fisheries, 2022). It is uncertain whether supply-side issues will arise if AS companies are obliged by law to recruit more women.

Bertrand et al. further argue that quotas can pose as an effective tool to improve gender equality, especially if qualified women are being discriminated against an absence of networks to help them climb the corporate ladder (Bertrand, Black, Jensen, & Lleras-Muney, 2019). More specifically, they state that the reform could have spurred a more widespread search for finding qualified women by breaking some of the "old boys" network that may have dominated the board appointment process prior to the quota. The "old boys club" theory states that male directors tend to look after one another through various activities, excluding female representatives. Males thus have an advantage in the selection process of becoming a board member where this phenomenon still exists (Lang, 2011). A recent study found that the 2003 regulation has contributed to a broader acknowledgement of what relevant competence for boards is (Seierstad, Tatli, & Huse, 2020), possibly disrupting some of the "old boys" network mentality. Furthermore, Bertrand et al. argue that the quota could carry long-term impact by telling young women to prepare themselves for increased opportunities in the corporate world

[6] The need for 10,800 women is calculated based on the threshold that only companies with more than 30 full-time equivalents and/or more than 70 NOK million in total income (operating and financial) will be subject to the regulation.

through for example, education – However, this is difficult to measure (Bertrand, Black, Jensen, & Lleras-Muney, 2019).

The question still stands – Do women themselves choose women? In their editorial opinion, DN states that no research has found that more women on boards lead to more female top management (DN, 2022). However, looking at corporate America, David A. Matsa and Amalia R. Miller (MM from now on) find a positive association between the female share in boardrooms in the previous year and the female share among current top executives. They further found that causality runs from boards to management and not the other way around, indicating a top-down effect that can be induced through legal matters such as a board quota. Thus, assuming similar patterns for the US and Norway, one should find a spillover effect of increased female presence on the board of directors onto top management.

We also consider the aspect of a critical mass of female directors. Rosabeth M. Kanter (1997) introduced the critical mass theory, stating that only when the minority gender makes up a minimum of 35% of a team, then gender diversity will enhance team performance (Kanter, 1997). She argues that a lower share reduces productivity and diminishes the participants of the minority gender to symbolic representatives, also known as “tokens”. Improved team performance impacts the efficiency regarding core decisions, such as choosing the best candidate for top management positions, regardless of gender. The regulative restriction of 40% for both the GBL and the new EU directive thus seems reasonable. Douglas Branson subsequentially finds that obtaining a critical mass may decrease the “group thinking” phenomenon in the boardroom (Branson, 2012). Thus, we hypothesise that more women in the boardroom can help break some of the “old boys” network.

Our contribution to literature is threefold. First, we examine if there is an external spillover from the 2003 board quota for ASA onto AS boardrooms. That is, we study whether there is an indirect impact across two organisational forms, where one is affected by a mandatory policy, and the other is not. We have found no study explicitly looking into whether the quota, in isolation, has encouraged AS companies to increase the number of female directors voluntarily. We find little to no impact. Second, we investigate if there is internal spillover from the 2003 board quota onto top management in the affected companies. That is, we study whether the board quota, in isolation, increased the opportunities for women outside the

boardroom, which, to our knowledge, has yet to be explicitly studied. Again, we find little evidence of a spillover effect. Third, we look at the general board-to-management relationship by replicating the study of Matsa & Miller (2011) for Norwegian and Swedish companies. We find no significant relationship between the female board share and the female share of top management in Norway, while the results are more ambiguous for Sweden.

Finally, we want to acknowledge a debated limitation to analysing the GBL, which might affect our methodology going forward. Since the law is mandatory for ASA only, companies could avoid the legislation by shifting registration into AS. One might argue that this adds a problematic layer to the methodology of analysis done using pre-post-reform data. In their 2013 paper, Bøhren and Staubo state that half of the ASA firms at the time of legislation decided to exit to the limited organisational form, a form not exposed to the law (Bøhren & Staubo, 2013). Strøm supports this report, stating that the reform has had adverse, unintended effects, with the drastic reduction in the number of ASA, calling it "a withering of the ASA organisational form" (Strøm, 2019). Nevertheless, Eckbo et al. debunk this myth of firms changing their legal status through their study and state that no listed ASA delisted for reasons other than M&A or bankruptcy, which are "complex transactions that are almost certainly not driven by the quota restriction" (Eckbo, Nygaard, & Thorburn, 2022). For unlisted ASA, they do find conversions; however, by controlling for year-fixed effects, these conversions are uncorrelated with the board gender composition. Hence, this paper does not consider ASA to AS conversions as problematic.

3. Data and sample characteristics

In this section, we present the data used in our analyses. We have separated the presentation of the data sample for the external and the internal analysis, as these consists of two different datasets from separate databases. We find these two data sources have different prospects in answering the different parts of the thesis.

3.1 Data for the external analysis

The primary data used for the first part, regarding the external spillover from the ASA quota to AS gender ratio, is provided by SNF[7] and the Norwegian School of Economics' database of accounting and company information for Norwegian companies, developed by Endre Berner, Aksel Mjøs and Marius Olving (Berner, Mjøs, & Olving, 2015). The data source is the Accounting Register of Norway, maintained by the Brønnøysund Register Centre[8], which contains complete financial records on a fiscal year basis for most Norwegian firms (SNF, 2022). All public and private limited liability firms are required by law to prepare and disclose these financial records.

We have the population of ASA and AS for the years 2000-2020. There are 551,606 unique AS company IDs over the period, and 1,168 unique ASA company IDs, whereas 413 are listed, and 955 are unlisted, with 120 changing their legal status over the sample period. Hence, some companies are counted as both listed and unlisted over the period, making the total sum deviate from the unique number of companies. For the purpose of this paper, we do not find it necessary to separate listed and unlisted ASA companies, as our primary focus is to study the difference between firms that are obliged by the current law and those that are not, thereby ASA and AS. Subsequentially, some companies also change their activity status over this time, but we do not consider this a disruption to our analysis. We removed all observations where revenue was either not reported or below zero. These companies had missing observations on several data points we were interested in. We also exclude companies where information on board composition is lacking, such as the number of board members or female board members.

Following Eckbo et al. (Eckbo, Nygaard, & Thorburn, 2016), we create a subset of the AS sample by keeping the 1% largest AS in terms of revenue at a given year. Hence, the number of unique firms over the period reduces from 551,606 to 6,453. This resonates with the recent hearing, where the government suggest some cut-offs based on revenue or number of full-time

[7] SNF stands for «Samfunns- og næringslivsforskning». It is the center for applied research at the Norwegian School of Economics (SNF, u.d.).

[8] The Brønnøysund Register Centre is a government agency subject to the Ministry of Trade and Industry. The centre administers 17 of the most important registers in Norway, including financial statements for most Norwegian companies. (The Brønnoysund Register Centre, 2022)

equivalents Although a set threshold for size is yet to be determined, we find using the 1% largest AS sample is appropriate. Descriptive sample characteristics are presented in *Table 2* below, with panel A and B for ASA and AS 1% largest respectively. The average board size for the full AS sample is only 2.08, whereas for the 1% largest AS, it is 4.71, which is more similar to the ASA sample, which holds an average board size of 5.48. In panel A, we observe that the average gender ratio for ASA is only 35% in 2020, although the quota requires 40% gender representation. *Allmennaksjeloven,* §6-11 a. (2) gives exemption if the board is of a certain size which can explain the lower average ratio, as denoted in *Table 1*.

A presentation of the Swedish subset can be found in Appendix 1. In Sweden, there are currently no regulations for gender composition on boards, and the data serves as an important control group. We have retrieved data on board characteristics for Swedish companies over the period from 2000 to 2020 through the BoardEx database[9]. For this sample, we only have access to public limited companies. However, for the purpose of this paper, we do not find it necessary to include private limited companies as neither have quota requirements. There are 414 unique company IDs from Sweden. Comparing *Table 2* to Appendix 1, we find some discrete differences between the Norwegian and the Swedish samples. The Swedish companies tend to have larger boards, with an average board size of 6.47 board members. Nevertheless, the average number of women on the board is similar to Norwegian ASA, with approximately 1.5 seats. Subsequently, the average ratio for Sweden becomes lower compared to ASA.

[9] See *3.2 Data for the internal analysis* for more information on this database

Table 2: Sample characteristics for the Norwegian data

The table reports firm and board characteristics from 2000 to 2010, as well as for 2015 and 2020 for Norwegian public limited companies (ASA) in panel A and Private Limited Companies (AS) in panel B. *AS 1%* refers to the 1% largest AS in terms of revenue for a given year. *Avg. gender ratio* refers to the number of female directors over the number of total directors. Revenue is reported in 1000 NOK. *Mean* at the end of each panel refers to the average over the whole period. The data is retrieved from SNF, and the sample consist of 1168 unique ASA and 6,453 unique AS.

Year	Number of observations	Mean revenue	Avg. # of employees	Avg. board size	Avg. # of women on board	Avg. gender ratio
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: ASA			
2000	541	349 448	135	5.21	0.23	0.04
2001	563	634 501	129	5.18	0.24	0.04
2002	528	675 149	128	5.16	0.31	0.05
2003	511	518 676	116	5.12	0.38	0.06
2004	516	629 602	115	5.16	0.52	0.09
2005	461	847 010	115	5.35	0.87	0.15
2006	479	892 935	111	5.29	1.21	0.22
2007	467	951 957	101	5.22	1.76	0.34
2008	401	1 507 468	118	5.32	1.97	0.37
2009	346	1 041 713	127	5.36	1.95	0.37
2010	331	1 295 121	143	5.43	1.99	0.37
…						
2015	216	2 008 235	209	5.70	2.07	0.37
…						
2020	238	1 950 457	187	5.88	2.03	0.35
Mean	356	1 398 557	153	5.48	1.53	0.28
			Panel B: AS 1%			
2000	1263	956 699	267	5.08	0,41	0.07
2001	1290	878 222	260	5.10	0,42	0.08
2002	1304	884 073	286	5.13	0,47	0.08
2003	1406	810 320	249	4.93	0,47	0.09
2004	1505	882 790	245	4.90	0,51	0.09
2005	1515	1 036 316	255	4.93	0,56	0.10
2006	1743	1 074 168	246	4.86	0,60	0.11
2007	1910	1 066 347	248	4.83	0,61	0.12
2008	1974	1 121 776	261	4.82	0,63	0.12
2009	1991	1 060 226	250	4.81	0,64	0.12
2010	2002	1 114 471	248	4.82	0,66	0.12
…						
2015	2640	1 042 974	256	4.51	0,51	0.11
…						
2020	3315	1 002 730	214	4.19	0,56	0.12
Mean	2143	1 042 191	247	4.71	0.54	0.11

3.2 Data for the internal analysis

For the internal spillover part of the analysis, we have retrieved board composition and top management data through the BoardEx database. BoardEx is a global leadership database covering board members, non-board members, the C-suite, senior leaders, and professional advisors (WRDS, 2022). The Norwegian BoardEx sample contains 256 unique companies, while the Swedish sample consists of 414 unique companies over the period from 2000 to 2020. In addition, we have retrieved data on annual revenue and number of employees per company, which enables us to perform a propensity score matching between the Norwegian and Swedish samples. This data is retrieved from Compustat Global through the S&P Global Market Intelligence database, a leading provider of financial and industry data worldwide (WRDS, 2022).

Note again that most companies were only active over part of the period, making the number of observations for a given year vary. As explained above for the Swedish subset in the external analysis, using the BoardEx database for both board and management data limit our sample to public limited companies only. In *Table 3* below, we have presented some sample characteristics on both boards and management.

Table 3: Sample characteristics for Norwegian and Swedish BoardEx data

The table reports board and management characteristics for Norwegian and Swedish public limited companies for 2000, 2010 and 2020, in panel A and B respectively. The sample consists of 256 unique Norwegian firms (ASA) and 414 unique Swedish firms. *Any Female?* refers to the percentage of companies that have at least one female board or management representative in the given year. *Average # of Female* refers to the average number of females in board or management.

	Board				**Management**			
Year	Any female?	Average share of female	Average size	Average # of female	Any female?	Average share of female	Average size	Average # of female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Norway (256 unique firms)								
2000	0.25	0.08	5.40	0.43	0.30	0.48	4.95	0.48
2010	0.92	0.39	6.35	2.49	0.56	1.70	11.03	1.74
2020	0.92	0.38	6.43	2.44	0.79	2.68	10.48	2.68
Panel B: Sweden (414 unique firms)								
2000	0.39	0.10	6.32	0.61	0.48	0.13	6.90	0.89
2010	0.85	0.24	6.34	1.49	0.68	0.20	10.88	2.16
2020	0.94	0.34	6.47	2.17	0.89	0.27	11.93	3.22

For Norway, the values differ somewhat from the ones observed in the SNF data. The BoardEx sample displays a generally higher average gender ratio and average board size compared to the SNF sample. Since the BoardEx database mainly contains information on public limited companies, we are not able to use this data in the first part of the analysis, as it would be impossible to compare ASA to AS. We will undeniably see differences in the average values with two different data samples for ASA. The data sample from BoardEx contains only companies that provide both board and management data, limiting the sample to 256 unique public limited companies. The magnitude of these differences is not highly significant, as our analyses look at marginal changes rather than values, it does not seem to pose a problem. Additionally, there might be some differences in how the data is cleaned, which we elaborate on further.

3.2.1 Cleaning BoardEx data

The following addresses how we cleaned the raw data from the BoardEx database. We use a merged panel with data from Norwegian and Swedish companies from 2000 to 2020. For each company, the number of board members and managers is counted for each year they are reported. An illustrative header for the regression data can be found in Appendix 2. First, some board and management positions have a high turnaround, with two or three different people holding the role in a given year. Hence, we must adjust the data when counting the absolute number of positions on either the board or management for a given company. We only assign an individual to a board or management position each year if the individual held the position by 31st of December. By doing so, we avoid assigning two individuals to the same position and thereby count one distinct role several times in a given year. A weakness in this approach is that we might assign one particular individual to a whole year even if they only held the position for a small fraction of the year or that we fail to count an individual that held the position most of the year but quit just before the year changed. However, for simplicity reasons, we deem this method the most practical.

Second, we have some observations missing either start- and end-date or both. Missing end dates could simply imply that the individuals still hold the position. To make these individuals count over the years, these observations are given a hypothetical end date of 01/01/2050. On the other hand, observations missing start-date serve as a more significant problem as we can

not know how long the individual has held the position or when the individual was instated. We find it more accurate to leave out these observations, with the implication that some board members are not accounted for. The number of excluded observations was relatively small, so excluding them should not be a significant limitation of our analysis.

Third, some observations had missing data on gender, one of the most important parameters for our analysis. For Norway, we had 8,020 individual ID observations and found 649 individuals without a gender variable, while for Sweden, there were 1 048 missing data on gender out of 14,625 individuals. In other words, around 7 to 8 % of the individuals had not reported gender in the BoardEx database. To ensure correct gender ratios for the Norwegian and Swedish samples, we matched the registered names against national registers of common names for men and women, such as Statistisk Sentralbyrå (SSB) for Norway and Statistikmyndigheten (SCB) for Sweden. Director names with still no match, often due to foreign names, were in total 57 individuals. These individuals were manually assigned a gender based on common perception or google searches. A weakness in doing so is that we might have misgendered some individuals; however, the issue seems limited as few observations were manually assigned a gender.

4. Empirical Analysis

In this section, we begin by looking at the indirect effects from the 2003 quota, in isolation. We separate the quota-specific analysis into (4.1) an analysis of the external spillover from the quota on ASA towards AS and (4.2) an analysis of the internal spillover from the board quota towards ASA management ratios. Last, (4.3) we investigate whether there is, in general, an internal spillover from boards to management, regardless of the quota. In each section, we briefly describe the methodology before presenting our findings.

4.1 Methodology for External Spillover – ASA quota to AS

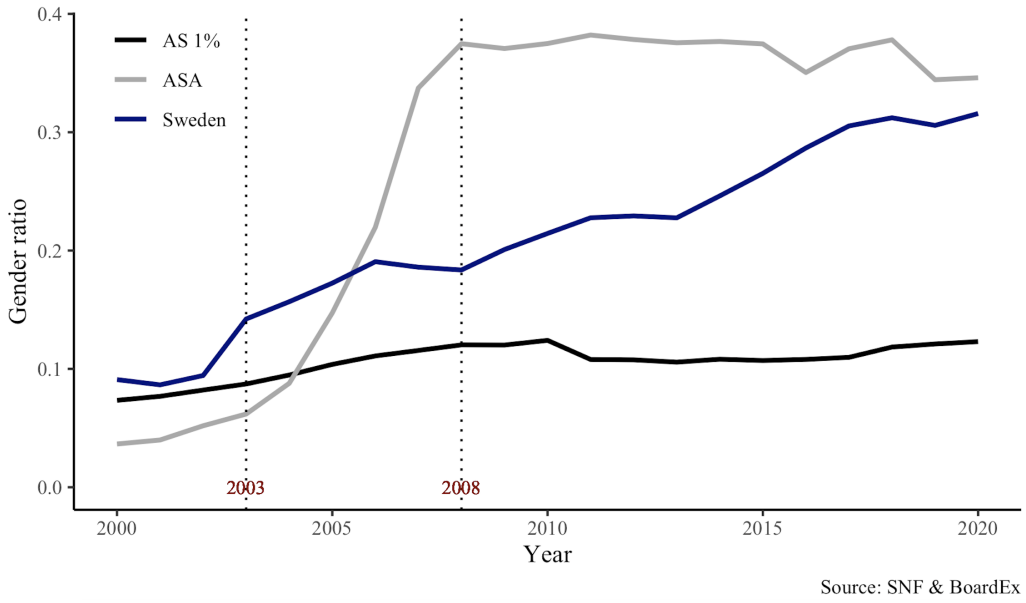
For analysing the isolated, external spillover from the board quota for ASA to AS, that is, the indirect effect upon the unaffected group of companies, we opt for a difference-in-difference (DiD) analysis. Furthermore, we compare the two Norwegian groups to a Swedish subset of companies for robustness. This can provide a cross-sectional trend factor, for a country often

compared to Norway in societal and cultural matters. We find this add-on important, as it can shine light upon whether there is a general change in society towards more female board seats even without a quota, thereby indicating if a policy for AS is necessary or not in the longer term.

Figure 2 below illustrates the development from 2000 until 2020 for ASA, the 1% largest AS and the Swedish subset. We observe different patterns for the three groups. Interestingly, ASA companies and the Swedish unregulated subset seem to convert towards the same ratio, while AS 1% has developed relatively flat throughout the period.

Figure 2: Development of average gender ratio for ASA, AS, and Sweden

The dotted lines illustrates when the quota was first formally introduced (2003) and when the quota became mandatory (2008). The solid lines show the average percent of female board representation for Norwegian ASA, a subset of the 1% largest AS companies in terms of revenue and a Swedish subset over the period from 2000 to 2020.



Source: SNF & BoardEx

The DiD estimator is defined as the difference in average outcome in the treatment group before and after treatment, subtracting the difference in average outcome in the control group. For the DiD estimator to be unbiased and to ensure validity, the assumption of parallel trends must hold. It assumes that the difference between the treatment group and the control group would be constant over time absent of treatment. Violations of this assumption will coherently cause a biased estimation of the causal effect. Although there is no statistical way of testing this assumption, we can visually assess the pre-treatment period for both treated and untreated.

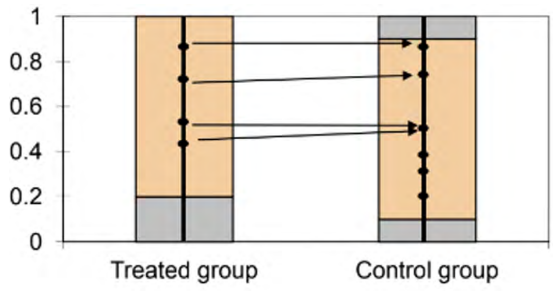
Looking at *Figure 2*, we see some disparity in the developments for the different groups before 2008, when the quota became mandatory. The quota itself is exogenous, but the timing of compliance is not. Many companies made changes in the board composition long before it became mandatory in 2008. Hence, to avoid violating the parallel trend assumption, we set 2003 as the time of treatment, as this was when the policy was first enacted. There is a noticeable increase in the data for Sweden in 2002, which may lead to biased estimates. However, by using 2003 as the time of treatment we limit our pre-treatment period to only three years, 2000, 2001 and 2002, reducing the opportunity to study the pre-trend for the two groups. Additionally, we set the upper bound to 2010, as we cannot make causal interpretations that the quota enacted in 2003 indirectly impacted coefficients in 2020. The timeframe resonates more towards a short-term view of the indirect effects.

Furthermore, the DiD-estimation is limited to only time- and treatment effects. Hence, a concern with the regression is that the two groups modelled may differ in ways that affect their trends or composition over time. Propensity score methods are often used to handle this type of confounding in non-experimental studies (Stuart, et al., 2014). To reduce bias in our sample, we perform propensity score matching, defined as the conditional probability of assignment to a particular treatment given a vector of observed covariates (Rosenbaum & Rubin, 1983).

We match similar companies across the treated and untreated group, enabling us to see if these have changed significantly in different directions post treatment (Katchova, 2013). In our analysis, we match three AS for each ASA. The matching of companies is based on the variables *Revenue, Number of employees, Board-size* and *Sector.* The propensity score model (PSM) used is a probit model with treatment as the dependent variable and the variables mentioned above as independent (Katchova, 2013). When performing a multiple regression on the independent variables we find all to be significant. Hence, they are all included in the propensity score matching. The regression result is depicted in Appendix 3. Each observation is then given a propensity score. There are several matching methods available, but we chose the nearest neighbour approach, that is, for each treated observation i (ASA), we select three control observations j (AS), that has the closest set of variable values, that is $\min\|p_i - p_j\|$. The approach is illustrated in *Figure 3* below.

Figure 3: Nearest neighbour (KNN) matching by Katchova, 2013

The figure illustrates the Nearest Neighbour approach for Propensity Score Matching. Each ASA observation is matched towards three AS observations based on *Revenue, Number of employees, Board-size* and *Sector.*



PSM makes causal interpretation of the outcome of two different groups easier, as it reduces the bias by comparing ASA with AS firms that are similar. However, the propensity score matching method has also been criticised with the true propensity score never presented. Hence, one can never be certain of the accuracy between the matched observations.

4.1.1 Findings for External Spillover – ASA quota to AS boards

We first regress AS against ASA without doing the propensity score matching beforehand. In *Table 4* below, we present descriptive statistics of the two groups before and after the policy was enacted in 2003. Not surprisingly, we find a significant increase in gender ratios for ASA companies, while the average gender ratio for AS companies have only slightly changed upwards, from 7.77% to 11.1% over the period.

Table 4: Descriptive statistics for ASA and AS 1% before and after policy

The table reports the average share of female directors for ASA and the 1% largest AS in terms of revenue before and after the GBL was introduced. Here, *Orgfom,* refers to the organizational form of the data sample. *Before policy Change* refers to the period from 2000 to 2002, while *After Policy Change* refers to the period from 2003 to 2010. The total number of observations is 17 903 for AS 1% and 5 144 for ASA.

t = 2003 (2000-2010)	**Orgform**	**Number of observations**	**Average gender ratio**
After Policy Change	AS 1%	14 046	0.111
Before Policy Change	AS 1%	3 857	0.077
After Policy Change	ASA	3 512	0.231
Before Policy Change	ASA	1 632	0.042

The DiD estimate is given by the following formula,

$$\hat{\delta}_{DD} = \bar{Y}_1^T - \bar{Y}_0^T - (\bar{Y}_1^C - \bar{Y}_0^C) \approx 0.231 - 0.042 - (0.111 - 0.077) = 0.154$$

The regression results are depicted in *Table 5* below. As expected, we find that the interaction coefficient *After Policy Change * ASA* is significantly positive. However, the variable *After Policy Change*, a dummy variable that takes the value 1 after 2003, is also significantly positive. This indicates evidence of a positive increase in gender ratio also amongst AS companies, which have not been required by law to improve their gender balance. Also, note that the *ASA* variable is significant and negative, simply implying that ASA prior to policy change had a lower average gender ratio than AS.

Table 5: DiD regression for ASA and AS 1% prior to PSM (2000-2010)

The table reports the result of the DiD regression between ASA and the 1% largest AS companies in terms of revenue using the regression below. *ASA* is a dummy equal to 1 if firm i is an ASA, zero otherwise. *After Policy Change* is a dummy equal to 1 if the year equals 2003 or higher. The constant represents the baseline, which is the average for AS 1% before 2003. *Gender Ratio* is the dependent variable and refers to the female board share. The regression use data from 2000 to 2010.

$$Gender\ Ratio_i = \alpha + \beta ASA_i + \gamma \cdot After\ Policy_i + \delta(ASA_i \cdot After\ Policy_i) + \varepsilon_i$$

	Dependent variable:
	Gender ratio
After Policy Change (t = 2003)	0.034***
	(0.003)
ASA	-0.035***
	(0.004)
After Policy Change * ASA	0.154***
	(0.005)
Constant	0.077***
	(0.002)
Observations	23,047
R^2	0.107
Adjusted R^2	0.106
Residual Std. Error	0.149 (df = 23043)
Note:	*p**p***p<0.01

These simple findings suggest that there has been an indirect spillover from the ASA quota to AS boardrooms, in that the policy has positively affected the board's gender ratio, regardless of organisational form. However, before attempting to make a firm conclusion based on these findings, we need to make sure that the sample is comparable. To reduce potential bias, we perform propensity score matching where each ASA is matched towards three comparable AS companies. The results from the DiD estimation with propensity score matching is presented in *Table 6* below. Note that the number of observations has been reduced as not all AS have been given an ASA to match with due to a lack of similar values.

Table 6: DiD regression for ASA and AS 1% after PSM (2000-2010)

The table reports the result of the DiD regression with propensity score matching between ASA and the 1% largest AS companies in terms of revenue using the regression below. *ASA* is a dummy equal to 1 if firm i is an ASA, zero otherwise. *After Policy Change* is a dummy equal to 1 if the year equals 2003 or higher. The constant represents the baseline, which is the average in *AS 1%* before 2003. *Gender Ratio* is the dependent variable and refers to the female board share. All ASA observations are matched with three AS observations based on revenue, number of employees, board size and sector. The regression use data from 2000 to 2010.

$$Gender\ Ratio_i = \alpha + \beta ASA_i + \gamma \cdot After\ Policy_i + \delta(ASA_i \cdot After\ Policy_i) + \varepsilon_i$$

	Dependent variable:
	Gender ratio
After Policy Change (t = 2003)	0.034***
	(0.003)
ASA	-0.032***
	(0.005)
After Policy Change * ASA	0.152***
	(0.006)
Constant	0.074***
	(0.002)
Observations	18,332
R^2	0.128
Adjusted R^2	0.127
Residual Std. Error	0.145 (df = 18328)
Note:	*p**p***p<0.01

From the table, we confirm that all coefficients are still significant. The DiD estimate, *After Policy Change,* is significantly positive. Hence, even when accounting for firm-specific differences, our analyses indicate that the policy has had a positive effect on the gender ratio for AS. Although the change in gender ratio is relatively small for AS compared to ASA, the change is statistically significant.

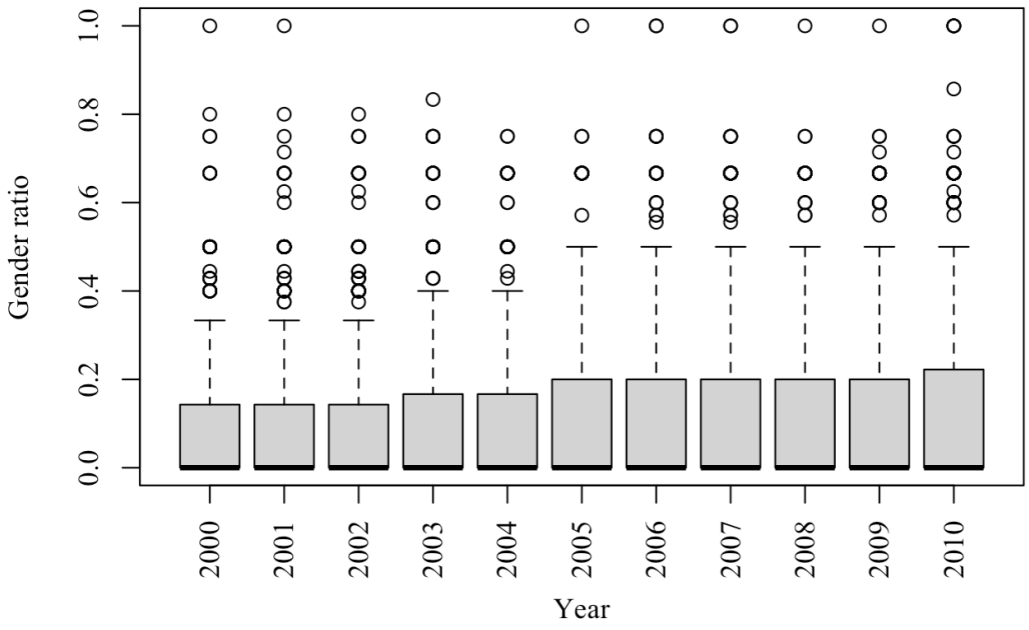
An explanation for the external spillover of the quota, could be that the ASA legislation sets the "tone" in corporate Norway, causing a signalling effect to other parts of the corporate landscape and alter how important participants perceives gender composition in boards to be. When the GBL was first presented, noncompliance would lead to dissolvement, confirming

the government's determination to increase female presence in the boardrooms. If AS companies expected that similar legislation would be initiated for limited companies, they would likely prepare in advance to avoid possible hurdles with recruitment and changes in board composition. Furthermore, if the biggest AS companies were planning on going public, compliance was necessary to ensure a smooth transition. However, other factors than those included in the regression could explain the changes seen, such as increased female participation in education that correlate closely with boardroom experience. Bertrand et al. debunked this hypothesis, stating that they found little evidence that the reform affected the decisions of young women (Bertrand, Black, Jensen, & Lleras-Muney, 2019).

The boxplot in *Figure 4* below speaks to a positive, steady trend for gender diversity in the top 1% largest AS companies, for the period from 2000-2010. Coherently, it illustrates why we find the *After Policy* coefficient significant. A steady progress could reflect deeper changes in society, hence the rise in female board representation in private limited companies may be independent of the GBL (Strøm, 2019).

Figure 4: Boxplot of gender ratios for the 1% largest AS

The figure illustrates the female board share of the 1% largest AS in terms of revenue over the period from 2000 to 2010. The box for each year is the Inter Quartile Range (IQR). It starts in the first quartile (25%) and ends in the third quartile (75%). Thereby representing 50% of the central data. The line represents the largest value less the upper quartile plus 1.5 times the IQR. Observations beyond this range is represented by the outliers.



In the next, we investigate whether there are signs of a general trend of increased focus on gender diversity in the corporate landscape over the period – causing more women to take place in the boardrooms of all companies. Studying the differences in board composition for treated and untreated companies in Norway towards untreated companies in Sweden can add valuable insight into the isolated effect of the quota to AS companies.

We perform DiD analysis comparing ASA and AS1% separately to a Swedish subset. *Table 7* below presents descriptive statistics for the treated and untreated groups, ASA and Sweden respectively, before and after the policy was enacted in 2003. Looking at the average gender ratios, we see that both groups have increased their average gender ratio. Sweden has gone from an average of 9.1% pre-quota to an average post-quota ratio of 18.2%. For Norway, the average gender ratio has increased from 4.2% to 23.1% from pre- to post-quota. Note that the average after the policy change is lower than the 40% mark, possibly due to it not being mandatory until 2008. We find that the post-quota average gender ratio for Sweden is only slightly below the one for ASA. Thus, it is possible that Norwegian ASAs would have reached similar levels over time absent of a quota.

Table 7: Descriptive statistics for ASA and Sweden before and after policy

The table reports the average share of female directors for ASA and the Swedish subset before and after the GBL was introduced. Here, *Sample,* refers to the data sample used. *Before policy Change* refers to the period from 2000 to 2002, while *After Policy Change* refers to the period from 2003 to 2010. The total number of observations is 2 362 for Sweden and 5 144 for ASA.

t = 2003 (2000-2010)	**Sample**	**Number of observations**	**Average gender ratio**
After Policy Change	Sweden	1 765	0.182
Before Policy Change	Sweden	597	0.091
After Policy Change	ASA	3 512	0.231
Before Policy Change	ASA	1 632	0.042

Looking at the regression results between ASA and Sweden below in *Table 8*, we find that all coefficients are significant. The interaction coefficient *Norwegian ASA After Policy Change*

(DiD-estimate) is positive, implying that Norwegian ASA has increased their gender ratio at a higher rate than their Swedish counterparts. This simply indicates what we would expect, namely that there is a more significant change in the gender ratio for ASA after the quota was instated in Norway. Interestingly, the dummy coefficient *After Policy Change* is also positive, indicating that Sweden has significantly increased the female gender ratio on their boards after 2003. This estimate is also higher than the one for AS in *Table 6*. The positive coefficient speaks to a general, positive trend in corporate Sweden, absent of a quota. A trend which is likely to exist in Norway as well, due to the similarity of the neighbouring countries. If this trend applies for both private limited and public limited companies, this finding could indicate a bias in the ASA to AS regression in *Table 6*.

Table 8: DiD regression for ASA and Sweden (2000-2010)

The table reports the result of the DiD regression between public limited companies in Norway (ASA) and Sweden using the regression below. *ASA* is a dummy equal to 1 if firm *i* is an ASA, zero otherwise, while *After Policy Change* is a dummy equal to 1 if the year equals 2003 or higher. The constant represents the baseline, which is *AS1% Before Policy*. The constant represents the baseline, which is the average in Sweden before 2003. *Gender Ratio* is the dependent variable and refers to the female board share. The regression use data from 2000 to 2010.

$$Gender\ Ratio_i = \alpha + \beta ASA_i + \gamma \cdot After\ Policy_i + \delta(ASA_i \cdot After\ Policy_i) + \varepsilon_i$$

	Dependent variable:
	Gender Ratio
After Policy Change (t = 2003)	0.091***
	(0.007)
Norwegian ASA	-0.048***
	(0.007)
Norwegian ASA After Policy Change	0.097***
	(0.009)
Constant	0.091***
	(0.006)
Observations	7,506
R^2	0.194
Adjusted R^2	0.194
Residual Std. Error	0.155 (df = 7502)
Note:	*p**p***p<0.01

However, we cannot exclude that there might be country-specific factors contributing to the increase seen in Sweden. Expectations of a similar law being passed in Sweden could have influenced Swedish companies to increase the number of females in the boardroom. However, this would suggest an indirect spillover across borders, from ASA to Sweden, and less so to AS. One explanation could be that the spillover is reliant on organisational form, as the Swedish subset consists solely of public limited companies. Given that the quota applied to only public limited companies, the Swedish subset, perhaps more so than the AS subset, would show signs of increasing their share – possibly from a more reasonable fear of similar legislative efforts being imposed. Another contributing factor could be that large, international companies in Sweden to a larger extent experienced pressure from partners or clients based in countries with already regulated board composition.

Note that there were in fact some soft government affiliations to the companies in Sweden as well, which could speak for the stable increase over the last two decades seen in *Figure 2*. This speaks for a lack of external shock, but rather a natural development over time. In 2004, the first Swedish Corporate Governance Code was published, which entered force in July 2005 (Code Group, 2004). The Swedish Corporate Governance Board was established to monitor and revise the code. Although the code itself only is a recommendation for companies, it likely boosted the focus on gender representation as a part of corporate governance, contributing to some of the increase seen in Sweden.

Next, we present a DiD of AS and Sweden, where neither has been treated, to see if either has developed differently. If two untreated groups have developed differently after the quota, this could speak to some spillover one way or the other. From the descriptive *Table 9* below, there seems to be a more significant change in the average gender ratio for Swedish companies, with a change in average from 9.1% to 18.2%, while Norwegian AS only change in average from 7.7% to 11.1%, both groups untreated. With a significantly different development, this might suggest that other factors in Norway suppress the development of women in boards for AS, or on the other side, factors in Sweden increasing their development.

Table 9: Descriptive statistics for AS 1% and Sweden before and after policy

The table reports the average share of female directors for the 1% largest AS in terms of revenue and the Swedish subset before and after the GBL was introduced. Here, *Sample,* refers to the data sample used, *Before Policy Change* refers to the period from 2000 to 2002, while *After Policy Change* refers to the period from 2003 to 2010. The total number of observations is 2,362 for Sweden and 17,903 for AS.

t = 2003 (2000-2010)	**Sample**	**Number of observations**	**Average gender ratio**
After Policy Change	Sweden	1 765	0.182
Before Policy Change	Sweden	597	0.091
After Policy Change	AS 1%	14 046	0.111
Before Policy Change	AS 1%	3 857	0.077

Looking at the regression results for DiD between AS and Sweden in *Table 10* below, we again find all coefficients to be significant. Not surprisingly after looking at *Figure 2*, the interaction coefficient *Norwegian AS After Policy Change* (DiD estimate) is negative, indicating that Norwegian AS has increased their gender ratio at a slower rate than their Swedish counterparts.

Since two comparable and untreated groups develop in a significantly different manner, it weakens the argument of an external spillover to AS companies. In other words, the spillover from the ASA quota to AS has not been considerable enough to impact AS more than the observed trend in Sweden. One explanation could be that there is a lack of supply – is it enough qualified women to fill both ASA and AS board seats? This question was raised and heavily debated before the GBL quota came in 2003. The recent hearing concludes that the challenge is not a lack of competent women but rather a lack of assessment and recognition of their competence. (Ministry of Trade, Industry and Fisheries, 2022). This thesis does not go in depth on potential supply-side issues, but we recognize the need for more knowledge about the topic before a definite recommendation is given.

Table 10: DiD regression for AS 1% and Sweden (2000-2010)

The table reports the result of the DiD regression between the 1% the largest AS in terms of revenue and the Swedish subset using the regression below. *AS* is a dummy equal to 1 if firm i is an AS, zero otherwise. *After Policy Change* is a dummy equal to 1 if the year equals 2003 or higher. The constant represents the baseline, which is Sweden *Before Policy*. *Gender Ratio* is the dependent variable and refers to the female board share. The regression use data from 2000 to 2010.

$$Gender\ Ratio_i = \alpha + \beta AS_i + \gamma \cdot After\ Policy_i + \delta(AS_i \cdot After\ Policy_i) + \varepsilon_i$$

	Dependent variable:
	Gender Ratio
After Policy Change (t = 2003)	0.091***
	(0.007)
AS	-0.013**
	(0.007)
After Policy Change * AS	-0.057***
	(0.008)
Constant	0.091***
	(0.006)
Observations	20,265
R^2	0.029
Adjusted R^2	0.029
Note:	*p**p***p<0.01

To summarize, the legislation in Norway had an impact on the female share in the ASA boardrooms. The quota is a "hard law" making all ASA comply as they would face forced liquidation if not. From *Figure 2,* we clearly observe that AS companies lie far behind both ASA and Sweden regarding female board presence. This could speak for a similar quota for AS companies to reach a higher female gender ratio. Initially, we do find some evidence of increased female board presence in AS companies after the quota, possibly from "setting the standard in corporate Norway" and initiating expectations of a similar law being passed for them. It is also possible that the biggest AS companies, in some ways, prepare for the change in legal status and therefore initiate efforts to comply with the quota gradually.

When separately comparing ASA and AS to the Swedish subset, we find evidence of an underlying trend as Sweden has doubled their average female share from pre- to post-period. So, although AS companies increased their share of women in the boardroom post-quota, the

impact diminishes compared to Sweden. Our findings weaken the argument of an external spillover from ASA to AS, as there are no regulations for neither AS nor Sweden. The external spillover may be conditional on the organisational form.

In conclusion, we find little evidence of an external spillover from ASA to AS. The two untreated groups, AS and Sweden, differ significantly in their development, with Sweden increasing their female share significantly, ultimately gaining a similar share as Norwegian ASA today. If the societal changes can be linked to the development seen in Sweden, and we assume that similar changes have also occurred in Norway, then it is necessary to examine why AS companies struggle to increase their rate at the same pace. This suggests that other factors are at play contributing to the slow increase. One explanation could be that there is a lack of qualified women to fill both ASA and AS boards. Nevertheless, a hard quota will inevitably help the government get more gender-balanced boards – providing more female seats at the table.

4.2 Methodology for Internal Spillover – Quota to Management

We study the relationship between the 2003 quota for boards and the subsequent development in management ratio using the same difference-in-difference methodology as section 4.1. We continue to use the period from 2000 to 2010 and thereby look at the short-term indirect effects of the 2003 quota. All data used in this section, and the next, is retrieved from the BoardEx database. We seek to answer if there is an indirect spillover effect from the board quota to management. Given the government's promise of increased labour market opportunities for all professional women, we would expect to find a positive and significant DiD estimator. Our hypothesis is that the quota, which led to more women on the boards, indirectly impacted the representation of women in top management as well.

Again, we perform propensity score matching to reduce bias in our sample. Here, we match each Norwegian ASA with two Swedish companies. When performing the multiple regression on the dependent variables, we include *Revenue, Number of employees, Board-size* and *Industry*. We find all variables but *Board-size* to be significant. Thus, we exclude board size

in the matching but keep the remaining variables. The regression result is presented in Appendix 4.

Furthermore, we investigate whether distinctive industries significantly differ in how their gender ratio for top management has evolved. We hypothesise that there might be more significant increases in female top management post-quota for traditionally male-dominated industries. To examine such industry-specific effects, we allocate each firm into one of eight different industries based on their registered sector code. The industries are depicted in *Table 11* below, and an overview of the allocation from sector to industry is presented in *Appendix 5*. Subsequently, we perform the same DiD analysis for each industry. We include propensity score matching, where we match on a one-to-one basis due to the skewed distribution of observations per industry.

Table 11: Firm allocation into industry

The table illustrates the number of firms from the Norwegians and Swedish BoardEx samples allocated to different industries. TMT refers to Technology, Media and Telecommunication, while *Other* include Real Estate, Aerospace & Defence, Transport, Leisure & Hotels, Automobiles & Parts and Education.

Number of companies per industry	**Norway (ASA)**	**Sweden**
Consumer Retail	12	43
Energy	39	12
Financial institutions	25	40
TMT	59	86
Business Services	11	14
Industrial	56	86
Healthcare	20	81
Other	34	50

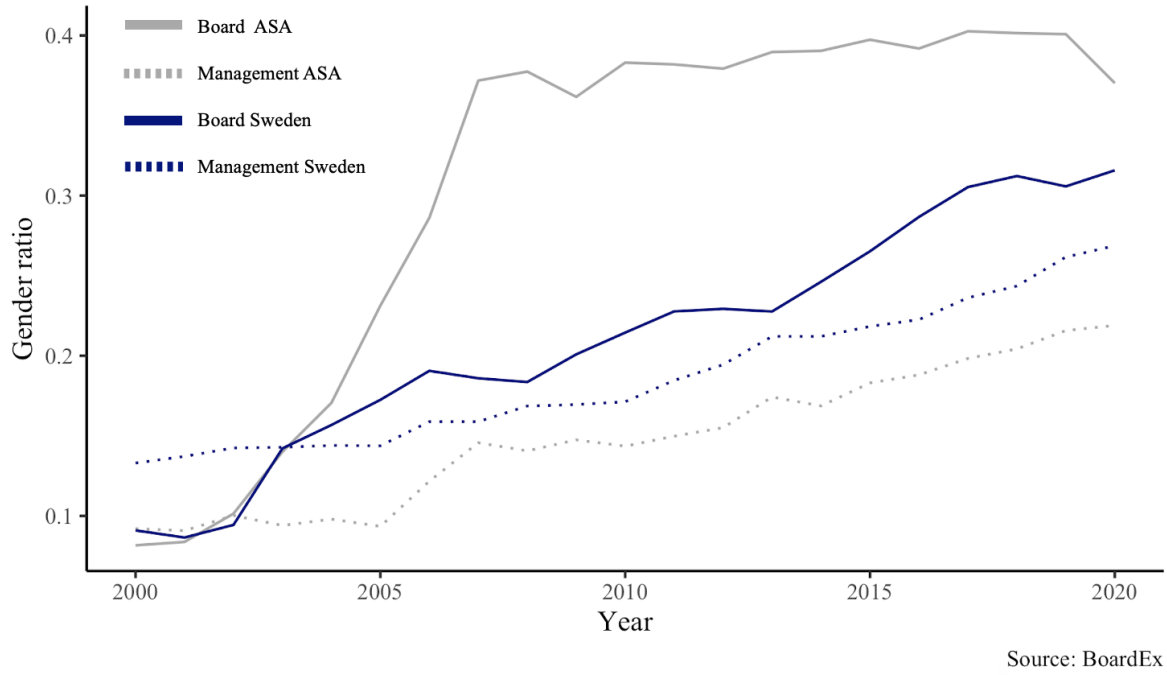
4.2.1 Findings for Internal Spillover – Quota to Management

We investigate if the boardroom quota for ASA indirectly affected the management gender ratio in the short-term. This is interesting, as it was one of the main objectives as to why the GBL was first introduced in 2003. If there is an indirect effect, the government can use this as a plausible motivation for a quota for AS. The direct effect of the quota was inevitably an

increase in the number of women on boards. However, did the quota also lead to a greater representation of women in top management positions? *Figure 5* below depicts the evolution of gender ratios for boards and management in Norway (ASA) and Sweden.

Figure 5: Development of gender ratio for board and management, ASA & Sweden

The dotted lines show the average percentage of female management representation for public limited companies in Norway (ASA) and Sweden over the period from 2000 to 2020, while the solid lines show the average percentage of female board representation. The sample is retrieved from the BoardEx database and consists of 256 unique ASA firms and 414 unique Swedish firms over the period.



Source: BoardEx

Looking at the figure, there seems to be a significant difference in female boardroom- and management representation, with the latter presenting a significantly lower gender balance. The difference is far greater for ASA than for Sweden, which could substantiate any claims that actions are required to obtain a more gender diverse management in Norway. The GBL enacted in 2003 was aimed to help with labour opportunities for professional women, particularly in top management. Yet, a diverse range of measures could be initiated to improve gender representation in leadership roles. In the recent hearing, the Ministry emphasizes actions such as leadership courses and -programs or mentoring programs (Ministry of Trade, Industry and Fisheries, 2022).

The management ratios for the two groups seem to develop in a similar trajectory, slowly increasing and stabilizing around 20-25% over the last decade. Interestingly, we notice a jump

in the management gender ratio for Norwegian ASA in 2005, two years after the quota was enacted. This could suggest a possible lag in an indirect effect of the 2003 quota from boards to management. A possible explanation for this lag can be that changes in management take time due to resignation- and recruiting decisions. Looking to Sweden, the management ratio has had a slightly flatter curve over the last two decades but still remains higher than for ASA. Interestingly, Sweden also experienced a slight jump around 2005 – questioning whether the quota in isolation stands for the jump in Norway. The disparity between the board- and the management gender ratio is less in Sweden than for ASA, which may be reasonable given that the hard quota in Norway makes for a high board ratio.

We begin by performing a DiD estimation for ASA towards the Swedish subset, including a propensity matching approach. We look at the difference in the female share of top management before and after the quota was introduced, still using 2003 as the time of treatment. Looking at *Table 12* below, the average female shares in management for ASA increased from 7.2% in the pre-treatment period (2000-2002) to an average of 12.4% post-treatment (2003-2010). For Sweden, the average female shares in management increase from 11.5% in the pre-treatment period to 13.6% in the post-treatment period.

Table 12: Descriptive statistics for ASA and Sweden before and after policy

The table reports the average share of female top management for public limited companies in Norway (ASA) and Sweden before and after the GBL was introduced. Here, *Sample,* refers to the data sample used*, Before policy Change* refers to the period from 2000 to 2002, while *After Policy Change* refers to the period from 2003 to 2010. The total number of observations is 1,397 for Sweden and 1,319 for ASA.

t = 2003 (2000-2010)	**Sample**	**Number of observations**	**Average mgmt. ratio**
After Policy Change	Sweden	1 069	0.136
Before Policy Change	Sweden	328	0.115
After Policy Change	ASA	978	0.124
Before Policy Change	ASA	341	0.072

Looking at the regression results in *Table 13* below, we find that all coefficients are statistically significant. The DiD estimator, *After Policy Change * ASA* is positive at 0.033, indicating that the policy impacted the female share of top management. Thus, the quota's promise of increased general labour opportunities for women in top management positions may hold as a valid objective for an upcoming quota for AS. However, the progress could also be a natural development, as Norway had a far lower share of women in top management than Sweden post quota. This can be seen in *Figure 5*, and by the negative *ASA* coefficient.

Table 13: DiD regression on management ratio for ASA and Sweden with PSM

The table reports the result of the DiD regression with propensity score matching between public limited companies in Norway (ASA) and Sweden using the regression below. *ASA* is a dummy equal to 1 if firm i is an ASA, zero otherwise. *After Policy Change* is a dummy equal to 1 if the year equals 2003 or higher. The dependent variable is *Female share of Top Management.* The constant represents the baseline, which is Sweden *Before Policy.* All ASA observations are matched with one Swedish observation based on revenue, number of employees and sector. The regression use data from 2000 to 2010.

$$Mgmt\ Ratio_i = \alpha + \beta ASA_i + \gamma \cdot After\ Policy_i + \delta(ASA_i \cdot After\ Policy_i) + \varepsilon_i$$

	Dependent variable:
	Female share of Top Management
After Policy Change (t = 2003)	0.022***
	(0.007)
ASA	-0.040***
	(0.010)
After Policy Change * ASA	0.033**
	(0.012)
Constant	0.114***
	(0.006)
Observations	3,457
R^2	0.014
Adjusted R^2	0.013
Note:	*p**p***p<0.01

Interestingly, the coefficient *After Policy Change* is positive, implying that Sweden also experienced an increase in the share of women in top management in the years after the GBL was enacted in Norway. This speaks for a trend in the corporate environment which could bias

the interpretation of the results negatively. Again, a trend in the corporate environment could diminish the isolated indirect effect of the Norwegian quota, given that Norwegian and Swedish companies face the same societal changes. The implication is that the argument for the quota giving opportunities to women outside the boardroom appears misleading.

In conclusion, our findings suggest that the board quota has increased the opportunities to obtain a management position – possibly "breaking" some of the glass ceiling. However, Norway's average is still below the average of Sweden, which could indicate that the quota caused a small short-term boost in Norway, but with a modest long-term effect. It seems to be a general trend in the corporate landscape to increase female management representation. Sweden was not affected by the Norwegian quota, yet we find a similar trajectory. Hence, using a board quota as a tool to increase women in management appears weak – The ministry should instead contemplate some of the other measures emphasized in the hearing to increase female representation in management.

Furthermore, we investigate if there are distinct differences between the board GBLs effect on female management ratios across different industries. The regression results are depicted in *Table 14* below. When comparing Swedish and Norwegian companies within similar industries, we only find the DiD-estimate, *After Policy Change * ASA,* to be statistically significant for Finance and Business Services. This indicates that there has been a relatively large increase in female top management share within these sectors after 2003 for Norwegian companies (ASA). For Sweden, the coefficient *After Policy Change* is significant for all but Finance and TMT.

Table 14: DiD regression for ASA and Sweden per industry (2000-2010)

The columns report the result of the DiD regression between public limited companies in Norway (ASA) and Sweden for different industries using the regression below. *ASA* is a dummy equal to 1 if firm i is an ASA, zero otherwise. *After Policy Change* is a dummy equal to 1 if the year equals 2003 or higher. The dependent variable is *Female share of Top Management.* TMT refers to Technology, Media and Telecommunication, while *Other* include Real Estate, Aerospace & Defense, Transport, Leisure & Hotels, Automobiles & Parts and Education. The regression use data from 2000 to 2010.

$$Mgmt\ Ratio_i = \alpha + \beta ASA_i + \gamma \cdot After\ Policy_i + \delta(ASA_i \cdot After\ Policy_i) + \varepsilon_i$$

	Dependent variable: Female share of Top Management							
	Industrial	TMT	Finance	Health	Energy	Consumer	Business services	Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
After Policy Change	0.045***	-0.008	-0.040	0.155*	0.114**	0.070**	-0.241***	0.047**
	(0.014)	(0.014)	(0.041)	(0.088)	(0.051)	(0.032)	(0.077)	(0.023)
ASA	0.008	-0.053***	-0.108**	-0.042	0.066	-0.034	-0.313***	-0.023
	(0.016)	(0.016)	(0.052)	(0.111)	(0.045)	(0.035)	(0.087)	(0.030)
After Policy Change*ASA	0.007	0.028	0.139**	0.114	-0.070	0.030	0.246**	-0.036
	(0.019)	(0.021)	(0.060)	(0.124)	(0.055)	(0.047)	(0.109)	(0.037)
Constant	0.068***	0.108***	0.211***	0.068	0.028	0.074***	0.401***	0.118***
	(0.011)	(0.011)	(0.036)	(0.078)	(0.042)	(0.024)	(0.063)	(0.019)
Observations	591	589	247	80	234	104	65	418
R^2	0.044	0.026	0.024	0.152	0.042	0.119	0.227	0.030
Adjusted R^2	0.040	0.021	0.012	0.118	0.030	0.093	0.189	0.023
Note:								*p **p ***p<0.01

From the analysis above, we find some evidence of the quota posing as a booster for the industries Finance and Business Services. In Sweden, we find no evidence of a significant increase in Finance, yet negative development in Business Services. The results from Sween could imply that the Norwegian board quota did, in fact, boost the share of women in management within these industries, and even countered the negative development for Business Services. In conclusion, it is difficult to make a causal interpretation on whether the board quota in general, had a larger effect on management ratios across more male-dominated industries as the results diverge.

4.3 Methodology for Internal Spillover in General – Board to Management

Until now, we have only looked at the indirect effects of the 2003 quota, externally towards AS and internally to top management. We have done this to substantiate the hypotheses that (1) the quota for ASA has spilled over to AS, which it likely did not and (2) if the board quota for ASA has had spillover effects to top management, which it likely did but to a fairly small degree. To validate these findings, we now study the general correlation between board ratio and top management, regardless of any quota. In other words, do women choose women? We hypothesise that increased female presence in the boardroom has a spillover effect on top management, leading to more women in influential positions. Evidence of this can indicate that increased female board presence decreases demand-side barriers by breaking some of the "old boys"-network.

Interestingly, in talks with individuals who hold boardroom positions, some hypothesise that women in power might be as sceptical to up-and-coming women as their male counterparts, being themselves part of the "old boys club". If women do not facilitate for other women more than their male counterparts, one of the main objectives of the quota falls short. If so, the argument can hardly be used in the reasoning for the forthcoming AS regulation. We examine if there are spillover effects from boards to top management or vice versa. Additionally, we consider the critical mass theory and investigate if the number of women on boards significantly affects the decision to appoint women to top management. However, we also acknowledge that any evidence of a spillover could result from decreased supply-side barriers. If female directors have influential power over qualitative factors within a company, such as the corporate culture it could potentially attract more women to apply for leadership positions.

MM found evidence of spillover from boards to management in the corporate US (Matsa & Miller, 2011). We replicate their study by looking to Norway and Sweden to see if we find similar patterns in the two Nordic countries. We use a multivariate regression framework and regress the female share of executives on the female share of the board and year-fixed effects. To avoid the disruption of a sudden increase in the female share of boards due to the GBL, we only use a data from 2010 to 2020. We find using recent data more relevant and interesting.

However, considering MM uses data from 1997 to 2009, we might observe different patterns due to era-specific tendencies as well as country-specific differences.

We adjust for year-fixed effects to ensure that the association we measure is not simply a reflection of a broader trend of more female representation in corporate leadership positions. In addition to control for year -fixed effects, we include firm-specific and industry-specific effects in some of our regressions. Firm-specific effects are added to address the concern that time-invariant firm characteristics might bias our results. We account for both of these effects as MM debates the relationship between board and management may partly be explained by companies with more female boards also having a greater supply of female managers or that some industries are likely to attract more female talent due to factors such as the corporate culture, a specific clientele or travel demands (Matsa & Miller, 2011). If such factors affect both directors and top management, they could induce a spurious positive or negative correlation.

The regression is done separately for Norwegian and Swedish companies and is presented in *Table 15* in the next sub-chapter. In column 1, we regress the average female share of top management conditional on the previous year's female share of the company's board of directors, with only year-fixed effects. The lag is added to account for the fact that management changes can take time, and that new board members might not be able to make significant decisions within the first year of being seated. Even if women are seated and have the desire to hire a female executive, adjustments can be costly and the positions can already be filled with qualified candidates (Matsa & Miller, 2011). The regression is presented in the following, where the *BRatio* variable represents the female board ratio for a given year and τ_t is the year fixed effects.

$$(1) \qquad Management\ Ratio_t = \alpha + BRatio_{t-1} + \tau_t$$

In column 2 we build on the model, adding variables for the current year, one-year lagged, and one- and two-year leading values for the female share of the board. The leading values are added to explore if female board representation predicts female executives or the other way around. Depending on which coefficients are statistically significant, we get an indication of which way a potential spillover goes. The regression is presented in the following.

$$(2) \quad Management\ Ratio_t = \alpha + BRatio_{t-1} + BRatio_t + BRatio_{t+1} + BRatio_{t+2} + \tau_t$$

Further, we account for firm-specific fixed effects in column 3, as there might be underlying trends in certain firms, making them more suited for female leadership. This provides the following regression, where θ_i coherently is the firm-specific effects.

$$(3) \quad Management\ Ratio_{it} = \alpha + BRatio_{t-1} + \theta_i + \tau_t$$

To account for the possibility of specific industries attracting more female talent due to qualitative factors, we include industry-specific effects in column 4, given by κ_i.

$$(4) \quad Management\ Ratio_{it} = \alpha + BRatio_{t-1} + k_i + \tau_t$$

We acknowledge that there are several limitations to our analysis in that the regression framework is relatively simple, and endogeneity issues can arise. Our analysis does not account for other qualitative factors that could contribute to any observed correlation between board and management.

4.3.1 Findings for Internal Spillover in General – Board to Management

We begin by analysing direct firm-level associations. *Figure 6* shows the average female share of top management dependent on the previous year's female share of the company's board of directors. We see clear tendencies that firms with more women on the board also tend to have more women in top management. The figure shows a similar image as the one MM found when studying corporate America.

Figure 6: Average share of female top management by lagged female board share

The figure illustrates the relationship between previous year's female share of the board towards the female share of top management using different intervals for public limited companies in Norway (ASA) and Sweden. The values are based on averages for each interval, from the years 2000-2020.

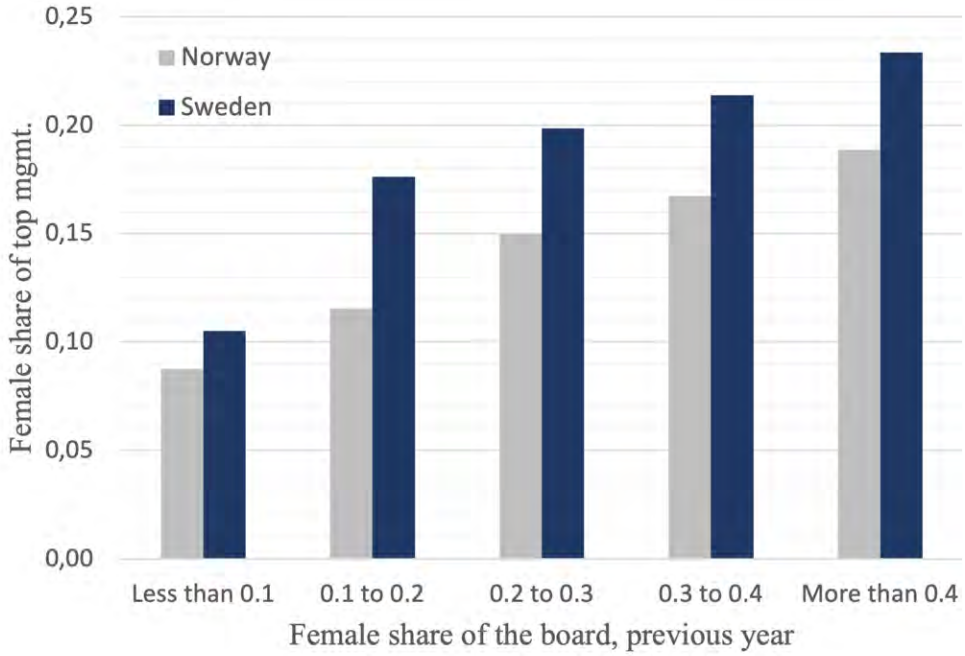


Figure 6 shows that, on average, companies with a higher percentage of women on their boards tend to have more female top management. The relationship stagnates below the 25% female share in top management for Sweden and under 20% for Norway. The graph emphasizes that it is not a one-for-one relationship in that adding one extra woman to the board does not seem to indicate another female executive. Nevertheless, having some women on the board might impact next year's female representation for executives. We do not find evidence of the critical mass theory, as it seems to be a linear relationship, halting in the higher board ratios. We examine this pattern more closely, and in *Table 15* below, we present our regression estimates for Norway and Sweden.

Table 15: Gender ratio spillover from boards to management (2010-2020)

The table reports estimates for Norway (columns 1-4) and Sweden (columns 5-8). The dependent variable, *Management Ratio,* refers to the average female share of top management, while *BRatio* is the female share of the board. Columns 1 and 4 reports estimates from the simple regression, where the female top management share is conditional on previous year's female board share. Columns 2 and 5 report estimates where current female board share, forward one- and two years female top management share is added as explanatory variables. In column 3 and 7 we again use the simple regression but adds firm-specific effects. In column 4 and 8 industry-specific effects is included instead. Time-fixed effects are accounted for in all columns. The regression use data retrieved from BoardEx from 2010 to 2020.

	Dependent variable: Female share of Top Management							
	Norway				Sweden			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female share of Board								
Previous year	0.033	-0.029	0.029	0.046	0.170***	0.020	-0.029	0.150***
	(0.040)	(0.075)	(0.034)	(0.040)	(0.019)	(0.047)	(0.022)	(0.018)
Current year		0.048				0.018		
		(0.097)				(0.061)		
Forward one year		0.006				0.071		
		(0.103)				(0.060)		
Forward two years		-0.036				0.116***		
		(0.093)				(0.047)		
Fixed effects								
Across time	Year	Year	Year	Year	Year	Year	Year	Year
Across firm	None	None	Firm	Industry	None	None	Firm	Industry
Observations	1,414	853	1,414	1, 414	3,091	2,007	3,091	3,091
R^2	0.01	0.0005	0.761	0.071	0.051	0.041	0.674	0.139
Note:								*p**p***p<0.01

The first model, columns 1 and 5 for Norway and Sweden respectively, regresses the board's female share in the previous year on the current female share of top management. We find the coefficient estimates for *Previous year* to be positive for both countries, but only the Swedish estimate is significant. For Sweden, a percentage-point increase in the share of women on the boards of directors is associated with a 0.170 percent increase in the female share of top

management. For Sweden, this implies that companies with a higher share of women on the board also tend to hire more women in top management.

With the coefficient not being significant in Norway, we have not found evidence that supports an internal spillover from board to management over the last decade. However, the insignificance may be partly explained by Norway's high gender balance on the boards since 2008, when companies had to comply. The high board gender ratio for ASA as a result of the GBL restricts how much more Norwegian ASA can increase their female board share and thereby how much spillover to management we can observe. Another explanation could be that women fit for management positions more frequently are hired into director positions for companies to comply with the law – ultimately having less time on their hands to fill a top management position. Arnesen-Nyhus & Strøm (2016) found that from 2001 to 2010 women on average held more directorships per person than men. Women hold an average of 1.12 directorships in 2001, and 1.26 in 2010, while men start with 1.31 directorships and end with 1.26. Thus, women in corporate Norway may be overlooked for management positions due to the heavy push for women in the boardroom. However, the newly published hearing states it's more common for men to hold more board positions than for women (Ministry of Trade, Industry and Fisheries, 2022). Among female board members, 85% are board members in only one company, while the corresponding proportion for men is 69%.

Further, in columns 2 and 6, for Norway and Sweden respectively, we present a model where variables for the female share of the boards in the current year and forward one- and two-years are added. We observe the coefficient *Previous year* to be non-significant for neither estimate. The Norwegian estimates are all insignificant after adding these additional lags, so we cannot conclude the implications either way. Only the estimate for *Forward two years* in Sweden is significant, which indicates that the spillover goes from management to boards and not the other way around. Hence, we cannot give a joint conclusion for Norway and Sweden. The female board share in Sweden have been lower throughout the period as they have no quota to oblige by. Hence, they have been able to increase their female board share to a greater extent from 2010 to 2020 than Norwegian ASA, which could result in a significant effect. Our findings indicate a different relationship between boards and management for Norway and Sweden, suggesting structural differences between the neighbour countries. This may seem questionable, as Norway and Sweden are often referred to as vastly similar on several matters

concerning social, cultural, and political factors (Stein, 2019). Sweden has had more gradual progress in female participation on both boards and in management compared to Norway. Hence, the significant effect seen in Sweden may simply be a spurious positive correlation between boards and management due to a general trend in the corporate landscape.

In columns 3 and 7, we include firm-specific effects and again regress the female share of the board in the previous year on the current female share of top management. We find no statistically significant relationship for either Norway or Sweden. Hence, for our Nordic sample, we cannot conclude as MM (2011) did for the US. Namely, that changes in board composition precede changes in top management when accounting for firm-specific effects. In the last model, we have instead accounted for industry-specific effects. For Norway, the relationship is still not statically significant. For Sweden, the relation is again significant at a 1% significance level when accounting for industry-specific effects. From column 8, a percentage-point increase in female board members is associated with a 0.150 percent increase in female top management. Industry differences can explain about 10% of the relationship between male and female directors.

In their research, MM (2011) found that lagged female board membership predicts female executives but not the reverse. For Norway, we find no evidence of spillover from boards to management or vice versa. Hence, the argument that female board members facilitate for more females in top management appears weak and should be used with caution when debating if a board quota for AS will cause a broader impact on women in business beyond the boardroom. For Sweden, the results are more divergent, making a clear interpretation more difficult. The significant coefficient in columns 5 and 8 suggests that female boards are hiring female executives, but column 6 indicates the opposite in that influence goes from management to boards. Hence, we cannot conclude that board composition precedes changes in executive membership.

5. Conclusion

Almost twenty years have passed since Norway became the first country to introduce a legislative board gender quota. The objectives for the proposition were, first and foremost, to improve labour market opportunities for all professional women and, secondly, that it would lead to improved firm performance through efficiency and innovation. Throughout the thesis, we have emphasized the first promise, investigating potential external and internal spillover effects from the 2003 quota. Additionally, we have looked at a general study on the internal spillover from boards to management, regardless of the GBL.

We find our study useful for policymakers when debating a similar quota for AS companies. The ongoing debate reflects major disputes between those in favour of a quota and those who oppose it. One of the motivations for the recent proposal is that a board quota indirectly increases career opportunities for women in top management, that is, indirect positive effects outside the boardroom. Our thesis can serve as an objective point of view, looking to see how the GBL from 2003 has delivered on its first promise, and what to expect from a similar AS quota to management relationship.

First, we find some evidence that the quota has caused an external spillover from ASA to the 1% largest AS. However, when comparing the AS subset to Sweden, two groups untreated, we observe a significantly higher ratio for Sweden post quota. Ultimately, this weakens the evidence of an external spillover from the ASA quota to AS boards. It seems that AS companies struggle to increase their female board share, and since the policymakers do not view the challenge as a lack of competent women but rather the lack of assessment and recognition of their competence, a hard board quota will inevitably lead to more female seats in the boardrooms and thus, more gender-balanced boards.

Second, we find some evidence that the 2003 legislation increased the opportunities for women to be seated in top management in Norway. However, as the effect is relatively small and the development in Sweden follows almost the same trajectory as Norway post quota, it is difficult to assign the effect directly to the quota. It appears the GBL caused a small short-term boost in Norway, but with modest long-term effects. Looking at industry differences, we get divergent results, making it hard to draw a firm conclusion on whether traditionally male-

dominated industries was more affected. We conclude that a board quota is a weak tool to increase labour opportunities for women beyond the boardroom. The government should refrain from using this relationship as a core motivation for the forthcoming AS legislation.

Third, when studying the general internal spillover effect, we fail to find a significant and explicit relationship between female board share and female share of top management. Looking at Sweden, we get divergent results, making a clear interpretation difficult. For Norway, we find no evidence of any general spillover effect from boards to management or vice versa. Hence, the government should be careful about using impact outside the boardroom as a motivation for instigating a board quota for AS, as it appears misleading.

In conclusion, there is little to no evidence that the GBL has had a significant impact on women's careers beyond the boardroom. There is still a great disparity between the genders in top management. Hence, if the policymakers want to achieve greater labour opportunities for women in management and make the quote from Sheryl Sandberg come to life, other measures targeting management directly should be considered. Similarly, it appears the GBL has had little impact on increasing female representation in AS boardroom, with AS companies having failed to make significant progress since the 2000s. Based on the above, we recommend that the government implement a board gender quota for AS, only if the primary objective is to increase female board representation. A hard law will undoubtingly provide more female seats at the table, but not cause spillover effects beyond the boardroom. Finally, we acknowledge that potential supply-side issues of recruiting enough women should be studied more profoundly before enacting new regulations.

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7. Appendix

Appendix 1: Descriptive table of the Swedish subset

The table reports a selection of firm and board characteristics for Swedish public limited companies over the period from 2000 to 2020. *Avg. gender ratio* refers to the number of female directors over the number of total directors. Revenue is reported in 1000 SEK. *Mean* at the end of the panel refers to the average over the whole period. The data is retrieved from BoardEx, and the sample consist of 414 unique ASA, 6,453 unique AS.

Year	**Number of observations**	**Avg. board size**	**Avg. # of women on board**	**Avg. gender ratio**
	(1)	(2)	(3)	(4)
Panel C: Swedish subset				
2000	191	6.32	0.61	0.10
2001	202	6.47	0.65	0.10
2002	204	6.55	0.73	0.11
2003	207	6.76	1.06	0.16
2004	210	6.75	1.21	0.18
2005	214	6.76	1.29	0.19
2006	224	6.52	1.35	0.21
2007	229	6.48	1.37	0.21
2008	229	6.41	1.33	0.21
2009	225	6.32	1.38	0.22
2010	227	6.35	1.49	0.24
2015	284	6.39	1.83	0.29
2020	341	6.47	2.17	0.34
Mean	259	6.48	1.50	0.23

Appendix 2: Illustrative table of section table of the BoardEx data format

The table illustrates the format of the BoardEx data using company with BoardEx ID of 773. *Fem_B* is the number of female board members, *GR_B* is the female share of top management, *Fem_Mgmt* is the number of females in management and *GR_Mgmt* is the female share of top management.

CompanyID	Country	Industry	Year	Fem_B	GR_B	Fem_Mgmt	GR_Mgmt
773	Sweden	Industrial	2005	1	0.2	2	0.2
773	Sweden	Industrial	2006	1	0.2	2	0.18
773	Sweden	Industrial	2007	1	0.2	02	0.18
773	Sweden	Industrial	2008	1	0.2	3	0.25
773	Sweden	Industrial	2009	1	0.25	5	0.36

Appendix 3: Significance of independent variables for PSM (SNF data)

	Dependent variable:
	Orgform = ASA
Revenue	-0.000***
	(0.000)
Employees	0.0002***
	(0.00002)
Board size	-0.115***
	(0.004)
SectorConstruction	0.354***
	(0.046)
SectorElectricity	0.340***
	(0.055)
SectorFinance	-1.682***
	(0.052)
SectorManufacturing	0.190***
	(0.043)
SectorOffshore/Shipping	-0.193***
	(0.044)
SectorOther services	-0.111**
	(0.043)
SectorTelecom/IT/Tech	-0.330***
	(0.046)
SectorTransport	0.375***
	(0.055)
SectorWholesale/Retail	0.334***
	(0.042)
Constant	1.323***
	(0.044)
Observations	51,518
Log Likelihood	-23,203.440
Akaike Inf. Crit.	46,432.880
Note:	*p**p***p<0.01

Appendix 4: Significance of independent variables for PSM (BoardEx data)

	Dependent variable:
	Norwegian ASA
Revenue	0.00000**
	(0.00000)
Employees	-0.002***
	(0.001)
Board size	0.002
	(0.002)
Industry Business Services	0.123***
	(0.044)
Industry Consumer Retail	0.105***
	(0.038)
Industry Energy	0.739***
	(0.037)
Industry Financial institutions	0.175***
	(0.033)
Industry Industrial	0.214***
	(0.028)
Industry Other	0.250***
	(0.032)
Industry TMT	0.220***
	(0.028)
Constant	0.098***
	(0.026)
Observations	3,526
R^2	0.116
Adjusted R^2	0.114
Note:	*p**p***p<0.01

Appendix 5: Sector and industry matching

INDUSTRY	SECTOR (BOARDEX)
CONSUMER RETAIL	Household Products, Clothing & Personal Products, Utilities – Other, General Retailers, Beverages, Tobacco, Publishing, Leisure Goods, Food & Drug Retailers, Consumer Services
ENERGY	Electricity, Oil & Gas, Renewable Energy
FINANCIAL INSTITUTIONS	Specialty & Other Finance, Banks, Insurance, Private Equity, Investment Companies
TMT	Software & Computer Services, Electronic & Electrical Equipment, Information Technology Hardware, Media & Entertainment, Telecommunication Services
BUSINESS SERVICES	Business Services
INDUSTRIAL	Diversified Industrials, Food Producers & Processors, Construction & Building Materials, Engineering & Machinery, Mining, Steel & Other Metals, Forestry & Paper, Chemicals
HEALTH	Health, Pharmaceuticals and Biotechnology
OTHER	Real Estate, Aerospace & Defense, Transport, Leisure & Hotels, Automobiles & Parts, Education