Female Leaders and the Representation of Women in Government[*]

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Abstract

Does electing female politicians increase women's political representation? Using a difference-in-differences design on a comprehensive cross-national dataset, we find that the first election of a female incumbent systematically increases the share of women in government. To address selection concerns, we apply the synthetic control method to a unique case of exogenous government change: the appointment of Germany's first female state prime minister in 1993—without a state election. Our findings provide causal evidence that her entry led to a lasting rise in women's political representation, highlighting how even one influential woman can help others ascend to high political office.

Keywords: Political leaders, gender gap in politics, political participation, political representation, gender composition.

JEL codes: J16, D72.

1 Introduction

While women's representation in politics has increased, gender parity remains a distant goal, even in countries with a long history of women's suffrage and political involvement. The gender gap in representation is especially striking at the highest levels of decision-making. For instance, by early 2024, only 48 countries had ever had a female head of state (UN Women, 2024). This seems to support the notion that *"the history of the world is but the biography of great men"* (Carlyle, 1841, p.47). In this paper, we ask: What about great women?

Our paper addresses the question of how female leadership influences women's political participation and representation. We present novel causal evidence on women's representation in high-level government positions, contributing to previous work that has focused on the impact of female politicians on the candidacy and re-election prospects of other women in lower levels of political office (e.g., Baskaran and Hessami, 2018; Bhalotra et al., 2018). While this research has shown that electing female politicians can pave the way for other female candidates in municipal and local council elections, the impact of female leadership on the representation of women in top government positions remains vastly understudied. These top positions hold disproportionate influence over national policymaking, and understanding how female leadership shapes access to these roles is essential to uncovering the mechanisms that sustain or dismantle gender hierarchies within political institutions. The focus on top government positions also allows us to provide the first empirical evidence on the *direct* effect of female leadership on the promotion of other women into powerful political offices—an outcome that is difficult to observe at lower tiers of government, where appointments are less centralized and leadership influence over personnel decisions is more limited.

We begin by providing comprehensive cross-national evidence from panel data covering 177 countries over the period 1966-2023. Using a difference-in-differences design, we estimate how female leadership at the national level affects the share of women among cabinet ministers. We document that the share of women in the cabinet systematically increases after the first election of a female incumbent. Our estimates show that, on average, the share of women among cabinet members is 4 percentage points higher under female than under male heads of government (excluding the female heads of government). The increase in women's political representation in top government positions following the election of a female leader also re-appears when we account for dynamic and heterogeneous treatment effects in event-study setups (following the approaches of Callaway and Sant'Anna, 2021, Sun and Abraham, 2021, de Chaisemartin and D'Haultfoeuille, 2024, and Borusyak et al., 2024).

The cross-national results offer comprehensive evidence from the broadest possible sample of countries and years. However, the primary challenge in estimating the causal impact of female leadership stems from the endogenous nature of electoral outcomes, which makes it difficult to isolate leadership effects from underlying selection dynamics. This challenge is particularly pronounced when studying representation in top government positions, where mixed-gender races are exceedingly rare, ruling out the use of regression discontinuity designs that have become standard in this literature. We instead leverage an unexpected government change in Germany in 1993 that offers a clean framework for identifying the causal effect of female leadership. Specifically, we examine the case of a major political scandal that brought Heide Simonis in power as the first-ever female head of state government in Germany. Importantly, Simonis gained power through a series of unexpected events, without being elected in a state election. Consistent with our cross-country results, we find that the number of women in government increased by 5 percentage points (or 45 %) following Heide Simonis' rise to power.

We use the synthetic control method to estimate the causal effects of Simonis' appointment. Our design compares outcomes in the German state of Schleswig-Holstein under female leadership with a synthetic counterfactual under a male prime minister. This setting is ideally suited to investigate the causal effect of female leadership for three key reasons. First, the change in political leadership was unanticipated, and Simonis' appointment instead of a male candidate was unexpected. Most importantly, the appointment was not driven by a general trend towards the promotion of women in political leadership positions—the next female prime minister after Heide Simonis was appointed more than one decade later. Second, our treatment of having a female prime minister is unique: Simonis was the first and only female prime minister in Germany during the period from 1948 to 2008. Third, both Simonis and her predecessor were members of the Social Democratic Party (SPD), which rules out the possibility of a confounding party effect.

To examine the impact on political representation, we hand collect a new comprehensive dataset detailing the gender composition of ministers, state secretaries, and department heads across all ministries in the West German states from the early 1980s to 2005. This government representation data enables us to study the *direct* effect of female leadership on government composition, specifically whether the prime minister influenced promotion of more women to top government positions. We also collect statistics on party membership by state and gender since the 1980s, which enables us to examine the *indirect* empowerment effect of a female leader on broader political participation. It also enables us to examine whether general trends in women's political participation may have contributed to Heide Si-

monis' appointment, or to the appointment of ministers or state secretaries following her path to office. Our large-scale data collection involved manually gathering information on government gender composition from books, official documents, and archive material, along with party membership records from the archives of the Friedrich-Ebert-Foundation in Bad Godesberg, the Konrad-Adenauer-Foundation in St. Augustin, the Labour Archive in Munich, and the Willy-Brandt-Haus in Berlin.

Our main finding is that Heide Simonis' appointment as the first female prime minister in Germany substantially increased the number of women in government positions. This evidence demonstrates that the gender identity of political leaders is an important factor in promoting women to government. The result underscores the significant impact that a single influential woman can have on other women's career progression and helping them reach top political positions.

Simonis came into office in the first year of the legislative period and stayed in office for three years before having to contest in elections. Simonis' assumption of office at the beginning of the legislative period eliminates concerns regarding reverse causality during her first three years in office. To further test the robustness of our results, we extend the post-treatment period to 1999 and 2004, demonstrating that the positive effect on the share of women in government remains highly persistent. We conduct a battery of additional robustness tests to assess the sensitivity of our results to alternative specifications of our synthetic control model. These tests show that the baseline findings are robust: We find no effects at placebo treatment times, nor any evidence that the effect is driven by a particular state in the donor pool.

Our results further confirm that the effect on representation is driven by the direct effect of promotion of women to government, rather than by increased participation by women in general. To investigate the influence of female leadership on broader participation, i.e., the external margin, we explore Simonis' effect on party membership. Since party membership is beyond the prime minister's direct influence and involves far lower costs than running for election, it serves as a strong indicator of political engagement, or the 'supply' of female politicians. We find no evidence that Simonis' appointment encouraged more women to participate in politics through party membership. We also find no significant increase in the number of female party members prior to Simonis' appointment that could have contributed to her rise to office.

Our results have important policy implications, highlighting the importance of influential women in promoting female representation in government. Our findings also echo those of Besley et al. (2017), who show that introducing a gender quota in Sweden increased both women's representation and the competence of

male politicians. In light of these results, our findings highlight the potential of female leadership to act as a catalyst for greater gender representation in government, while also emphasizing the broader role of leaders in shaping the selection of their subordinates and potential successors.

Contributions to the literature: Our paper contributes to several strands of the literature. First, we provide new causal evidence on women's political participation and representation, focusing particularly on top government positions. Previous studies on women's representation have predominantly focused on lower layers of policymaking, including the share of women running as candidates, the likelihood of women recontesting their seat (e.g. Baskaran and Hessami, 2022), or the votes received by female council candidates after a female mayor has been elected into office (e.g. Baskaran and Hessami, 2018). We specifically focus on representation in top positions, an area that has been underexplored in the existing literature. Our paper contributes to a deeper understanding of female politicians' career progression and their promotion to government, highlighting the pivotal role of female forerunners for the success of women in politics.

Second, we also connect to studies showing that successful female leaders can act as role models, empowering and encouraging others (Latu et al., 2013; Baskaran and Hessami, 2018). Increased women's political representation, for instance through gender quotas, has been found to improve perceptions of women's qualifications for top political positions (O'Brien and Rickne, 2016). Female leadership in village councils in India has increased girls' educational aspirations (Beaman et al., 2012), and in the business sector, female leaders have been found to improve work environments and promote gender parity by reducing toxic relational cultures (Alan et al., 2023). Despite these positive effects, evidence on whether women's electoral success encourages other women's political participation or increases their likelihood of reaching influential positions is mixed (e.g., Broockman, 2014; Gilardi, 2015; Bhalotra et al., 2018; Bagues and Campa, 2021). Our findings complement these previous findings, adding new insights into the influence of politicians' gender identity, and documenting mechanisms through which women's underrepresentation in politics may be mitigated.

Third, we provide new evidence on the impact of a female political leader in an industrialized country. Gender differences in political and policy preferences are well established (e.g., Lott and Kenny, 1999; Aidt et al., 2006; Aidt and Dallal, 2008), and a growing literature also documents gender differences in policies and economic outcomes. However, previous studies have largely focused on the share of women in different legislative bodies, or on female leadership at the local level, such as mayors or village council heads (e.g., Chattopadhyay and Duflo, 2004, Clots-

Figueras, 2011, Duflo, 2012, Ferreira and Gyourko, 2014, Baskaran and Hessami, 2023, and Hessami and da Fonseca, 2020 for a survey of the literature). While these studies reveal important insights into the effects of women in power, they are limited by the scope of influence legislators or locally elected officials have. An exception is Dube and Harish (2020), who provide historical evidence on the impact of female monarchs on state engagement in wars. Our study offers new causal evidence on the impacts of female leadership at the state level.

More broadly, our paper relates to the literature on the importance of leaders. A rich literature examines the role of political leaders in shaping their nations' fortune (e.g., Jones and Olken, 2005; Dreher et al., 2009; Dreher and Jensen, 2013; Besley et al., 2011; Dube and Harish, 2020; Gutmann et al., 2023; Boumans et al., 2024). This literature has uncovered evidence that political leaders matter for state performance and the long-run economic development of their nations. Much of this literature uses identification strategies based on random leadership transitions due to death or accidents or hereditary succession. However, these strategies are less applicable for exploring the causal impact of female leaders, who have historically been severely underrepresented. We present new causal evidence on the impact of a female head of state government, demonstrating that female leadership not only affects political outcomes directly but also plays a crucial role in shaping the selection of other high-level decision-makers.


2 International evidence

2.1 Data and descriptive statistics

To establish international evidence on female political leaders and women's representation, we use the *WhoGov* dataset on cabinet members, which covers 177 countries in the period 1966–2023 (Nyrup and Bramwell, 2020). Figure 1 shows the average yearly share of countries with a de facto female leader and the average yearly share of women among cabinet ministers (excluding the female leaders). The share of countries with female political leaders increased from 1 % in 1966 to 7 % in 2023 (left panel). The share of women among cabinet ministers increased from 1 % in 1966 to 24 % in 2023. During our sample period, one third of the countries had a female leader at least once, with the vast majority having only a single distinct female leader.

Nordic countries have the highest average shares of women among cabinet members. A prominent example of a female leader increasing the share of female cabinet members is Gro Harlem Brundtland, the first female prime minister of Norway (see, for example, Cirone et al., 2024). She was appointed prime minister on 4 February

Figure 1 FEMALE LEADERS AND SHARE OF WOMEN IN CABINET
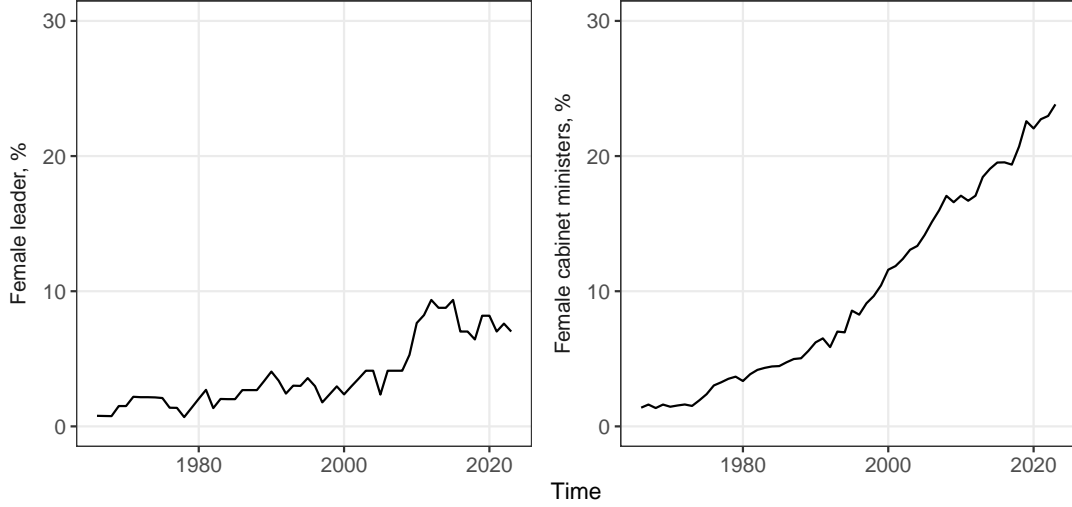
Notes: The figure shows the share of countries with female leaders (left panel) and the share of women among cabinet ministers (right panel) in 177 countries during the period 1966–2023. Data source: WhoGov.

1981, but left office already in October of the same year when the government resigned. Still, the number of female ministers increased from 2 to 3 (excluding the prime minister) in 1981. She was re-appointed as prime minister on 9 May 1986, after which the number of female ministers increased from 4 to 7.

2.2 Empirical strategy

We estimate the following difference-in-differences model:

$$y_{ct} = \alpha_c + \lambda_t + \beta FemaleLeader_{ct} + \varepsilon_{ct} \tag{1}$$

where the outcome y_{ct} is either the share of women among cabinet ministers, or the share of women among core members of cabinet in country c in year t.[1] $FemaleLeader_{ct}$ is a treatment indicator that takes value one if country c has had a female leader by year t.[2] We consider countries permanently treated since the first female leader. α_c are country fixed effects and λ_t are year fixed effects. This model rules out that the effects are driven by time-invariant differences across countries, or by the outcomes evolving over time in a way that is constant across countries (e.g., general increase in women's representation).

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[1]Core members are defined on a country by country basis, and include positions such as cabinet ministers, prime ministers, presidents, vice presidents, vice prime ministers, members of the politburo and members of a military junta (Nyrup and Bramwell, 2020).

[2]The treatment indicator is equivalent to $\mathbb{1}\{t \geq t_c^*\}$, where t_c^* represents the year in which country c had a female leader for the first time.

Table 1 FEMALE LEADERS AND WOMEN'S REPRESENTATION IN GOVERNMENT

	Share of women among cabinet ministers				Share of women among core members			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female leader	0.105***	0.156***	0.049***	0.038***	0.103***	0.151***	0.047***	0.035***
	(0.019)	(0.013)	(0.018)	(0.013)	(0.019)	(0.013)	(0.018)	(0.013)
N	9150	9150	9150	9150	9150	9150	9150	9150
R^2	0.08	0.38	0.36	0.64	0.08	0.39	0.37	0.66
Country FEs		X		X		X		X
Year FEs			X	X			X	X

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Standard errors adjusted for clustering at country level. The dependent variable in columns (1)-(4) is the share of women among cabinet ministers, and in columns (5)-(8) it is the share of women among core members of cabinet, excluding the leader. The independent variable is an indicator that takes value one if country c has had a female leader by year t.

2.3 Results

Table 1 presents the estimates for women's representation in government. We find a strong positive association between female political leadership and women's representation in government. The coefficient estimates of the female leader variable are statistically significant at the 1 % level. When we consider year and country fixed effects, the parameter estimates suggest that the share of female ministers (excluding the female head of government and multiple positions) was 3–4 percentage points higher when the head of government was a woman rather than a man (columns 4 and 8). The average number of ministers across countries and over time is 19, with two female ministers, underscoring that the estimated parameters are economically sizable.

The identifying assumption is that in the absence of treatment, outcomes would have developed in parallel in treatment and control countries. A threat to the identification is that countries appointing female leaders may be on different trends of women's representation. Furthermore, in a setting with multiple time periods and staggered treatment an additional assumption of homogeneous treatment effects is required for the two-way fixed effects to yield consistent estimates for the ATT (de Chaisemartin and D'Haultfoeuille, 2020; Sun and Abraham, 2021; Callaway and Sant'Anna, 2021; Goodman-Bacon, 2021). Variation in treatment effects over time or across units would bias the estimates. We therefore cannot give these estimates a causal interpretation.

We explore robustness of the results, including event studies and using estimators introduced by Sun and Abraham (2021), Callaway and Sant'Anna (2021), de Chaisemartin and D'Haultfoeuille (2024), and Borusyak et al. (2024), that are robust to heterogeneous treatment effects. Estimates from all models exhibit similar patterns, suggesting that the share of women among cabinet ministers increases mainly in the years immediately after the first appointment of a female leader.

We also examine heterogeneity across autocracies and democracies, developing and industrial countries, as well as differentials over time. Across the board, we find that the share of women in top government positions increases after a female leader enters office. The largest increases in the share of women in governments tend to occur in settings with initially low levels of women's representation. For brevity, we report and discuss those results in Appendix A.

3 Evidence from Germany

Our cross-national results suggest that female leaders have a positive impact on the number of female representatives in government positions. However, the main threat to identification is that electoral results are inherently endogenous and potentially driven by an array of factors that might correlate with the post-electoral composition of governments. To estimate the causal effect of female leadership, we next turn to a unique case of unexpected government change in early-1990's Germany, which allows for a clean identification of causal effects.

3.1 Exogenous government change

In 1993, the German state of Schleswig-Holstein experienced a political earthquake that unfolded in a series of unexpected events. Schleswig-Holstein is the northernmost of the 16 German states (see Figure 2). It shares a border with Denmark and has around 3 million inhabitants. The capital is Kiel. In May 1993, Björn Engholm, the state's prime minister since 1988, was forced to resign due to a political scandal. The stakes were high: Engholm had been the national chairman of the Social Democratic Party (SPD) since 1991 and was the SPD's designated candidate for the 1994 national elections. Engholm wanted to contest Germany's Chancellor Helmut Kohl of the Christian Democratic Union (CDU).

Had Engholm left Kiel to contest Kohl, it was expected that Günther Jansen would succeed him as prime minister in Schleswig-Holstein.[3] Jansen had been the chairman of the SPD in Schleswig-Holstein during 1975–1987, served as vice prime minister and minister for social affairs in Engholm's cabinet. He was popular in the SPD and among the citizens of Schleswig-Holstein. However, in an unexpected twist, Jansen was forced to resign on 5 March 1993 after admitting to paying Reiner Pfeiffer, an unemployed man who had been spying on Engholm. Pfeiffer claimed he was paid by Uwe Barschel (CDU), the previous prime minister of Schleswig-Holstein, who died under unknown circumstances in a Geneva hotel in 1987, with

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[3]Munimus (2010) describes this stunning case. We follow her description.

rumors saying he was murdered. Jansen admitted to paying Pfeiffer a sum of 25.000 Deutschmark. The story came to light when Elfriede Jabs, Pfeiffer's former lover, leaked the story to the press after Pfeiffer left her for another woman. Engholm then needed a new vice prime minister. On 10 March 1993, Heide Simonis, the finance minister in Engholm's cabinet, was appointed the vice prime minister.

Jansen's resignation gave rise to further questions. Engholm faced increasing pressure about his role in Uwe Barschel's death. On 3 May 1993, Engholm resigned from all his political mandates and offices after admitting to having lied in an earlier parliamentary inquiry into the matter. Schleswig-Holstein then needed a new prime minister. Norbert Gansel, an influential SPD politician from Kiel, sought to succeed Enholm, but Engholm wanted to prevent that. Gansel, who had worked closely with Engholm, knew of his false testimony and pressured him to come clean, hoping this would clear the way for his own candidacy. Gansel also faced competition from Heide Simonis, the finance minister in Engholm's cabinet.
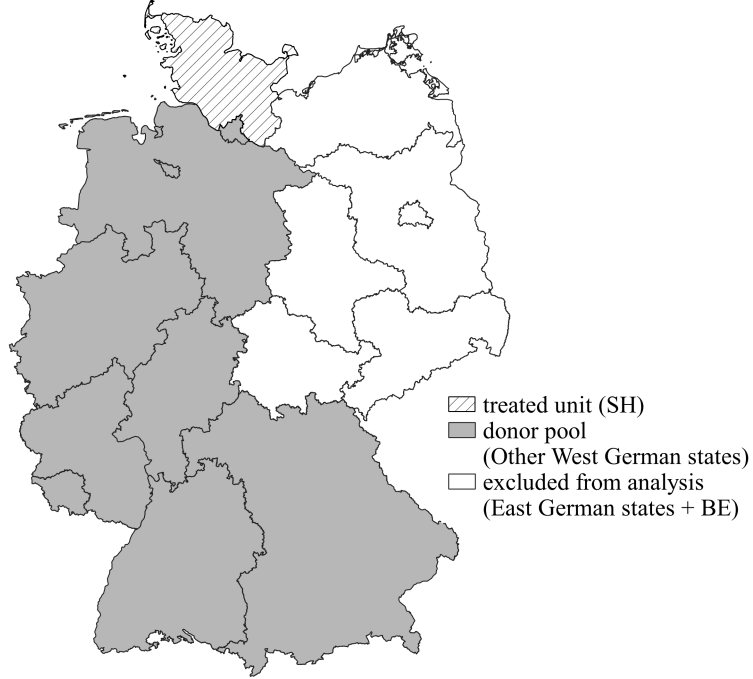
Simonis ultimately prevailed. The state parliament narrowly elected Simonis with 46 out of 88 votes, and on 19 May 1993, she became the first female prime minister in Schleswig-Holstein, and the first female head of state government in Germany. Her biographer describes her accession to office as *"phenomenal and unexpected"* ([Munimus](), [2010]). Heide Simonis herself said: *"Some thought it was an industrial accident. I myself felt like I had been thrown off a steamer into the cold Baltic Sea at night. "Bye," said the steamer—and suddenly I was Prime Minister."*

The SPD had the absolute majority in parliament and formed a single-party government until the end of the legislative period in 1996. In the next state elections on 24 March 1996, Simonis was re-elected as prime minister. However, the vote share of the SPD declined from 46.2% in 1992 to 39.8 % in 1996, and the SPD needed to form a coalition government with the Green party. Simonis also ran for prime minister in the 2000 state elections. The SPD received 43.1% of the votes and Simonis was again confirmed as prime minister and continued the coalition government with the Green party. She was not confirmed as prime minister after the 2005 state elections—the reason being that a member of the SPD did not support her in the state parliamentary vote for prime minister on 17 March 2005.

Heide Simonis was Germany's first female prime minister.[4] The second female prime minister in Germany was Christine Lieberknecht (CDU), who became the prime minister of the German state Thuringia in 2009. Consequently, Heide Simonis was the only female prime minister in Germany over the period 1993–2008. This means that all control units remain untreated even when we extend the post-treatment period until the end of Simonis' time in office. Simonis' tenure is an ex-

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[4]Louise Schröder (CDU) served as interim prime minister in Berlin for three months in 1947–1948.

Figure 2 RESEARCH DESIGN—TREATED UNIT AND DONOR POOL

> **treated unit (SH)**
> **donor pool**
> (Other West German states)
> **excluded from analysis**
> (East German states + BE)

Notes: The figure shows Schleswig-Holstein, the treated unit, and the donor pool consisting of all states in West Germany. We do not include Eastern German states, as there is no sufficient pre-treatment period available (German re-unification was in 1990).

cellent case to estimate the causal effects of female political leadership on women's political representation and participation. We estimate these effects using the synthetic control method, which we describe in the next section.

3.2 The synthetic control method

We use the synthetic control (SC) method (Abadie and Gardeazabal, 2003; Abadie et al., 2010, 2015; Abadie, 2021) to estimate the causal effect of a female leader on women's political representation in Schleswig-Holstein.[5] We follow the framework described in Potrafke and Wüthrich (2020): Let j index German states and t index time periods. Here, $j = 1$ corresponds to Schleswig-Holstein, and $j = 2, \ldots, J + 1$ index J other German states that serve as controls. Figure 2 shows the treated unit and the donor pool that we use in our analysis.

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[5]There is a fast-growing literature on using synthetic control to estimate causal effects (e.g. Eliason and Lutz, 2018 and Andersson, 2019). Related studies using the SC method based on data for the German states include Roesel (2017) and Potrafke and Wüthrich (2020).

Using the potential outcomes framework ([Neyman, 1923](); [Rubin, 1974]()), let $Y_{jt}(0)$ and $Y_{jt}(1)$ denote the potential outcomes without and with the treatment in state j at time t. The "treatment" is defined as having a female prime minister. Schleswig-Holstein is untreated for $t \leq T_0$ and treated for $t > T_0$. The donor pool consists of the nine other West German states, which remain untreated in all periods. We denote treatment status, i.e., female prime minister, as $D_{jt} = \mathbb{1}\{j = 1, t > T_0\}$. Thus, observed outcomes are related to potential outcomes as $Y_{jt} = D_{jt}Y_{jt}(1) + (1 - D_{jt})Y_{jt}(0)$. The female prime minister took office on 19 May 1993. We therefore consider the year 1993 as the first year of treatment, such that $T_0 = 1992$.[6]

In the baseline model, we analyze data until 1995, as the next state election took place in March 1996. Since Heide Simonis won the 1996 and 2000 state elections and stayed in office till 2005, we also examine extended post-treatment periods for robustness tests.

We are interested in the causal effect of the political leadership change in Schleswig-Holstein after 1992:

$$\alpha_t = Y_{1t}(1) - Y_{1t}(0), \quad t \in \{1993, 1994, 1995\}$$

Note that $Y_{1t}(1)$ (the potential outcome with a female prime minister) is observed in the post treatment period, whereas $Y_{1t}(0)$ (the potential outcome without a female prime minister) is fundamentally unobserved, such that $\alpha_t = Y_{1t}(1) - Y_{1t}(0) = Y_{1t} - Y_{1t}(0)$.

To estimate α_t, we need to estimate $Y_{1t}(0)$. We consider the following SC estimator:

$$\hat{Y}_{1t}(0) = \sum_{j=2}^{J+1} \hat{w}_j Y_{jt}(0) = \sum_{j=2}^{J+1} \hat{w}_j Y_{jt}, \tag{2}$$

where the second equality follows because $Y_{jt}(0) = Y_{jt}$ for $j \geq 2$ and all t, since the control states are untreated. In equation (2), we approximate the potential outcome of Schleswig-Holstein using a weighted combination of the contemporaneous (potential) outcomes of the other German states. We refer to this weighted combination as the "synthetic Schleswig-Holstein".

We estimate the weights based on the pre-treatment data. Let $X_1, \ldots, X_{J+1}$ denote vectors of predictors and define $X_0 \equiv [X_2, \ldots, X_{J+1}]$. Different choices of predictors X_j are possible. To mitigate concerns of specification searching, we

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[6]We follow studies on partisan politics that assign a year in which a government changes to the government that was in power for at least six months ([Potrafke, 2017](); [Potrafke and Wüthrich, 2020]()).

use all pre-treatment outcomes and no additional covariates (e.g., Doudchenko and Imbens, 2016).[7] The weights are obtained as

$$\hat{w} \equiv (\hat{w}_2, \ldots, \hat{w}_{J+1}) \quad = \quad \arg\min_w \sqrt{(X_1 - X_0 w)' \Omega (X_1 - X_0 w)}$$

$$\text{s.t.} \quad w \geq 0 \text{ and } \sum_{j=2}^{J+1} w_j = 1.$$

We implement SC using the Stata package `synth` (Abadie et al., 2011), which computes the matrix Ω using a data-driven regression-based method. We emphasize two important features of the SC weights (Abadie, 2021, Section 4). First, due to the constraints imposed on the estimation problem, $\hat{w}$ will typically be a sparse vector (i.e., only contain few non-zero weights), which facilitates the interpretation of the synthetic Schleswig-Holstein. Second, the adding-up and positivity constraints preclude extrapolation beyond the support of the control data.

To make inferences, we employ the widely-used permutation method of Abadie et al. (2010); see also Firpo and Possebom (2018) and Abadie (2021, Section 3.5) for further discussions.[8] In Section 3.5, we show that our results are robust to using the recently proposed conformal inference procedure of Chernozhukov et al. (2021a).

3.3   Data

We compile a dataset at the state level for all West German states from the early 1980s to 2005 using existing data collections and large-scale manually collected data. Our outcomes of interest are women's political representation in the government, and party membership.

Women in government: To examine the effect on political representation and to understand the direct effect of Simonis' appointment, we collected data on women in high-level government positions. We launched a large-scale data collection process to collect information on the ministers, state secretaries, and department heads of all ministries in West-German states between the early 1980s and 2000. This data is not readily available and needs to be compiled based on multiple books, documents, and archive material. We contacted the states' chancelleries and state ministries and asked for data and support. For most ministries, there are *State Handbooks* ("Staatshandbücher") available, which provide information on the personnel working

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[7]We refer to Botosaru and Ferman (2019) and Kaul et al. (2017) for a discussion of the role of additional covariates in SC settings.

[8]Our post-treatment period only comprises three years such that inference methods relying on many post-treatment periods such as Chernozhukov et al. (2021b) and Li (2020) are not suitable here.

in all ministries in a given year. Acquiring data based on these books requires systematic screening of one book per state per year and manually digitizing the numbers. We also acquired organizational charts from ministries and digitized the information.

Party membership: To measure trends in women's political participation and the indirect effects of female leadership, we undertook another extensive data collection effort. We collected information on party membership by state and gender in the Social Democratic Party (SPD) and Christian Democratic Union (CDU), the two largest parties in Germany. Since this data is not publicly available for our sample period in the 1980s and early 1990s, we took several steps to gather the data. First, we received complete data for the CDU from the archives of the Konrad-Adenauer-Foundation in St. Augustin. For the Social Democrats, we gathered some data from the archive of the Friedrich-Ebert-Foundation in Bad Godesberg which was, however, incomplete. To fill the gaps, we contacted the West German state and some district offices of the SPD individually. With their cooperation, a visit to the Labour Archive in Munich and finally with the help of the Willy-Brandt-Haus in Berlin, we were able to complete female party membership data for the SPD for the West-German states.
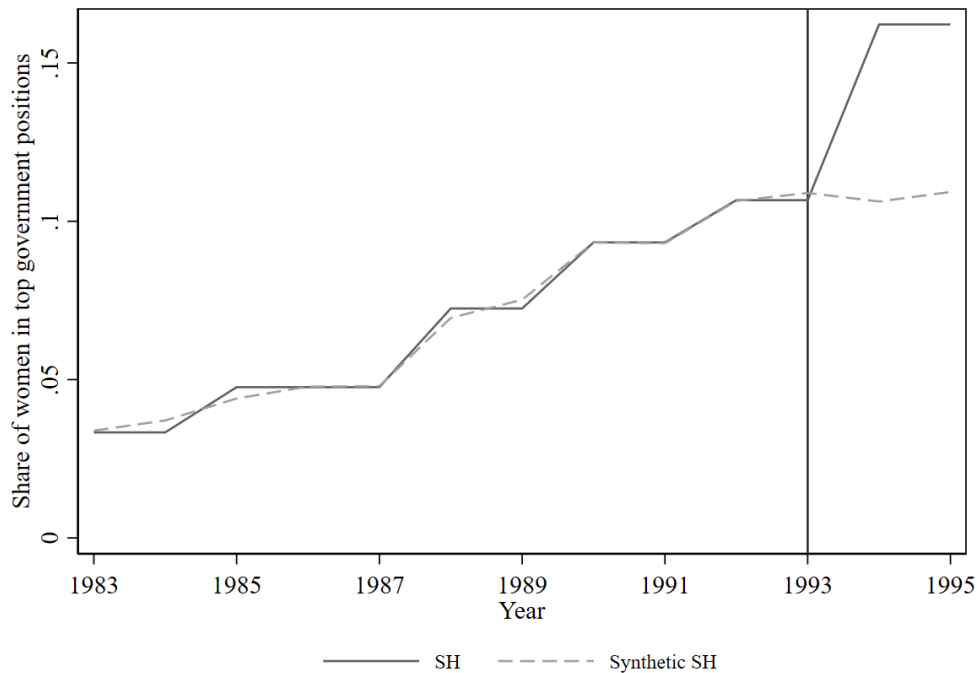
3.4 Results

3.4.1 Impact on women's political representation

We examine the effect of female leadership on political representation. In particular, we investigate whether the appointment of Heide Simonis as prime minister had a direct effect on the gender composition of government. Figure 3 presents our main results, showing the share of women in the ruling government—ministers, state secretaries, and department heads (excluding Simonis herself). The figure shows realized and counterfactual outcomes before and after treatment. Our estimates indicate a sizable impact of Heide Simonis' appointment: The share of women in government in Schleswig-Holstein (16 %) was 5 percentage points higher than in the synthetic Schleswig-Holstein (11 %). Simonis increased the absolute number of women in top government positions from 8 in 1992 to 12 in 1994.

Figure 4 presents further analysis that allows us to draw inferences about the effect of Simonis' appointment. Panel (a) shows placebo treatments for all units in the donor pool. We find that the treatment effect for Schleswig-Holstein strongly outperforms all potential effects for units in the donor pool. Panel (b) illustrates the ratio of post- to pre-treatment root mean squared prediction error (RMSPE)

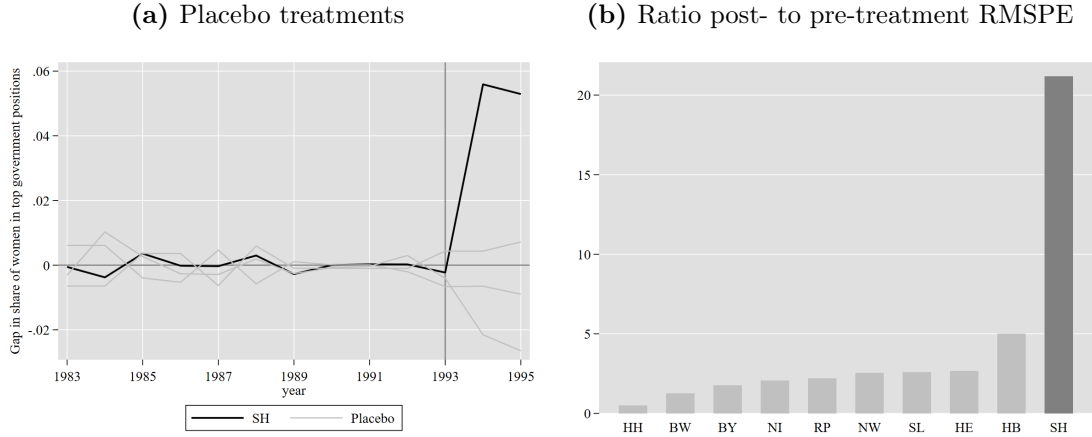**Figure 3** SYNTHETIC CONTROL RESULTS—POLITICAL REPRESENTATION

Notes: The figure shows the main results of our synthetic control analysis on the causal effect of the appointment of Heide Simonis, the first-ever female prime minister of a German state on the share of women in top government positions. The graph shows realized and counterfactual outcomes for share of women among ministers, state secretaries, and department heads.

(see Abadie et al., 2015). A "large" ratio, particularly compared to the units in the donor pool, indicates a rejection of the null hypothesis that the leadership change had no effect. Schleswig-Holstein clearly stands out with the largest RMSPE ratio. The rank order of Schleswig-Holstein in the distribution of RMSPE ratios, divided by the number of states, gives the probability that the effect was produced by chance. This implies a p-value of $1/10 = 10$ %. Alternatively, the p-value can be constructed by calculating the fraction of placebo effects that are larger than or equal to the effect for the treated unit. Table B.1 presents the estimated synthetic control weights.

Overall, our findings show that the appointment of Heide Simonis significantly increased the share of women in government. We interpret this effect as the direct effect of Simonis on the appointment of other women to high-level government positions. This finding highlights that having even a single influential woman can contribute towards greater gender parity in political representation.

Figure 4 PLACEBOS AND RMSPE-RATIOS—POLITICAL REPRESENTATION

(a) Placebo treatments

(b) Ratio post- to pre-treatment RMSPE

Notes: The figure shows the main results of our synthetic control analysis on the causal effect of the appointment of Heide Simonis, the first-ever female prime minister of a German state on the share of women in top government positions. Panel (a) shows placebo treatments of all units in the donor pool. We discard states whose pre-treatment mean squared prediction error (RMSPE) is 10 times the one of Schleswig-Holstein. Panel (b) illustrates the ratio of post-treatment RMSPE to pre-treatment RMSPE (see Abadie et al., 2015). Schleswig-Holstein is indicated in dark gray.

3.4.2 Indirect effects on political participation

We then examine whether Simonis' appointment as prime minister had indirect effects on women's political participation. Previous research has examined whether women's success in politics encourages other women to participate in politics, by running as candidates (e.g., Baskaran and Hessami, 2022) or by recontesting their seat (Baskaran and Hessami, 2018). Evidence on this empowerment hypothesis is mixed, with most research on mature democracies finding no significant effects on other women's political participation or electoral success (Broockman, 2014; Ferreira and Gyourko, 2014; Araico Cordero et al., 2024). However, some evidence suggests that women's political representation improves perceptions of women's qualification (O'Brien and Rickne, 2016) and raises girls' educational aspirations (Beaman et al., 2012).

We test the empowerment hypothesis in the context of Germany by studying party membership in the Social Democratic Party and the Christian Democratic Union as broader measures of political participation. Since becoming a party member involves much lower costs than running for office, if Simonis' appointment encouraged more women to participate in politics, we should be able to detect effects in party membership.

Figure 5 shows the results for membership in the Social Democratic Party (SPD) and in the Christian Democratic Union (CDU). We find no evidence that the appointment of Heide Simonis triggered participation effects in the general population.

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Figure 5 Synthetic control results—party membership

(a) SPD

(b) CDU
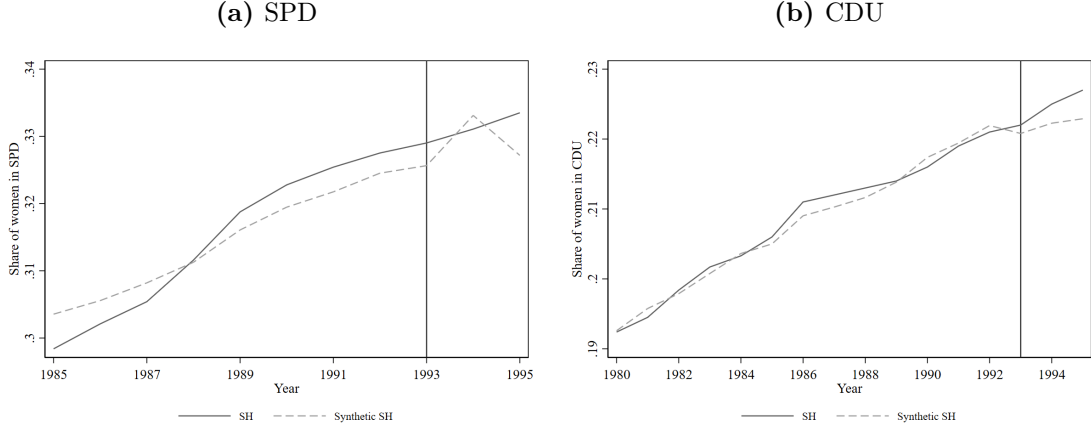
Notes: The figure shows results of our synthetic control analysis on the causal effect of the appointment of Heide Simonis, the first-ever female prime minister of a German state on the share of women among members of political parties. The graph shows realized and counterfactual outcomes for women's party membership in the Social Democratic party (SPD) and the Christian Democratic Union (CDU). Due to data availability, the pre-treatment period for the share of women in the SPD starts in 1985.

This finding supports the conclusion that at least large and systematic empowerment effects are unlikely. To draw inferences, we estimate placebo treatments for all units in the donor pool, and compute a ratio of post- to pre-treatment RMSPE for each state (see Figure B.4).[9]
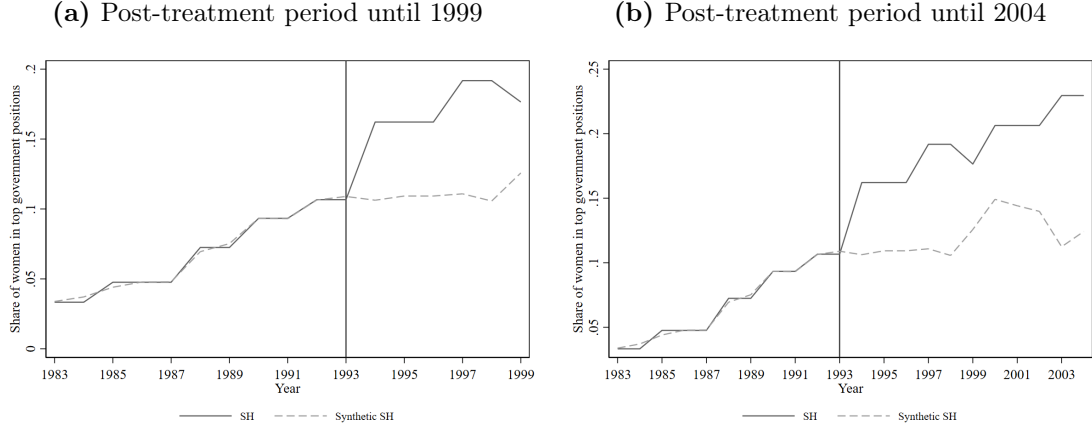
3.5 Robustness

We run a battery of robustness analyses to assess the sensitivity of our results regarding women's representation in government to a series of alternative specifications of our synthetic control model.

Extended post-treatment period: Our baseline model includes three years of post-treatment period (1993–1995). The reason is that state elections took place in March 1996. The major advantage of using only the period 1993–1995 as post-treatment is that reverse causality is ruled out. Voters did not have a chance to evaluate policies and outcomes under Heide Simonis' government and reward or punish her. Heide Simonis succeeded in the state elections 1996 and 2000 and stayed in office as prime minister until the 2005 state elections. All control states remain untreated during this time period. Extending the post-treatment period

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[9]Because the pre-treatment fit of membership in the Social Democratic party is poorer than in our other models, for robustness we also estimate an augmented synthetic control model. Following Ben-Michael et al. (2021), we augment the SCM with a ridge regression. As shown in Figure B.5, this improves the pre-treatment fit but does not influence the inferences regarding participation effects in the general population.

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Figure 6 EXTENDED POST-TREATMENT PERIOD—POLITICAL REPRESENTATION

(a) Post-treatment period until 1999　　　　　**(b)** Post-treatment period until 2004

Notes: The figure shows robustness tests of our synthetic control analysis on the causal effect of the appointment of Heide Simonis on the share of women in top government positions. The graph shows realized and counterfactual outcomes for political representation with an extended post-treatment period.

for robustness tests allows us to study how persistent the direct impact on other women's promotion to government were. Extending the post-treatment period also helps to consider that encouragement effects or effects on how female politicians are perceived may take time to influence representation and participation. We therefore now extend the post-treatment period till the end of 1999 and 2004. As the results in Figures 6a and 6b show, the effect on the share of women in top government positions is persistent. At the end of Simonis' terms in office, there was still a 6 percentage point gap between the share of women among the government in Schleswig-Holstein and its synthetic counterpart.

In-time placebos: We perform in-time placebo tests as suggested by Abadie et al. (2015) and backdate the treatment from 1993 to 1992, 1991, 1990, and to 1989. Overall, the baseline finding is robust: Employing placebo treatments does not yield significant effects at the arbitrary timings. The synthetic counterfactuals closely follow the share of women in government in Schleswig-Holstein in the 1983–1993 period. Instead, the gap in share of women in government remains clearly observable after 1993 (see Figure B.1).

Leave one out: As suggested by Abadie et al. (2015) we re-estimate our models by gradually excluding the individual German states from the donor pool. This analysis allows us to examine whether our inferences are sensitive to including or excluding an individual German state in the donor pool. Our result is robust: We find no evidence that the effect would be driven by any one state in the donor pool.

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The leave-one-out synthetic controls very closely follow the baseline counterfactual, producing very similar estimated effects (see Figure B.2).

Conformal inference procedure: We follow the inference method suggested by Chernozhukov et al. (2021b) and Chernozhukov et al. (2021a) to compute p-values for the average treatment effect as well as for each post-treatment year. The p-values for the average effect in 1993–1995 are 0.077 using moving block permutations, and 0.004 using iid permutations. Figure B.3 plots the estimates with point-wise 90 % confidence intervals.

4   Conclusion

Female political leadership increases the representation of women in government. Based on new panel data covering 177 countries over the period 1966–2023, we show that having a female leader and the share of women in cabinet positions are positively correlated. These findings provide external validity to our causal evidence from Germany. To make causal inference, we exploit a unique case from Germany in which a political scandal created an exogenous change in political leadership in the state of Schleswig-Holstein in 1993. We use the synthetic control method to estimate the causal effects of appointment of Heide Simonis as Germany's first female prime minister.

The unexpected change in political leadership is an excellent case to study the causal effect of female leadership. The government change took place just one year after the state election, which leaves three years of post-treatment period in which we can rule out reverse causality. Both Simonis and her predecessor were from the same party, which rules out confounding party effects. Simonis was the first and only female prime minister in Germany until 2008, meaning that all control units remain untreated even when we extend the post-treatment period.

We demonstrate that a female head of state government can directly influence the representation of women in prominent government roles. Our finding underscores the influence of leaders' gender identity on shaping opportunities and career advancement for women within political institutions. It highlights how even a single influential woman can help other women reach high political positions.

The effect of Simonis' appointment is highly persistent over time and robust to various additional specifications. Furthermore, our cross-country panel data analysis corroborates this finding, suggesting that the effect of female leadership on women's representation extends beyond the case of Schleswig-Holstein.

While a rich literature studies women's representation in legislative bodies or local offices, we focus on the underexplored influence of female leadership at higher levels of government. Our analysis indicates that the increase in women's representation in government is driven by the direct effect of appointing more women to government positions rather than a general increase in women's political engagement. Party membership among women, which we use as a measure of political participation in the general population, is not significantly affected by Simonis' appointment. This points to the importance of influential women as key drivers of gender parity in politics.

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Female Leaders and the Representation of Women in Government

Online Appendix

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April, 2025

A   Difference-in-differences

A.1   Heterogeneity

This Appendix reports heterogeneity analyses for our two-way fixed effects results. First, splitting the sample to before and after the 2000's reveals that although the level of women's representation in government is substantially higher in the second half of our sample, the correlation with female leadership is strongest in the first half of the sample (Table A.1).

Second, using the Machine Learning Democracy Index by Gründler and Krieger (2016, 2022), we show that the relationship between female political leadership and women's representation is stronger in autocratic countries (Table A.2). Figure A.1 also shows both female leaders and share of women in cabinet are substantially higher under democratic regimes.

Third, we examine heterogeneity between OECD member and non-member countries (A.3). While the average share of women in cabinet in OECD countries is 19 %, and 9 % in non-OECD countries, the correlation between female leadership and share of women in cabinets is quite similar in member and non-member countries. Although women's representation has increased globally, in the 2020's, the average share of women in cabinets is only about 23 %. Aligned with prior literature that tends to find positive effects of women's representation mainly in developing countries, particularly India (e.g., Baskaran and Hessami, 2023; Clots-Figueras, 2012; Pande, 2003), our results indicate that the biggest advances are made in the beginning of the sample period, and in less democratic countries—generally, in countries with initially low levels of women's representation.

Table A.1 FEMALE LEADERS AND SHARE OF WOMEN AMONG CABINET MINISTERS—PRE- AND POST-2000

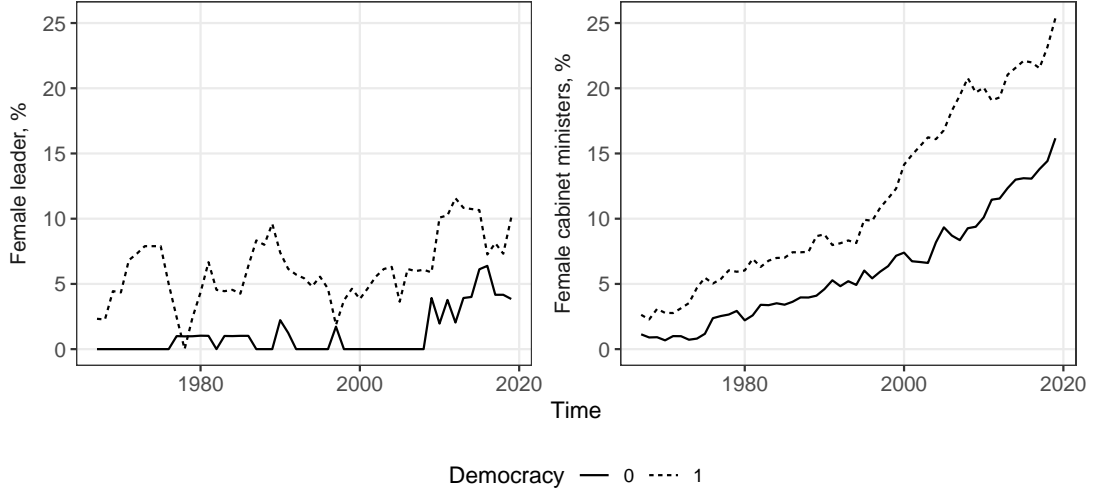|	Share of women among cabinet ministers				Share of women among core members			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Share of women among cabinet ministers – 1966–1999								
Female leader	0.033	0.062***	0.019	0.016	0.032	0.058***	0.017	0.013
	(0.024)	(0.017)	(0.023)	(0.018)	(0.024)	(0.018)	(0.023)	(0.018)
N	5060	5060	5060	5060	5060	5060	5060	5060
R^2	0.01	0.42	0.14	0.54	0.01	0.45	0.14	0.57
Panel B: Share of women among cabinet ministers – 2000–2023								
Female leader	0.075***	0.064***	0.061***	0.002	0.073***	0.059***	0.059***	-0.003
	(0.018)	(0.011)	(0.019)	(0.012)	(0.018)	(0.011)	(0.018)	(0.012)
N	4090	4090	4090	4090	4090	4090	4090	4090
R^2	0.05	0.63	0.11	0.70	0.05	0.64	0.12	0.71
Country FEs		X		X		X		X
Year FEs			X	X			X	X

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Standard errors adjusted for clustering at country level. The dependent variable in columns (1)-(4) is the share of women among cabinet ministers, and in columns (5)-(8) it is the share of women among core members of cabinet, excluding the leader. The independent variable is an indicator that takes value one if country c has had a female leader by year t. Panel A shows estimates for the time period 1966–1999 and Panel B shows estimates for the time period 2000–2023.

Table A.2 FEMALE LEADERS AND SHARE OF WOMEN AMONG CABINET MINISTERS—DEMOCRATIC AND NON-DEMOCRACIES REGIMES

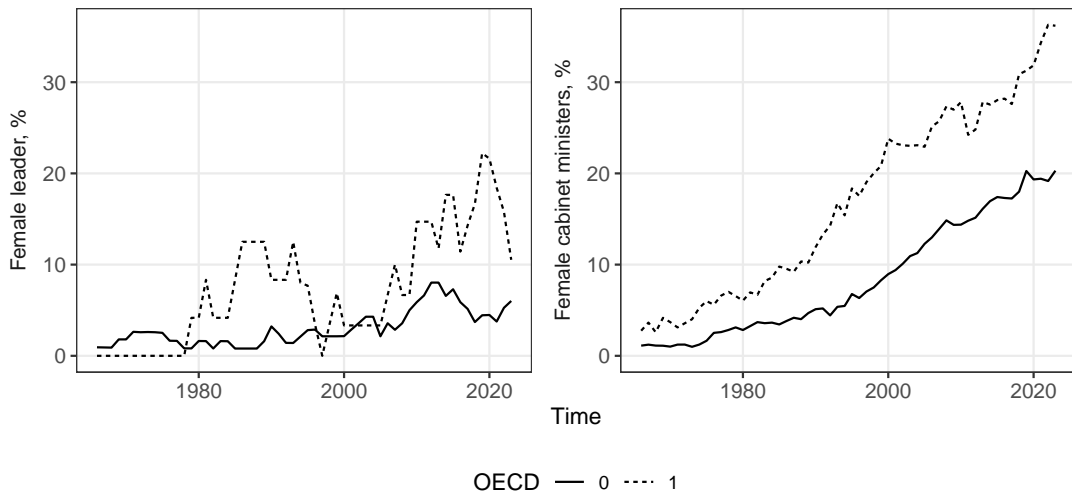|	Share of women among cabinet ministers				Share of women among core members			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Share of women among cabinet ministers – Democratic regimes								
Female leader	0.055**	0.148***	0.022	0.022	0.052**	0.142***	0.020	0.018
	(0.023)	(0.016)	(0.021)	(0.016)	(0.022)	(0.017)	(0.021)	(0.017)
N	4259	4259	4259	4259	4259	4259	4259	4259
R^2	0.03	0.40	0.27	0.65	0.03	0.41	0.27	0.67
Panel B: Share of women among cabinet ministers – Authoritarian regimes								
Female leader	0.092***	0.125***	0.059***	0.058*	0.083***	0.115***	0.051**	0.051*
	(0.021)	(0.030)	(0.021)	(0.031)	(0.020)	(0.029)	(0.020)	(0.030)
N	3905	3905	3905	3905	3905	3905	3905	3905
R^2	0.04	0.31	0.27	0.53	0.04	0.33	0.29	0.56
Country FEs		X		X		X		X
Year FEs			X	X			X	X

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Standard errors adjusted for clustering at country level. The dependent variable in columns (1)-(4) is the share of women among cabinet ministers, and in columns (5)-(8) it is the share of women among core members of cabinet, excluding the leader. The independent variable is an indicator that takes value one if country c has had a female leader by year t. Panel A shows estimates for countries under democratic regimes and Panel B for authoritarian regimes. Countries are classified based on the Machine Learning Democracy Index by Gründler and Krieger (2016, 2022).

Figure A.1 FEMALE LEADERS AND SHARE OF WOMEN IN CABINET—DEMOCRACIES AND NON-DEMOCRACIES

Notes: The figure shows the share of countries with female leaders (left panel) and the share of women among cabinet ministers (right panel) during the period 1966–2019 separately for countries under democratic (dashed line) and non-democratic regimes (solid line). Countries are classified based on the Machine Learning Democracy Index by Gründler and Krieger (2016, 2022). Data source: WhoGov.

Figure A.2 FEMALE LEADERS AND SHARE OF WOMEN IN CABINET—OECD MEMBER COUNTRIES AND NON-MEMBERS

Notes: The figure shows the share of countries with female leaders (left panel) and the share of women among cabinet ministers (right panel) during the period 1966–2023 separately for OECD member countries (dashed line) and non-members (solid line). Data source: WhoGov.

Table A.3 FEMALE LEADERS AND SHARE OF WOMEN AMONG CABINET MINISTERS—OECD MEMBER COUNTRIES AND NON-MEMBERS

	Share of women among cabinet ministers				Share of women among core members			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Share of women among cabinet ministers – OECD								
Female leader	0.136***	0.194***	0.040	0.011	0.133***	0.188***	0.041	0.011
	(0.033)	(0.023)	(0.043)	(0.026)	(0.033)	(0.024)	(0.043)	(0.027)
N	1621	1621	1621	1621	1621	1621	1621	1621
R^2	0.13	0.41	0.42	0.75	0.13	0.42	0.42	0.75
Panel B: Share of women among cabinet ministers – Non-OECD								
Female leader	0.072***	0.129***	0.027*	0.025*	0.070***	0.126***	0.025*	0.023*
	(0.017)	(0.013)	(0.014)	(0.014)	(0.017)	(0.013)	(0.013)	(0.013)
N	7529	7529	7529	7529	7529	7529	7529	7529
R^2	0.05	0.29	0.37	0.58	0.05	0.30	0.39	0.60
Country FEs		X		X		X		X
Year FEs			X	X			X	X

* p < 0.1, ** p < 0.05, *** p < 0.01

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Standard errors adjusted for clustering at country level. The dependent variable in columns (1)-(4) is the share of women among cabinet ministers, and in columns (5)-(8) it is the share of women among core members of cabinet, excluding the leader. The independent variable is an indicator that takes value one if country c has had a female leader by year t. Panel A shows estimates for OECD member countries, and Panel B shows estimates for non-members.

A.2 Event studies

We assess the parallel trends assumption by estimating the following dynamic version of equation 1, given by

$$y_{ct} = \alpha_c + \lambda_t + \sum_{g \in G} \beta_g \mathbb{1}\{t - t_c^* \in g\} + \varepsilon_{ct} \tag{3}$$

where $\mathbb{1}\{t - t_c^* \in g\}$ is an indicator of country c in treatment cohort g being $t - t_c^*$ years from its first treatment (t_c^*) at time t. Treatment cohort g is given by the year in which the country had a female leader for the first time.

Heterogeneous treatment effects over time, for instance, if treatment effects are larger close to the time of first treatment or if countries more likely to experience bigger increases in women's representation following treatment are be more likely to be treated earlier, would introduce bias of unclear direction. To address this, we use estimators that are robust to heterogeneous treatment effects.

Figure A.3 presents the event studies using two-way fixed effects as well as robust estimators by Callaway and Sant'Anna (2021), Sun and Abraham (2021), de Chaisemartin and D'Haultfoeuille (2024), and Borusyak et al. (2024). Estimates from all models exhibit similar patterns, suggesting that the share of women among cabinet ministers increases mainly in the years immediately after a country has a female leader for the first time. The treatment cohorts are small, most of the time consisting of only one or two countries. This affects particularly the estimates obtained using the Callaway and Sant'Anna (2021) estimator. Figure A.4 illustrates the treatment roll-out. 58 countries have a female leader at least once during the period 1966–2023.

A remaining threat to identification is the way in which countries are selected to treatment. Selection can be non-random and not violate parallel trends. Non-random treatment, for example, differences in baseline levels of outcomes do not bias estimates if treatment assignment is mean-independent of the trend in the outcome. Whereas selection on treatment gains, i.e., if only countries that will experience positive treatment effects are treated, would violate the parallel trends assumption (Roth et al., 2023). The de Chaisemartin and D'Haultfoeuille (2024) and Borusyak et al. (2024) estimators suggest non-zero pre-trends three or four years before the first-time appointment of a female leader.

Figure A.3 FEMALE LEADERS AND SHARE OF WOMEN IN CABINET—EVENT STUDIES
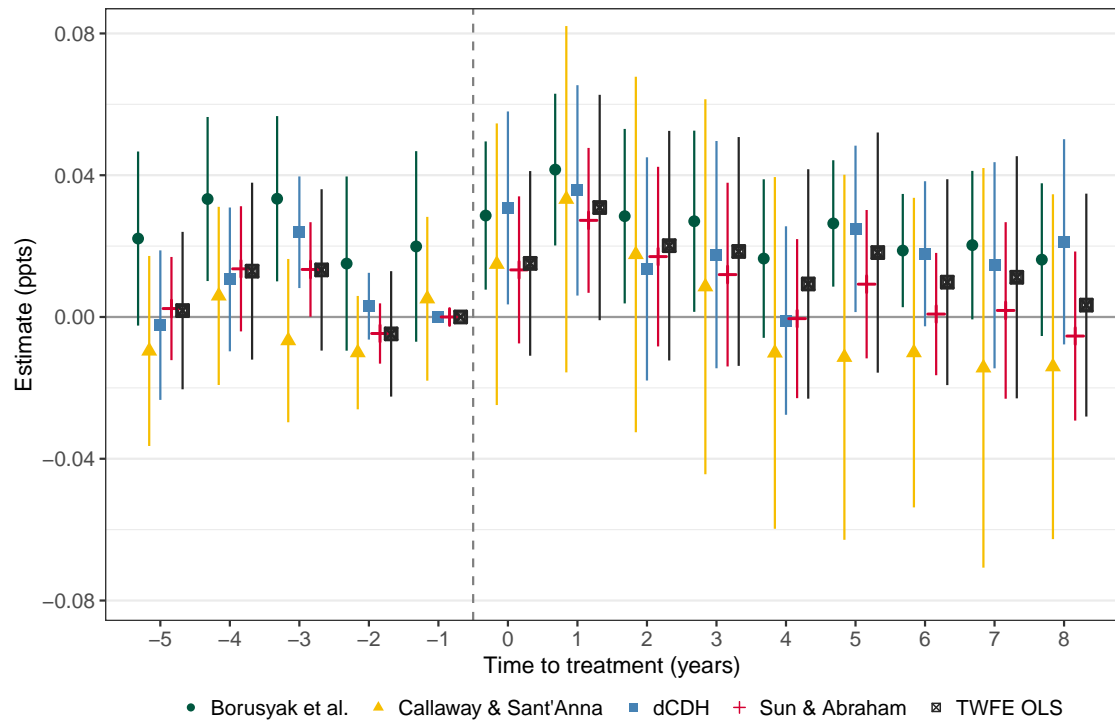
Notes: The figure presents event studies using different estimators: dynamic TWFE model (black squares), Sun and Abraham (2021) (red crosses), de Chaisemartin and D'Haultfoeuille (2024) (small blue squares), Callaway and Sant'Anna (2021) (yellow triangles), and Borusyak et al. (2024) (green dots). The dependent variable is share of women among cabinet ministers. Vertical bars represent 95 % confidence intervals. Standard errors are clustered at country level.

Figure A.4 TREATMENT ROLL-OUT
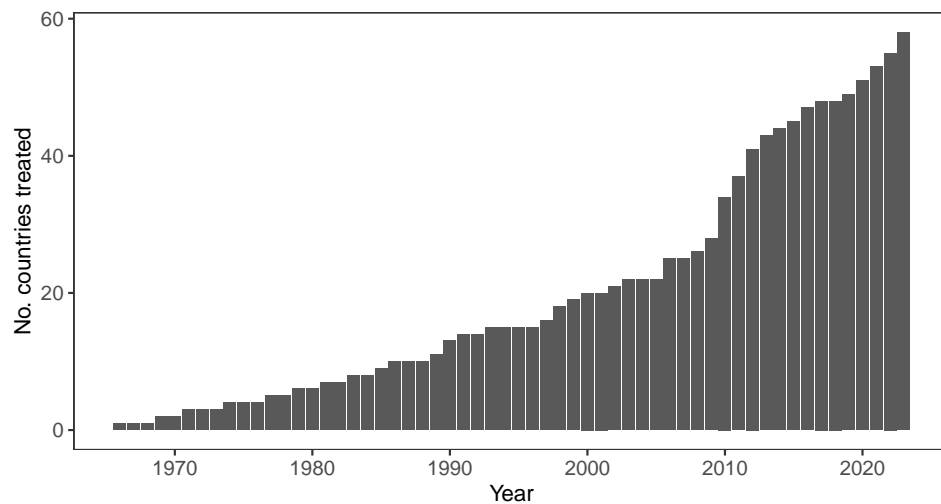
Notes: The figure shows the number of countries in our sample that have had a female leader by a given year during the period 1966–2023. Data source: WhoGov.

B Robustness of the synthetic control analysis

B.1 Government representation

This Appendix reports additional information and robustness tests of our synthetic control results on women's representation in government. Table B.1 presents the estimated synthetic control weights for the states that make up synthetic Schleswig-Holstein in each of our models.

Table B.1 Synthetic control weights

| State	Estimated weight
Government representation	
Baden-Württemberg	0.262
Bremen	0.202
Hamburg	0.267
Lower Saxony	0.17
North Rhine-Westphalia	0.029
Saarland	0.071
SPD membership	
Bavaria	0.28
Hamburg	0.72
CDU membership	
Baden-Württemberg	0.346
Lower Saxony	0.302
Saarland	0.352

State weights in the synthetic Schleswig-Holstein. Additional control states that obtain zero weights in all models are Hesse and Rhineland-Palatinate.

Figure B.1 shows the synthetic control results using placebo treatment timings, in Panel (a) the treatment is set to 1992, in Panel (b) to 1990, in Panel (c) to 1989, and in Panel (d) to 1988. The placebo treatments do not yield significant effects at the arbitrary timings.

In Figure B.2, we leave out individual states from the donor pool one by one. The effect we find is not driven by any one unit in the donor pool.

Figure B.3 plots the estimates with point-wise 90 % confidence intervals, computed using the conformal the inference method suggested by Chernozhukov et al. (2021b) and Chernozhukov et al. (2021a).

Figure B.1 BACKDATED TREATMENT TIMING—POLITICAL REPRESENTATION
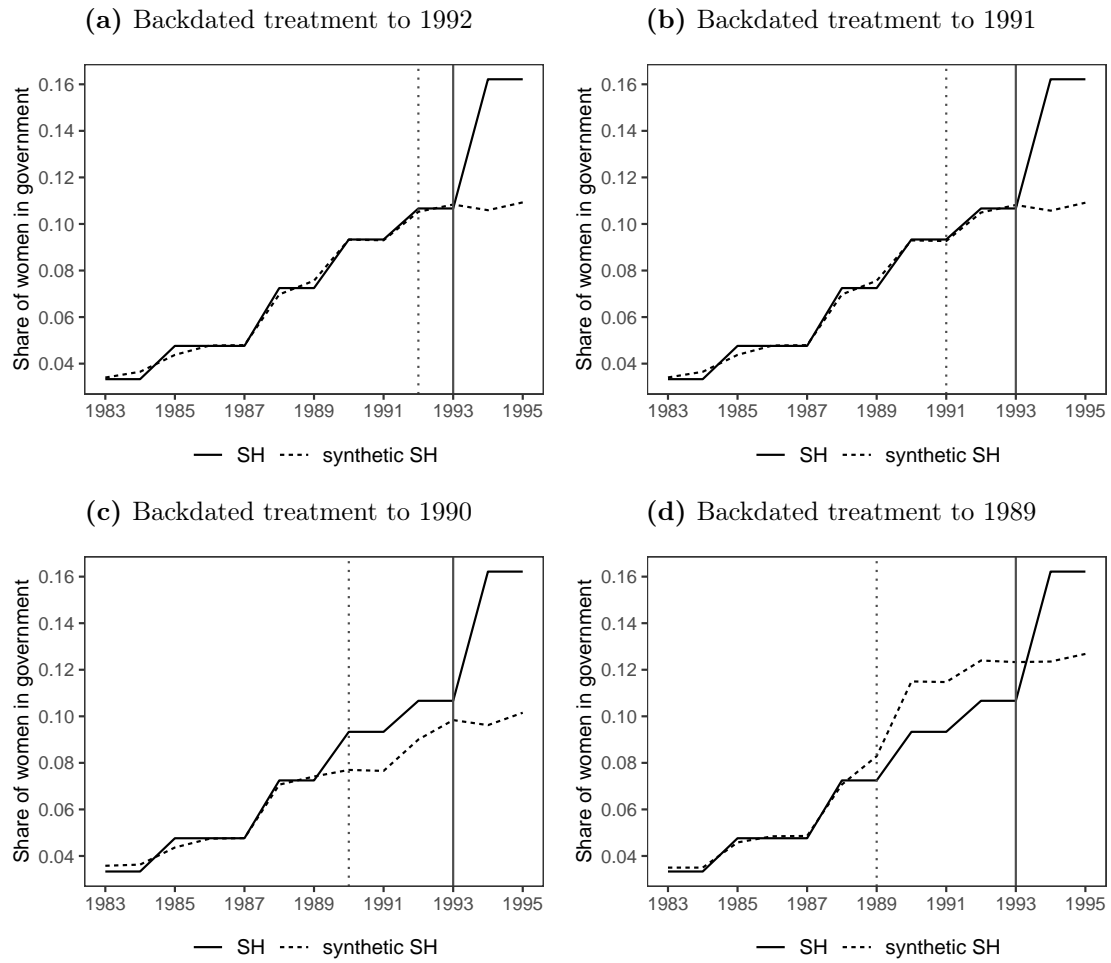
(a) Backdated treatment to 1992

(b) Backdated treatment to 1991

(c) Backdated treatment to 1990
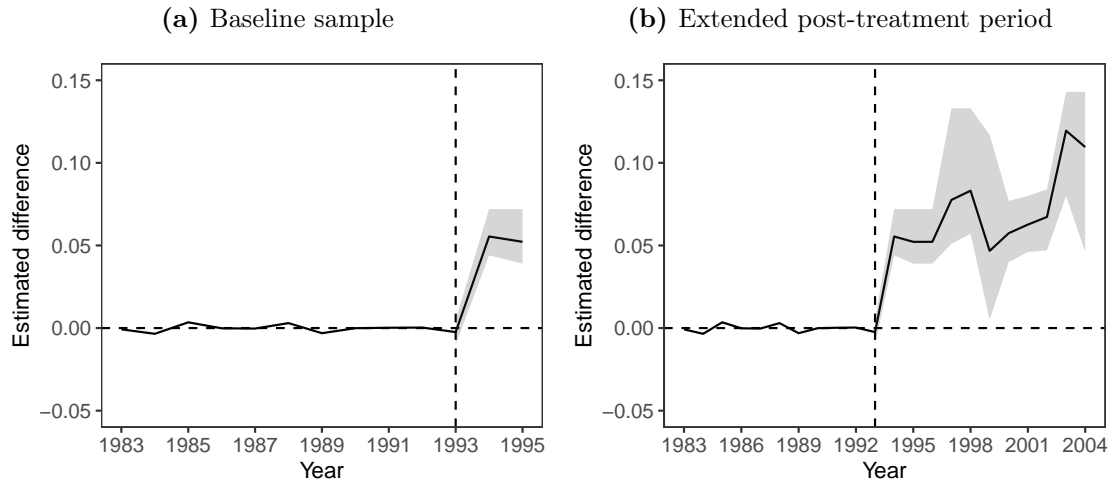
(d) Backdated treatment to 1989

Notes: The figure shows robustness tests of our synthetic control analysis on the causal effect of the appointment of Heide Simonis on the share of women in top government positions. The graph shows realized and counterfactual outcomes for political representation with backdated treatment timing.

Figure B.2 LEAVE-ONE-OUT—POLITICAL REPRESENTATION
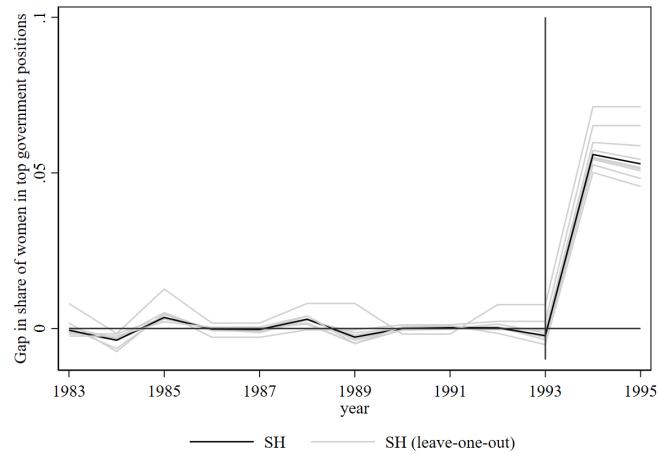
Notes: The figure shows robustness tests of our synthetic control analysis on the causal effect of the appointment of Heide Simonis on the share of women in top government positions. The graph shows the leave-one-out analysis.

Figure B.3 Difference in women's representation in Schleswig-Holstein and its synthetic counterfactual

(a) Baseline sample

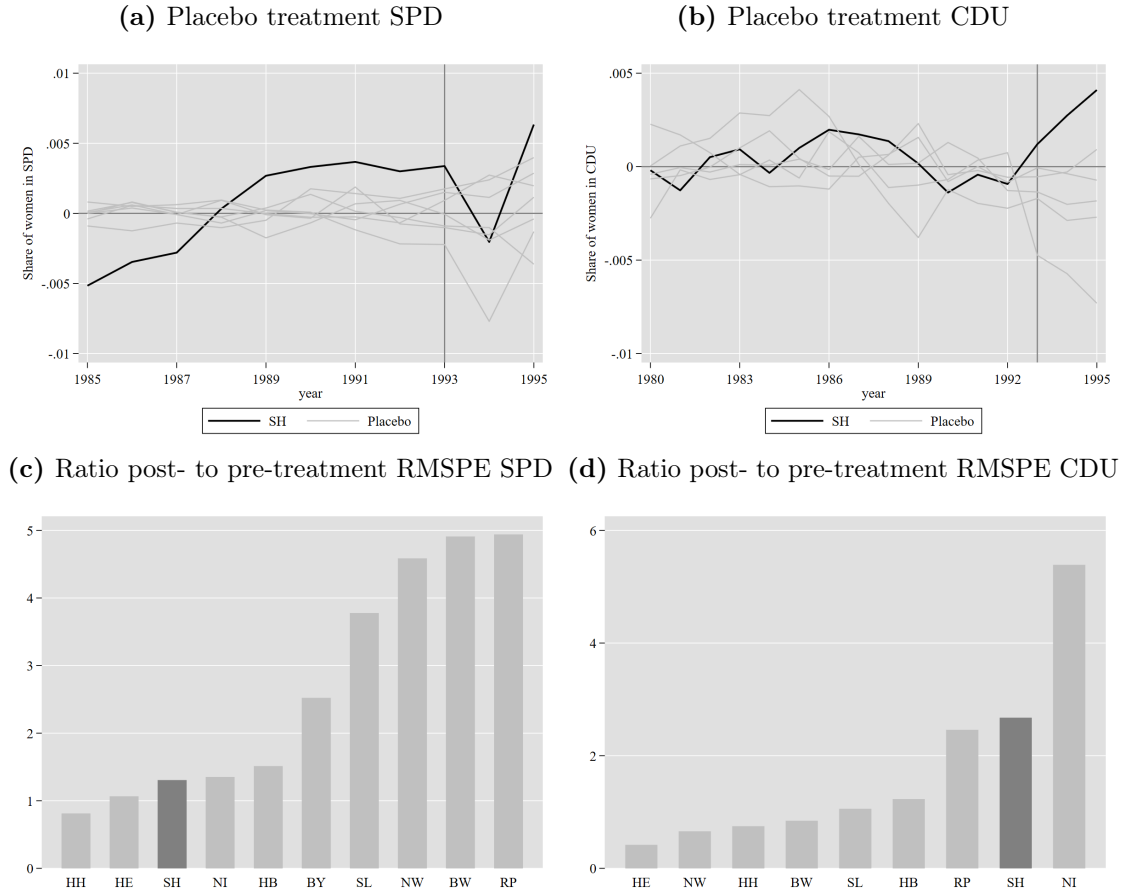**(b)** Extended post-treatment period

Notes: The figure shows the causal effect of the appointment of Heide Simonis on the share of women in top government positions. Point-wise 90 % confidence intervals estimated using conformal inference. Figure (a) uses the baseline period, and Figure (b) extends the post-treatment period until 2004.

B.2 Party membership

This Appendix presents additional figures regarding our synthetic control analysis. Figure B.4 shows placebo treatments and RMSPE ratios for estimates on party membership. Panel (a) shows placebo treatments for SPD membership, and Panel (b) shows placebo treatments for CDU membership. Panel (c) shows the RMSPE ratios for SPD membership, and Panel (d) for CDU membership.

Figure B.4 PLACEBOS AND RMSPE-RATIOS—PARTY MEMBERSHIP

(a) Placebo treatment SPD   **(b)** Placebo treatment CDU

(c) Ratio post- to pre-treatment RMSPE SPD **(d)** Ratio post- to pre-treatment RMSPE CDU

Notes: The figure shows the causal effect of the appointment of Heide Simonis on the share of women among members of political parties. Panels (a) and (b) show placebo treatments of all units in the donor pool for SPD and CDU female party membership, and Panels (b) and (c) illustrate the corresponding ratios of post-treatment root mean squared prediction error (RMSPE) to pre-treatment RMSPE (see Abadie et al., 2015). Schleswig-Holstein is indicated in dark gray.

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Figure B.5 AUGMENTED SCM—SPD MEMBERSHIP

(a) Share of women in SPD　　　　　　　**(b)** Estimates
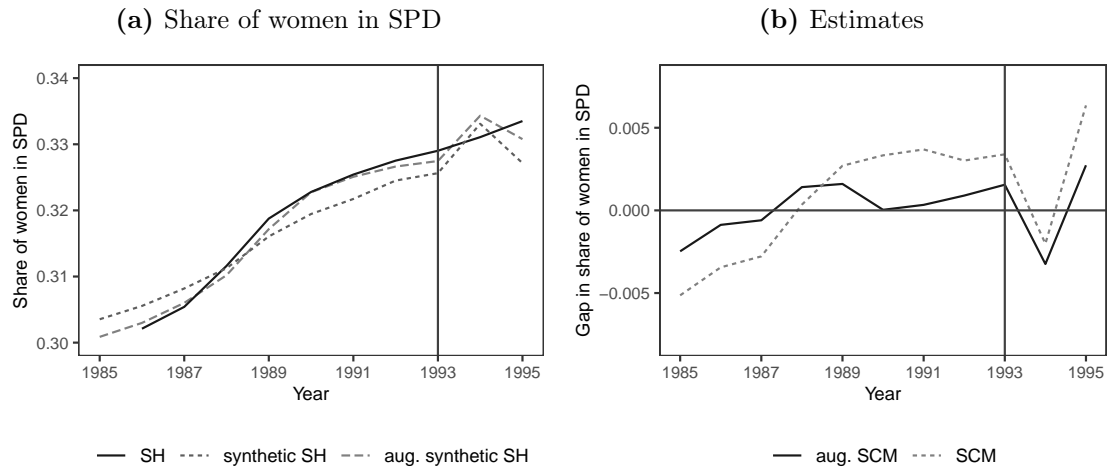
Notes: The figure shows the synthetic control analysis of the appointment of Heide Simonis on the share of women among members of the Social Democratic Party (SPD). Panel (a) shows realized and counterfactual outcomes, and panel (b) shows the estimated differences, using our baseline SCM and ridge augmented SCM (Ben-Michael et al., 2021).