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Gender, Political Knowledge, and Descriptive Representation: The Impact of Long-Term Socialization

Ruth Dassonneville Université de Montréal
Ian McAllister Australian National University

Abstract: *Successive studies have found a persistent gender gap in political knowledge. Despite much international research, this gap has remained largely impervious to explanation. A promising line of recent inquiry has been the low levels of women's elected representation in many democracies. We test the hypothesis that higher levels of women's elected representation will increase women's political knowledge. Using two large, comparative data sets, we find that the proportion of women elected representatives at the time of the survey has no significant effect on the gender gap. By contrast, there is a strong and significant long-term impact for descriptive representation when respondents were aged 18 to 21. The results are in line with political socialization, which posits that the impact of political context is greatest during adolescence and early adulthood. These findings have important implications not only for explaining the gender knowledge gap, but also for the impact of descriptive representation on political engagement generally.*

Replication Materials: The data, code, and any additional materials required to replicate all analyses in this article are available on the *American Journal of Political Science* Dataverse within the Harvard Dataverse Network, at http://doi.org/10.7910/DVN/PL2XFD.

Political knowledge is fundamental to the functioning of representative democracy. Knowledgeable citizens display higher levels of political participation (Verba and Nie 1972), are more likely to hold incumbents to account for their performance while in office (De Vries and Giger 2014), and tend to vote for more ideologically proximate parties (Lau, Andersen, and Redlawsk 2008; Singh and Roy 2014). As such, political knowledge strengthens the link between citizens' preferences and the policy positions of the parties and candidates who are elected to office. In short, political knowledge is at the core of democracy and is "the currency of citizenship" (Delli Carpini and Keeter 1996, 8).

Yet in spite of its normative importance, successive studies have found that the average citizen—regardless of the country or the time period under examination—has a low level of political knowledge.[1] More seriously, these studies consistently find that knowledge is unevenly distributed across social groups, which entails a risk of unequal representation and a weakening in the quality of democracy (Kwak 1999). One such inequality is gender, and the consistent finding that women are less politically knowledgeable than men. This gender gap has been observed in studies conducted in the United States (Delli Carpini and Keeter 1996; Dow 2009), Europe (Fraile 2014), Britain (Frazer and Macdonald 2003), and Latin America (Fraile and Gomez 2017), as well as in broader comparative studies that cover both established and new democracies (Fortin-Rittberger 2016; Grönlund and Milner 2006).

A variety of explanations have been advanced to account for the gender gap in political knowledge. One explanation identifies different levels of political interest and media attention between men and women as a cause (Fraile 2013). Another explanation is concerned with the different levels of human capital that men and women

Ruth Dassonneville is Assistant Professor and holds the Canada Research Chair in Electoral Democracy, Département de science politique, Université de Montréal, C.P. 6128 succursale Centre-ville, Montréal QC H3C 3J7, Canada (ruth.dassonneville@umontreal.ca). Ian McAllister is Distinguished Professor of Political Science, College of Arts and Social Science, Australian National University, Canberra ACT 0200, Australia, (ian.mcallister@anu.edu.au).

[1]There is a considerable literature on the topic. For reviews, see Delli Carpini and Keeter (1996), Dolan (1998), and Kenski and Jamieson (2000).

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accumulate over the course of their lives, which they can then deploy in politics (Verba, Burns, and Schlozman 1997). And a third explanation focuses on potential biases associated with measurement and survey methodology (Dolan 2011; Lizotte and Sidman 2009; Mondak and Anderson 2004). However, none of these three explanations satisfactorily explains the gender gap. More recently, a promising line of inquiry has identified the descriptive representation of women in politics as a possible explanation.

The descriptive representation explanation hypothesizes that as the share of women elected representatives increases, these new female politicians will serve as role models, strengthening women's engagement with politics. It is argued that this increased political engagement will then encourage women to become more interested in politics, to participate more, and to become more politically knowledgeable (Carroll 1994; Sanbonmatsu 2002; Wolbrecht and Campbell 2007). A number of case studies have offered evidence in support of this hypothesis (Fraile and Gomez 2017; Wolbrecht and Campbell 2007). However, the limited comparative work that is available fails to show evidence of a link between women's descriptive representation and women's political knowledge (Fortin-Rittberger 2016) or their political engagement more generally (Carreras 2017; Karp and Banducci 2008).

In this article, we argue that the absence of any effect for descriptive representation on the gender gap in political knowledge in these studies is attributable to how it is conceptualized and measured. The current studies measure the impact of descriptive representation across a total electorate at one time point. Instead, drawing upon the rich literature that has shown that political attitudes are formed during adolescence and remain stable thereafter (Hooghe 2004; Jennings 1996), we argue that the formative impact of women's political representation occurs when the individual becomes eligible to vote. Our focus on the role of women's descriptive representation among the young is supported by the fact that some of the strongest evidence for female politicians' effectively serving as role models comes from studies of adolescents (Campbell and Wolbrecht 2006; Wolbrecht and Campbell 2007).

Our results, consistent with other studies, find no indication that more women elected representatives at one time point reduces the gender gap in political knowledge. By contrast, we do find that how well women are represented in politics at the time the respondent reached voting age has a significant effect in reducing the gender gap. These results have important policy implications, by allaying fears that a stronger representation of women in politics will not reduce the gender gap in political knowledge, or in political engagement more generally. A stronger presence of women in politics does have the potential to significantly reduce the gender gap, although we show that such a process will take time and will not occur in the short term. Indeed, many more generations of female voters will have to be socialized in a period of strong women's representation before the knowledge gender gap will disappear.

Our results are based on an analysis of two large, comparative data sets: Modules 1, 2, and 3 of the Comparative Study of Electoral Systems (CSES) and the 2009 European Election Study (EES). The first section of the article reviews the main explanations for the gender gap in political knowledge, and the second section places descriptive representation within the context of political socialization theory. Following a detailed description of the two data sets and the operationalization of the main variables, the fourth section presents the results. After verifying the robustness of our results, we discuss the implications of the findings.

The Gender Gap in Political Knowledge

The gender gap in political knowledge has been observed in a large number of studies, and it appears to persist cross-nationally and over time, leading Dow (2009, 117) to refer to the gap as "one of the most robust findings in the study of political behavior." A variety of explanations have been advanced to account for the gender gap in political knowledge. One of the earliest explanations identified the different human capital that men and women are able to bring to bear to understand the political world, mirroring research that sought to explain racial differences in political participation in the United States (e.g., see Verba, Schlozman, Brady, and Nie 1993). Such differences would appear to have some importance in explaining different levels of political participation: For example, women were traditionally less likely than men to gain a university education, a primary determinant of participation. In addition, there remains a persistent wage gap between men and women (Cha and Weeden 2014), and the greater proportion of women heading one-parent families has made women poorer and men richer (Edlund and Pande 2002; Iversen and Rosenbluth 2006). The human capital model therefore argues that differential access to resources may explain the gender gap in political knowledge.

The research that has tested gender differences in human capital as an explanation for variations in political attitudes and behavior has found only limited support.

There is evidence that it has been a factor in the gradual shift among women toward a center-left affiliation, away from their traditional center-right affiliation (Iversen and Rosenbluth 2006; McAllister 2011). This has occurred as more women gain tertiary education and participate in the labor force. However, human capital explains little in terms of election turnout, which has shown a long-term convergence in turnout rates between men and women (Blais, Gidengil, and Nevitte 2004; Leighley and Nagler 1992). There is also little evidence that it is a major factor in reducing the gender differences in political knowledge (Verba, Burns, and Schlozman 1997).

A second explanation for the gender gap in political knowledge is political interest and the associated patterns of media attentiveness. Women have been shown to be consistently less interested in politics than men, even after a wide range of other factors, most notably education, have been taken into account (Verba, Burns, and Schlozman 1997). Similarly, access to political information through the mass media has demonstrated a distinct gender pattern (McLeod, Scheufele, and Moy 1999). Once again, however, the research shows that this interest and media attentiveness have only a modest effect in shaping political knowledge (Prior 2005).

The inability of the human capital and interest explanations to explain the gender gap in political turnout has led some researchers to posit a third explanation, namely, the potential of measurement and survey effects to bias the results (Dolan 2011; Lizotte and Sidman 2009; Mondak and Anderson 2004). One line of inquiry has investigated mode factors, so that the reactions of female survey respondents when asked knowledge questions may be influenced by the gender of the interviewer (McGlone, Aronson, and Kobrynowicz 2006; Robison 2015).

A second approach has examined the greater propensity of men to attempt to guess a correct answer in a political knowledge battery, rather than give a "don't know" response (Lizotte and Sidman 2009, 129; Mondak and Anderson 2004). Gender differences in guessing would appear to account for between one-third and one-half of the gender gap in political knowledge (Kenski and Jamieson 2000; Lizotte and Sidman 2009; Mondak and Anderson 2004, 510). A third approach has focused on the absence of questions that relate directly to women's experiences (Barabas, Jerit, Pollock, and Rainey 2014; Dolan 2011).[2] Research along these lines has shown that women are equally or even better informed when measuring practical knowledge, such as knowledge on government services and benefits (Stolle and Gidengil 2010). For more conventional forms of political knowledge relating to institutions, parties, and elections, however, the gender knowledge gap is sizable and persistent.

The fourth explanation for the gender gap in political knowledge concerns the descriptive representation of women in politics, which is the subject of this article. This predicts that as the share of women elected representatives increases, these female politicians will serve as role models for other women, strengthening women's overall engagement with politics. This increased political engagement will then lead women to become more interested in politics, to participate more, and, as a consequence, to become more politically knowledgeable (Carroll 1994; Wolbrecht and Campbell 2007). Studies investigating this hypothesis, however, have offered only mixed results. While Fraile and Gomez (2017) have found indications that the gender knowledge gap in Latin America is significantly reduced when there are more women representatives, Fortin-Rittberger (2016) failed to find evidence of such an effect in a more varied set of democracies worldwide.

In summary, research on the gender gap in political knowledge has progressed through several stages. The early research on human capital provided a promising line of inquiry but has been largely superseded by women's advancement in education, labor force participation, and status attainment. Political interest and media attentiveness, while displaying distinct gender patterns, have also not explained the gap. The measurement of political knowledge has shown greater potential, with studies showing that it accounts for between one-third and one-half of the observed differences but still leaves a sizable gap unexplained. This leaves the descriptive representation of women, and the purpose of this article is to provide a definitive test of this hypothesis using two large-scale, comparative surveys that cover different countries and use different measures of political knowledge. The use of these surveys means we can effectively exclude the observed patterns' being a methodological artifact.

Descriptive Representation and Political Socialization

In studying the short-term effects of women's political representation on the gender gap in knowledge—measured in the year the survey was conducted—previous work has implicitly assumed that political knowledge is contingent on the immediate political context. In other words, it is assumed that the descriptive representation

[2]Dolan (2011, 105) shows, for example, that when questions include "political knowledge measures that ask about the present state of women in American politics, we see women's traditional gender disadvantage wiped out."

that exists at the time of the survey will translate into a particular level of political knowledge across the electorate as a whole. There are good reasons, however, to doubt the validity of this assumption.

A large literature has shown that aggregate changes in political attitudes take place not in a short time span but over an extended period. This rests on the finding that following adolescent political socialization, attitudes remain generally stable during adulthood (Hooghe 2004; Jennings 1987). As a result, society-wide changes in political attitudes are mostly a function of new generations—who are subject to influences from different contexts—entering the electorate (Abramson and Inglehart 1986). A similarly high degree of stability has been observed when tracing individuals' levels of political knowledge over an extended period. As Jennings (1996, 249) has argued, "what each cohort brings into political maturity has a good deal of continuity. . . . [A]s a whole the cohorts will not improve or worsen very much with respect to their knowledge levels." Furthermore, Prior (2010, 763) has shown that political interest—arguably the most important precursor to political knowledge—is exceptionally stable "both from year to year and in the long run."

Given what is known about the stability of political knowledge and the important role of adolescence in shaping citizens' political attitudes, it is not surprising that the strongest evidence for female politicians' serving as role models comes from surveys of young people. Campbell and Wolbrecht (2006), for example, show that girls are more likely to indicate a willingness to become politically active when women politicians are more visible on the news. Furthermore, Wolbrecht and Campbell (2007) have shown that adolescent girls will discuss politics more frequently and are more likely to participate in politics in adulthood if there is a higher proportion of women elected representatives. In contrast, evidence of female politicians' serving as role models for adult respondents is more mixed, as we have already noted. As citizens reach midlife, their attitudes are more stable (Jennings 1996; Plutzer 2002); it is unlikely, therefore, that a change in descriptive representation, however significant, will influence their political attitudes.

Building on this research, we argue that the impact of descriptive representation should be greatest among adolescents and young adults. In focusing on the impact of variables that capture the political context at the time when a voter first enters the electorate, our work mirrors how scholars of electoral behavior have sought to explain the decline in political participation. Studies have shown that the level of electoral competition or ideological polarization in the first election a voter participates in can leave a lasting imprint on her political behavior (Franklin 2004; Smets and Neundorf 2014). We also build on several recent studies that have investigated the long-term effects of women's representation (Beauregard 2017; Gilardi 2015), in contrast to the study of short-term term effects that has long dominated the field. In the analyses that follow, we investigate whether the descriptive representation of women leaves an imprint on citizens' political attitudes. Our hypothesis, then, is that female respondents who entered the electorate at a time when more women were represented in politics will have similar levels of political knowledge when compared to men.

Data and Method

Data

To test this hypothesis, individual-level data are required that include reliable measures of political knowledge, as well as contextual measures of women's political representation. We use two data sets that meet these requirements and that complement one another: the Comparative Study of Electoral Systems (CSES) and the 2009 European Election Study (EES).

First, Modules 1, 2, and 3 of the CSES project (CSES 2015a, 2015b, 2015c) cover a range of emerging and established democracies.[3] The data are based on post-election nationally representative surveys that include a common module of questions. Interviews were mostly, but not exclusively, conducted by telephone. Given that differences in survey mode might affect levels of political knowledge and the gender gap in knowledge, we control for the survey mode in our analyses of the CSES data.

Political knowledge in the CSES is measured by three questions, of varying levels of difficulty and specific to the country in question. The lack of standardization means that the question topics vary, although they all cover respondents' knowledge about institutions or government (Grönlund and Milner 2006). Given this cross-national variation in knowledge questions, it is important to control for topics that women are known to be more or less knowledgeable about. Following Fortin-Rittberger (2016), we therefore control for whether the knowledge items included questions on international relations or

[3]Relying on a pooled sample of different CSES modules has the advantage of covering a time period of one and a half decades (1996–2011), which substantially increases the variation in terms of women's descriptive representation. We do not take into account the data from Module 4 of the CSES project because the political knowledge items were standardized, thus making it less comparable to the data from the first three modules. We do value standardization, however, which is why we complement our analysis of the CSES data with an analysis of the EES 2009 data.

on female politicians. Finally, there is variation in question format, with some surveys including multiple-choice questions and others using a true/false or an open-ended format. This question format influences the levels of "don't know" responses in the surveys, which has been shown to bias the gender gap in political knowledge (Dolan 2011). We therefore account for this variation in question format in our analyses of the CSES data.[4]

Even though we control for survey mode, question content, and question format in the CSES data, the issue of the cross-national comparability of the knowledge items in this data set remains. To alleviate such concerns, we complement our CSES analyses with an analysis of the data from the 2009 EES project (van Egmond, van der Brug, Hobolt, Franklin, and Sapir 2013). Although the EES has a more restricted geographical focus and less variation in women's political representation, the knowledge questions in this data set have the advantage of being standardized in terms of question wording, question format, and survey mode. That is, the same knowledge questions were included in surveys in all participating countries, all questions were phrased in a true/false format, and surveys were conducted through telephone interviews.[5] The knowledge questions included in the 2009 EES were focused on institutions and government, with four items on European Union politics and three items measuring national political knowledge.[6] As Fraile (2014) has indicated, the true/false format of these knowledge questions as well as their focus on international politics and institutions might artificially inflate the gender gap in political knowledge. Our interest, however, is not in levels of knowledge but in verifying whether women's political representation explains the intercountry variation in this gender gap.

[4]We are grateful to Jessica Fortin-Rittberger for making her coding of the question content and question format variables available to us.

[5]Though it should be noted that in nine countries in Eastern Europe (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovakia), representative phone sampling was not feasible. In these countries, the sample is based on a combination of face-to-face and phone interviews. We control for this difference by adding a dummy variable to our analyses that identifies these nine countries.

[6]The following items were included: (1) Switzerland is a member of the EU; (2) The European Union has 25 member states; (3) Every country in the EU elects the same number of representatives to the European Parliament; (4) Every six months, a different member state becomes president of the Council of the European Union; (5) The [minister of education] is [correct name]; (6) Individuals must be 25 or older to stand as candidates in [country] elections; (7) There are [150% of real number] members of the [country parliament].

Measurement

Our focus is on the number of correct answers—rescaled to run from 0 to 1—that respondents provide on the political knowledge items that were included in the respective data sets. Any inferences from our analyses depend crucially on the reliability of these political knowledge measures. We have validated the knowledge scales by calculating Cronbach's alpha statistics for each specific election/country-study. Cronbach's alpha values can vary between 0 and 1, and the cut-off point that is usually referred to as the minimal value for a reliable scale (i.e., a scale measuring a one-dimensional construct) is about .60 (DeBell 2013). In addition, given that the knowledge items are meant to vary in their level of difficulty, we also calculated Loevinger's H-values for each subsample (Mondak and Anderson 2004). This measure assumes the scale has an underlying cumulative structure. Values on this measure can vary from 0 to 1, with values between .30 and .40 indicating a weak scale, values between .40 and .50 suggesting a medium scale, and values greater than .50 indicating a strong scale (Mokken and Lewis 1982).

These scaling statistics calculated for each subsample (listed in Appendix 3 in the supporting information [SI]) show that, overall, the knowledge scales are fairly reliable. We do note a contrast between the two indicators of scalability; the knowledge measures in the CSES data score higher on the Loevinger's H criterion, whereas the EES items appear to scale better when on the Cronbach's alpha statistic. This might be the result of the fact that only the CSES knowledge items were explicitly designed to be cumulative, a dimension that is captured by Loevinger's H. Taking this difference into account, we have validated the robustness of our results by respectively excluding EES samples for which the knowledge scale had a Cronbach's alpha value lower than .60 and CSES samples with a Loevinger's H lower than .40 (see Appendix 4 in the SI).

Our focus is on levels of political knowledge among female respondents, and how the difference between men's and women's level of knowledge is moderated by women's political representation. As an indicator of women's representation and in line with previous research, we focus on the percentage of women elected representatives. In contrast to other indicators of the political representation of women, such as the number of female cabinet ministers, data on the percentage of women in parliament are available for countries worldwide and over an extended period of time (i.e., since 1945). Information on this indicator comes from Paxton, Green, and Hughes (2008) and the Inter-Parliamentary Union (2016).[7] We

[7]We calculated annual percentages by averaging the monthly figures as available on the Inter-Parliamentary Union website.

constructed a short-term indicator that captures the percentage of women elected representatives at the time of the survey year, as well as an indicator of women's political representation at the time the respondent entered the electorate. For this latter measure, we take the mean percentage of women elected representatives when the respondent was between 18 and 21 years old (for more information, see Appendix 2 in the SI). In an additional robustness test, we verify whether our results are robust by changing the time window for this indicator (see Appendix 5). Importantly, there is substantial variation in the percent of women in national parliaments, both between the countries included as well as within countries over time (see Appendix 13), allowing for a thorough analysis of the correlates of women's descriptive representation.

Our interest is in the effect of gender on political knowledge and the moderating impact of women's political representation, but we control for a number of important covariates in our analysis. At the individual level, we add controls for age and level of education. We also account for the impact of some systematic differences between countries that might affect levels of knowledge as well as the gender gap in knowledge and include an indicator of electoral disproportionality and its interaction with gender (Fraile and Gomez 2017; Kittilson and Schwindt-Bayer 2010). To account for the more heterogeneous nature of countries included in the CSES data set, we also add controls for the quality of democracy (derived from the Polity IV data set) and for economic conditions (gross domestic product [GDP] growth) and their interactions with gender (see Appendix 1 in the SI for more information on the coding and descriptive statistics of all control variables).[8]

Research has shown that survey mode, as well as question content and format, can influence responses, so we add controls for each of these elements in our CSES analyses. For mode, we distinguish between face-to-face surveys, telephone surveys, self-administered surveys, and surveys that were conducted using a mixed design. On question content, we follow Fortin-Rittberger (2016) and add controls—and their interaction with gender—for question batteries that include a question on women and a question on international politics. Finally, we make use of Fortin-Rittberger's (2016) coding of different question formats to account for whether the questions were in a true/false format, a multiple-choice format, or an open-ended format. We add these controls separately as well as interactions with gender. Given that questions and survey mode were standardized in the EES survey, less controls are needed in these analyses. We add a control for whether a question on women was included and for survey mode (either telephone or a combination of face-to-face and telephone surveys).

[8]The data are available at http://www.systemicpeace.org/inscrdata.html.

Method

Both the CSES and the EES have a nested structure, with individuals nested in election years and countries (CSES) or countries only (EES). In addition, our interest in the role of the political context during respondents' formative years necessitates accounting for the fact that members of a same birth cohort[9] are more alike. To take this into account, we estimate a series of multilevel models.[10] Our models include variables at the individual level as well as the election/country level, and we are mainly interested in the estimated effects of the interactions between gender and the variables capturing women's political representation. We estimate a series of multilevel models, with random intercepts to allow different levels of knowledge between countries (Gelman and Hill 2007). To estimate these models, we employ maximum likelihood estimation. Although previous research has indicated that such estimates might be biased when the number of higher-level observations is low (Stegmueller 2013), our data sets are large, with around 36 countries in the CSES analyses and 27 countries in the EES.

To interpret the estimated effects, we present the results of linear models in the article, but we also verified the robustness of our results by estimating ordered logit models (see Appendix 6 in the SI).

Results

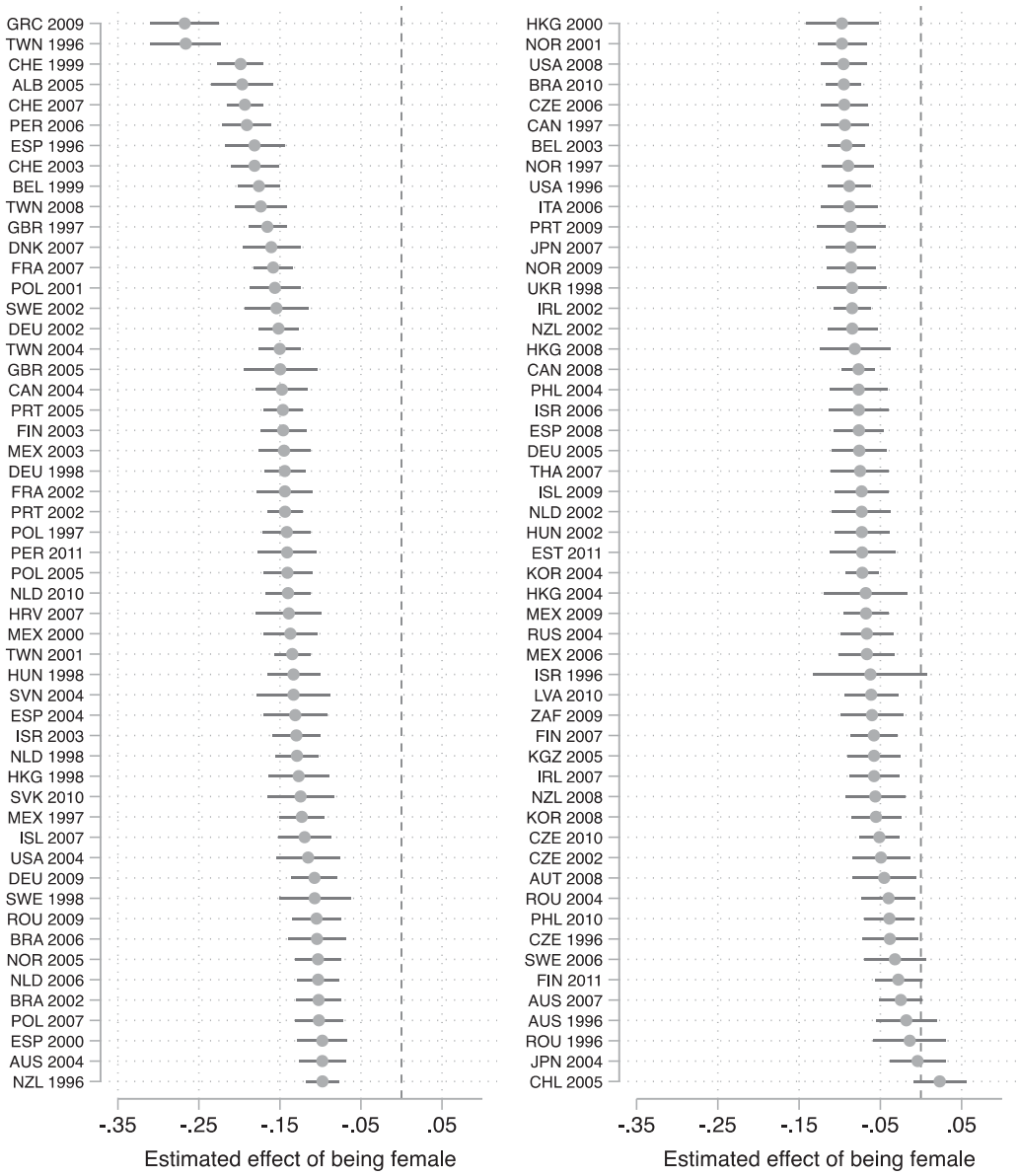
In line with previous research, the results from the CSES and EES confirm that women obtain a consistently lower score on these conventional political knowledge measures compared to men. Figures 1 and 2 present the estimated effect of being female on levels of political knowledge, obtained through a series of bivariate regressions for each subsample in the CSES and EES data sets, respectively.[11]

[9]In line with previous research on cohort differences in political attitudes and behavior, we specify birth cohorts as 5-year groups (e.g., those born in 1921–25, 1926–30, 1931–35, and so on).

[10]We estimate four-level models when analyzing the CSES data (individuals nested in cohorts nested in election years nested in countries) and three-level models when analyzing EES data (individuals nested in birth cohorts nested in countries).

[11]For formatting the figures in this paper, we used the plotplain package in Stata (Bischoff, 2017).

FIGURE 1 The Estimated Gender Gap in Political Knowledge, CSES

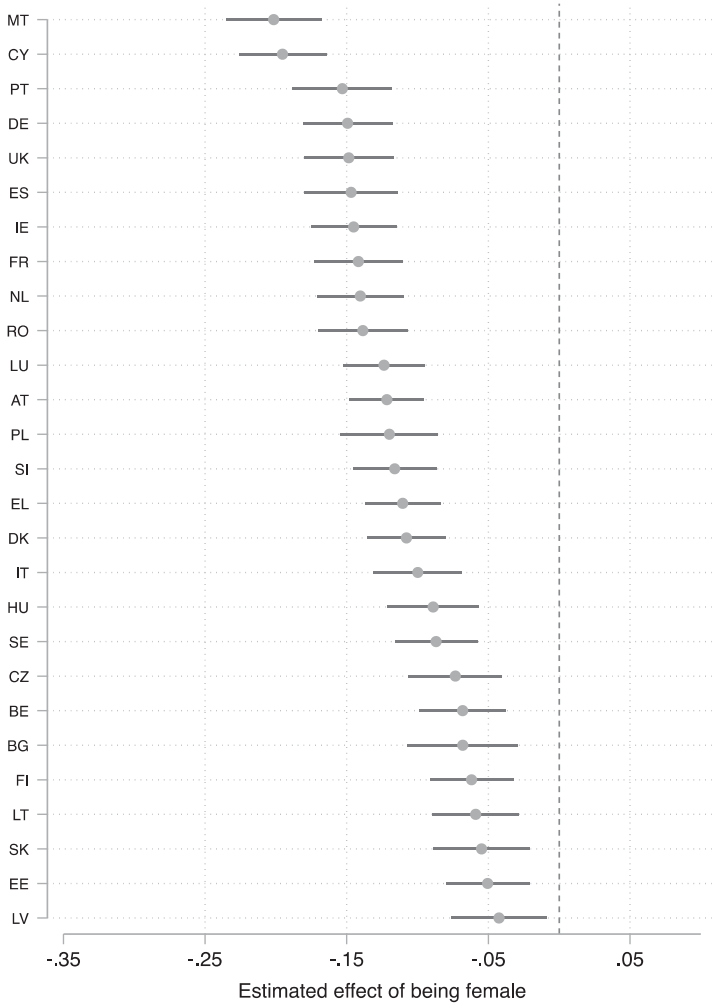


Note: Estimates are regression coefficients and 95% confidence intervals of the effect of being female (reference: male) on a 0–1 sum scale of political knowledge.
Source: CSES Modules 1, 2, and 3.

Across the total of 106 CSES election years, there is only one election—the 2005 election in Chile—in which women are found to have higher political knowledge than men. In the other 105 cases, women have a consistently lower knowledge score compared to men. Furthermore, there are only a handful of subsamples for which this gender gap is not statistically significant. The CSES data thus offer strong evidence of a gender gap in knowledge as it is conventionally measured. On a 0–1 scale, the mean size of the gap across the 106 elections is –.10.

A similar pattern emerges in the EES data. In fact, here, evidence for the presence of a gender gap in political knowledge is slightly more pronounced; the mean difference across the 27 countries is –.11 (again on a 0–1 scale). In every one of the 27 countries that participated in the 2009 EES wave of the EES survey, female respondents scored significantly lower when compared to male respondents. The largest gender gaps are found in Malta and Cyprus, and the lowest in Latvia and Estonia.

FIGURE 2 The Estimated Gender Gap in Political Knowledge, EES



Note: Estimates are regression coefficients and 95% confidence intervals of the effect of being female (reference: male) on a 0–1 sum scale of political knowledge.
Source: 2009 EES.

Figures 1 and 2, using different data sets and different groups of countries, confirm the presence of a gender gap. In the analyses that follow, we test the hypothesis that higher levels of women's political representation moderate the gap. For each of the two data sets, we present three models. The first model serves to benchmark the size of the gender gap and does not include interactions between gender and the percentage of women in parliament. The second model adds an interaction between respondents' gender and the percentage of women in parliament at the time of the survey. Finally, the third model adds an interaction between respondents' gender and the percentage of women in parliament when respondents were aged between 18 and 21 years. Our expectation is that this last model will show a significant impact of women's political representation on the gender knowledge gap. More precisely, we expect to find a positive interaction effect, indicating that as women are better represented in parliament during a respondent's formative years, the knowledge gap between men and women is reduced.

The CSES results are reported in Table 1. The first model confirms the importance of human capital in predicting political knowledge, through possession of a college degree and the accumulated knowledge that comes with age. There is also a significant negative impact on knowledge for the quality of democracy in the country. This may reflect the surge in political interest that accompanied the collapse of communism in 1989–90 in many

Table 1 Explaining the Gender Gap in Political Knowledge, CSES

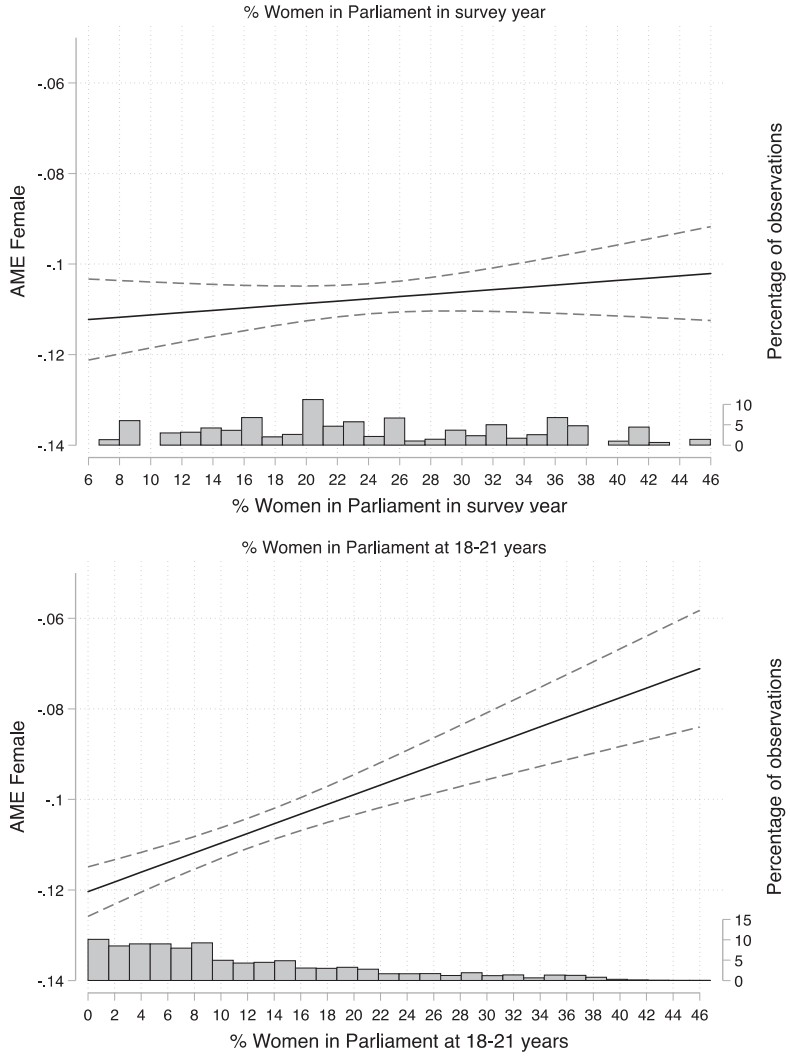
	Model 1		Model 2		Model 3	
	b	SE	b	SE	b	SE
Female	−0.016	(0.023)	−0.013	(0.023)	−0.031	(0.023)
Age	0.001***	(0.000)	0.001***	(0.000)	0.001***	(0.000)
College degree	0.169***	(0.002)	0.169***	(0.002)	0.168***	(0.002)
Disproportionality	0.002	(0.003)	0.000	(0.003)	−0.000	(0.003)
Female × Disproportionality	−0.002***	(0.000)	−0.001**	(0.000)	−0.001**	(0.000)
Polity IV democracy	−0.044**	(0.015)	−0.034*	(0.017)	−0.035	(0.018)
Female × Polity IV democracy	−0.007**	(0.002)	−0.008***	(0.003)	−0.006*	(0.003)
GDP growth	0.001	(0.004)	−0.001	(0.004)	−0.001	(0.004)
Female × GDP growth	0.000	(0.001)	0.000	(0.001)	0.000	(0.001)
Question on international politics	0.032	(0.028)	0.027	(0.028)	0.023	(0.028)
Female × Question on international politics	−0.014***	(0.004)	−0.014***	(0.004)	−0.016***	(0.004)
Question on female politician	−0.031	(0.056)	−0.018	(0.057)	−0.018	(0.057)
Female × Question on female politician	−0.008	(0.008)	−0.010	(0.008)	−0.007	(0.008)
Multiple choice (reference: true/false)	0.097	(0.074)	0.106	(0.074)	0.110	(0.074)
Open-ended (reference: true/false)	0.002	(0.036)	0.000	(0.035)	0.006	(0.037)
Mix of formats (true/false)	−0.002	(0.045)	0.004	(0.044)	0.021	(0.045)
Female × Multiple choice	0.041***	(0.011)	0.040***	(0.011)	0.036***	(0.011)
Female × Open-ended	−0.014**	(0.005)	−0.014**	(0.005)	−0.015**	(0.005)
Female × Mix of formats	−0.007	(0.007)	−0.008	(0.007)	−0.013	(0.007)
Telephone survey (reference: face-to-face)	−0.008	(0.013)	−0.009	(0.013)	−0.009	(0.013)
Self-administered (reference: face-to-face)	0.025	(0.017)	0.025	(0.017)	0.022	(0.017)
Mix of modes (reference: face-to-face)	0.053**	(0.016)	0.051**	(0.016)	0.051**	(0.016)
Percent women in parliament survey year			−0.002	(0.002)	−0.001	(0.002)
Female × Percent women in parliament survey year			0.000	(0.000)	−0.000	(0.000)
Percent women in parliament at 18–21 years					−0.003***	(0.000)
Female × Percent women in parliament at 18–21 years					0.001***	(0.000)
Constant	0.888***	(0.151)	0.860***	(0.151)	0.920***	(0.162)
σ^2 country	0.000		0.000		0.001	
σ^2 election year	0.012		0.012		0.011	
σ^2 cohort	0.003		0.003		0.002	
N countries/election years	38/86		38/86		38/86	
N cohorts	1,139		1,139		1,139	
N individuals	128,289		128,289		128,289	

Note: Estimates and standard errors (in parentheses) of mixed models are shown.
*p < .05, **p < .01, ***p < .001.
Source: CSES Modules 1, 2, and 3.

of the former communist states of Central and Eastern Europe. Furthermore, the gender gap is larger in countries that have a higher quality of democracy and in more disproportional electoral systems. With regard to the controls for survey mode, question content, and question format, we find a significant positive effect of the use of mixed survey mode. Further, we find that the gender gap is significantly larger when the survey included a question on international politics and when the question format is open-ended, whereas the gender gap is significantly smaller when knowledge is measured by means of multiple-choice questions compared to a true/false format. Adding the descriptive representation of women in Model 2, based on the proportion of women elected representatives in the survey year, has no significant effect on knowledge.

The addition in Model 3 of the level of descriptive representation at the time the respondent entered the electorate and its interaction with gender provide

FIGURE 3 The Effect of the Percentage of Women in Parliament on the Gender Gap, CSES



Note: Average marginal effect of being female (reference: male) on political knowledge (measured on a scale from 0 to 1) by women's representation at the time of the survey (upper panel) or when a respondent was 18–21 years old (lower panel) is displayed. Dashed lines indicate 95% confidence intervals. Histograms summarize the distribution of the moderating variable (women's representation in parliament) in the data. Estimates are obtained from Model 2 (upper panel) and Model 3 (lower panel) in Table 1.
Source: CSES Modules 1, 2, and 3.

an altogether different pattern. Here, the interaction term is in the expected—positive—direction: As the proportion of women elected representatives at the time respondents enter the electorate increases, the negative main effect of gender is significantly reduced. These results therefore provide support for our hypothesis, namely, that descriptive representation does matter in reducing the gender gap in political knowledge, but only when citizens are in young adulthood and therefore subject to the processes of political socialization.

The results also show a negative and significant main effect for descriptive representation—measured when the respondents were aged between 18 and 21. Given the inclusion of the interaction term with gender, this coefficient indicates the effect of descriptive representation among men. We elaborate on this finding below.

Overall, these results offer strong evidence that the knowledge gender gap is significantly reduced as women's political representation increases—with women's representation during respondents' formative years being the

TABLE 2 Explaining the Gender Gap in Political Knowledge, 2009 EES

	Model 1		Model 2		Model 3	
	b	SE	b	SE	b	SE
Female	−0.125***	(0.007)	−0.130***	(0.011)	−0.139***	(0.011)
Age	0.002***	(0.000)	0.002***	(0.000)	0.002***	(0.000)
Education	0.054***	(0.001)	0.054***	(0.001)	0.054***	(0.001)
Disproportionality	−0.006	(0.003)	−0.006	(0.003)	−0.007	(0.004)
Female × Disproportionality	−0.001	(0.001)	−0.001	(0.001)	−0.000	(0.001)
GDP growth	−0.002	(0.003)	−0.002	(0.003)	−0.004	(0.003)
Female × GDP growth	−0.004***	(0.001)	−0.004***	(0.001)	−0.002	(0.001)
Combination of personal interview and telephone (reference: only telephone)	−0.075**	(0.027)	−0.080**	(0.029)	−0.071*	(0.030)
Percent women in parliament at time of survey			−0.001	(0.001)	0.000	(0.001)
Female × Percent women in parliament at time of survey			0.000	(0.000)	−0.000	(0.000)
Percent women in parliament at 18–21 years					−0.002***	(0.000)
Female × Percent women in parliament at 18–21 years					0.002***	(0.000)
Constant	0.373***	(0.026)	0.391***	(0.046)	0.407***	(0.047)
σ^2 country	0.003		0.003		0.004	
σ^2 cohort	0.001		0.001		0.001	
N countries	27		27		27	
N cohorts	385		385		385	
N individuals	24,909		24,909		24,909	

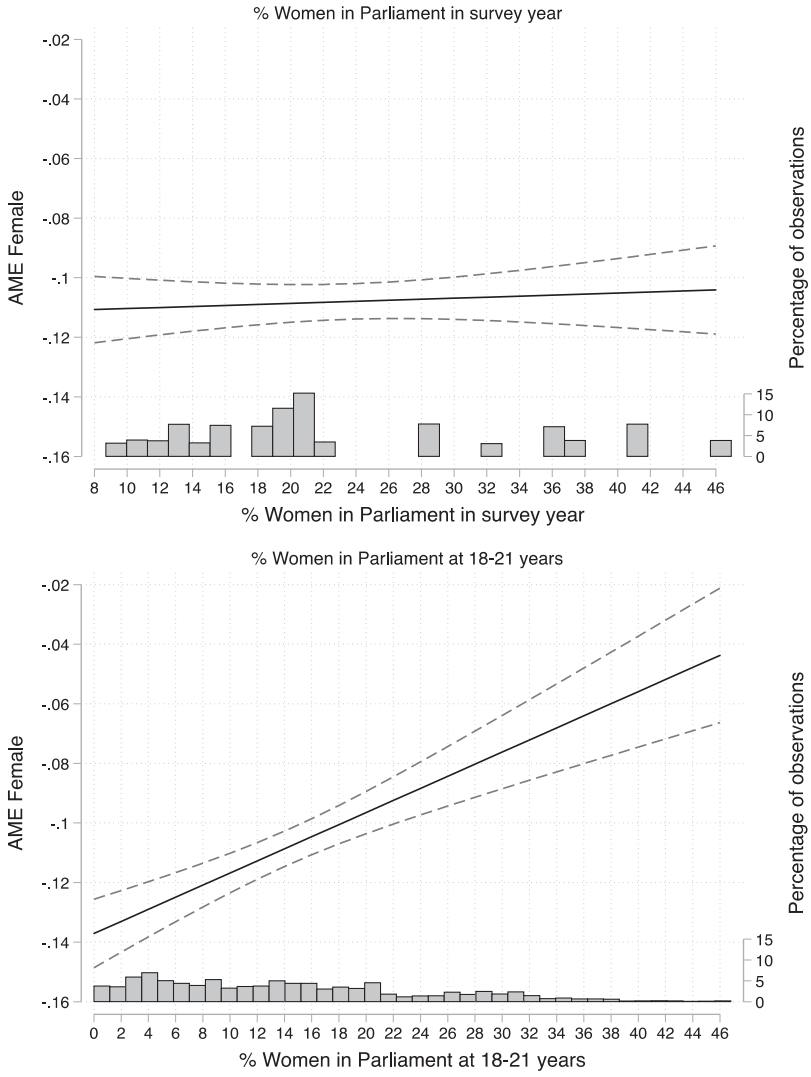
Note: Estimates and standard errors (in parentheses) of mixed models are shown.
$*p < .05$, $**p < .01$, $***p < .001$.
Source:2009 EES.

key indicator. Graphing the slopes for the two interaction effects in Figure 3 emphasizes the strength of this finding. In the top graph, there is virtually no effect on the gender gap in knowledge for the level of descriptive representation at the time of the survey. By contrast, the estimates in the bottom graph show a strong and consistent effect of women's representation measured at the time respondents were aged 18 to 21 years. This long-term effect of descriptive representation is almost linear. For example, the knowledge gap between a man and a woman who entered the electorate at a time when no women held seats in their national parliament—as was the case for voters entering the electorate in Switzerland in the 1960s—is estimated to be about –.12. For those who entered the electorate at a time when about 20% of the representatives in the Swiss parliament were women, the estimated gender gap is about –.09; this gap is further reduced to about –.07 for those entering the electorate when female representation was 40%, as was the case in Sweden in the late 1990s.

We have already noted the potential shortcomings in the measurement of political knowledge in the CSES data. Although Table 1 endeavored to take these into account through controls for survey mode, question format, and question content, it is still possible that our findings are caused by a methodological artifact. Accordingly, we replicate the estimates using the 2009 EES data, which used a more rigorous set of common questions across the countries, as well as fewer methodological differences in how the questions were administered. The results of this analysis, replicating as far as is possible the same measures used in the earlier analysis, are shown in Table 2. The results confirm our central finding, namely, that the level of descriptive representation that existed when a woman was aged from 18 to 21 years has a strong positive impact on her level of political knowledge. These results also show that the overall negative effect of descriptive representation—that is, the effect among men—is noteworthy.

Graphing the slopes of the two moderating variables in Figure 4 for the EES also shows substantially the same patterns as the CSES graphs. Once again, the slope for the percentage of women in parliament at the time of the survey shows no impact on political knowledge for descriptive representation; by contrast, there is a strong positive effect in reducing the gender gap the higher the descriptive representation was when the respondents were aged 18 to 21 years. For this data set as well, we observe a marked

FIGURE 4 The Effect of the Percentage of Women in Parliament on the Gender Gap, EES



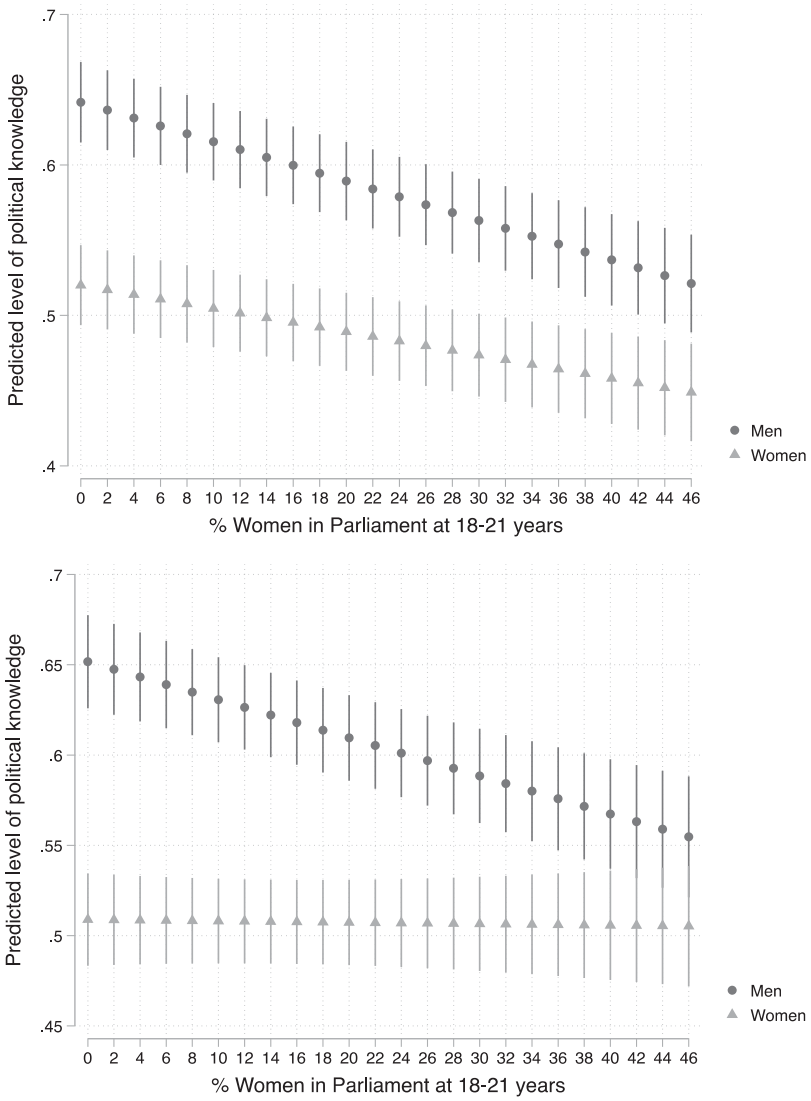
Note: Average marginal effect of being female (reference: male) on political knowledge (measured on a scale from 0 to 1) by women's representation at the time of the survey (upper panel) or when a respondent was 18–21 years old (lower panel) is displayed. Dashed lines indicate 95% confidence intervals. Histograms summarize the distribution of the moderating variable (women's representation in parliament) in the data. Estimates are obtained from Model 2 (upper panel) and Model 3 (lower panel) in Table 2.
Source: 2009 EES.

linear effect, with the gender gap in political knowledge being roughly halved as women's political representation changes from the minimum to the maximum value. More precisely, for those who entered the electorate at a time period when no women were elected representatives in the national parliament—such as citizens becoming eligible to vote in Cyprus in the early 1970s—the estimated gender knowledge gap is about –.14. In contrast, for those entering the electorate in a time period when 40% of the representatives in parliament were women—such as those entering the Finnish electorate in the late 2000s—the estimated gender gap between men and women is just –.05.

Effects among Men and Women

We have already noted the different male and female responses to increasing levels of women in parliament. The

FIGURE 5 The Effect of the Percentage of Women in Parliament on Men's and Women's Level of Political Knowledge



Note: Predicted level of political knowledge (measured on a scale from 0 to 1) by women's representation when a respondent was 18–21 years old among men and women is displayed. Spikes indicate 95% confidence intervals. Estimates are obtained from Model 3 in Table 1 (upper panel) and Model 3 in Table 2 (lower panel).
Source: CSES Modules 1, 2, and 3; 2009 EES.

graphs in Figure 5 summarize the main results in terms of predicted levels of political knowledge among men and women. These results show that while women's levels of political knowledge seem to be largely unchanged, men's knowledge levels appear to be lower as the percentage of women in parliament increases during their formative years. This finding contradicts the theory that suggests a stronger representation of female politicians will decrease the gender knowledge gap through a greater involvement of women in politics. While our results confirm the expectation of a smaller gender gap when women have more seats in the national parliament, the underlying mechanism appears to be different. The gender knowledge gap is reduced because a stronger political representation of women is associated with lower knowledge levels among men.

Our correlational data do not provide any insights into the reasons for this decline in men's knowledge levels

as the descriptive representation of women increases. We can only speculate that descriptive representation works in both directions for men and women, so that a greater proportion of women elected representatives will see a decrease in men's political knowledge. In this scenario, a trend toward gender equality in politics could result in politics' becoming less of a "masculine" domain of interest, leading to men's losing interest in the topic. Whatever the explanation, it is clear that more research is needed into the mechanisms that lead the gender knowledge gap to decrease as women are better represented in politics. Our results suggest that future research should focus not only on the effects of descriptive representation among women, but also on the fact that effects among men are an important part of the equation.

Discussion

A large and growing literature covering many countries and diverse time periods shows that women have different views of politics compared to men. For example, women rate certain traits in political leaders more highly than men (Dolan 2011; O'Neill and Stewart 2009), are more likely than men to be interested in local rather than national politics (Coffé 2013; Rapeli 2014), and take an interest in political issues that more directly impact on their lives, such as abortion and healthcare (Kenski and Jamieson 2000). Most importantly for the topic of this article, women and men have consistently different levels of political knowledge.

The results presented here confirm the persistent finding that women have lower levels of conventional political knowledge when compared to men. Using two independent, large-scale comparative data sets employing different methodologies to minimize measurement bias, we show that women have consistently lower levels of political knowledge when compared to men. Measured across 106 election years in the CSES, and separately across 27 countries in the EES, we find only one instance—Chile in 2005—in which women did not have a lower level of political knowledge compared to men. In all other cases, men knew more about politics than women, and the differences were often highly significant.

Our hypothesis is that this gender gap in political knowledge will be reduced by the descriptive representation of women in politics. So far there are only limited case studies that have supported this hypothesis (Fraile and Gomez 2015; Wolbrecht and Campbell 2007), and no comparative studies have shown evidence of it. We provide the first comparative evidence to support the hypothesis, taking a wide variety of potentially confounding factors into account, replicating our findings in two separate, independent data sets, and providing extensive robustness checks. Our results show that increased descriptive representation does not have a short-term effect on women's levels of political knowledge. Instead, we find that descriptive representation has a long-term impact; it leaves an imprint on young adults who are voting in their first election. This is in line with political socialization theory, which has shown that the influence of political context is strongest among those who are in the process of entering the electorate.[12]

Our results confirm our hypothesis and show a strong, long-term positive impact of women's political representation on the gender knowledge gap. This estimated effect, furthermore, is roughly about the same magnitude in both of the data sets we employ, confirming the generality of our findings. In addition, our results are remarkably robust. In the supporting information, we document the results of a series of additional analyses. We have verified whether excluding samples for which measures of political knowledge scale poorly, have used different operationalizations for defining respondents' formative years, have estimated ordered logit models, have added more individual- and aggregate-level controls[13] and interactions with gender to the models, and have changed the coding of political knowledge to capture political expression instead of knowledge. As evident from the supporting information, these additional tests indicate that our results are largely unaffected by changing the model specification, the operationalization of the key independent variable, or the dependent variable.

While we find the expected decline in the gender knowledge gap, the precise effect of an increased descriptive representation of women is somewhat unexpected. That is, our results indicate that the decline is mostly driven by men's having lower levels of political knowledge as the proportion of women in parliament at 18–21 years increases. This finding leads us to speculate that as

[12]Note that this effect is strongest among the youngest age groups (see the additional tests reported in Appendix 11 in the SI), indicating a gradual decline of the impact of the political context during the formative years as a citizen grows older.

[13]At an individual level, we additionally account for political interest, media attention, and gender roles (see Appendix 7 in the SI). At an aggregate level, we have added the percent of women in the labor force and the percent of women with a tertiary degree (see Appendix 8). We have accounted for differences between older and younger women by means of an interaction between gender and age (see Appendix 8). Furthermore, we have considered whether other contextual differences during respondents' formative years, such as the level of democracy (see Appendix 9), or a more general indicator of gender inequality explains the results (see Appendix 10).

men see fewer of "their" own group in office, they become less politically engaged and knowledgeable. This explanation accords with how descriptive representation influences women, but more research is needed into the causal processes that underlie it, and how it may affect men.[14]

Our findings have two implications for future studies of gender and politics. First and most important, the descriptive representation of women matters. As others have argued, more women role models in politics will decrease the gender knowledge gap (Carroll 1994; Sanbonmatsu 2002; Wolbrecht and Campbell 2007). Ultimately, such changes will create a more equitable political system and further reduce gender differences in many aspects of political attitudes and behavior. Second, our results suggest that such change will take many generations before it has any significant impact on a political system. Since the influence of descriptive representation is effective through the imprint it leaves on young adults, it will only be when substantial numbers of voters—socialized in a context of strong women's political representation—have moved into the electorate that overall patterns of engagement will change.

For the gender knowledge gap to disappear, not only must more time elapse—there must also be a continued and sustained increase in the percentage of women in national parliaments. In the countries included in our analyses, women's political representation has strongly increased over time, from an average of about 5% in 1945 to about 25% around 2015 (see Appendix 13). According to our estimates, however, even with this level of representation, women will still on average have less knowledge of basic political facts when compared to men. The implication is that in the vast majority of countries under consideration, there is still a sizable knowledge gap among new voters entering the electorate today. These differences, as we show here, have long-term effects for their views of and participation in politics, and will persist throughout their lives.

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[14]Given the limitations of cross-sectional research for establishing causality, experimental and natural experimental designs are a promising avenue for further research in this area.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Appendix 1: Coding and descriptive statistics of the independent variables

Appendix 2: Operationalization of descriptive representation during formative years

Appendix 3: Scalability statistics of the knowledge scales

Appendix 4: Robustness of the results when restricting the analyses to samples with 'reliable' knowledge scales

Appendix 5: Robustness of the results when changing the time window for the 'formative years'

Appendix 6: Robustness of the results when estimating ordered logit models

Appendix 7: Robustness of the results when controlling for additional individual-level variables: political interest, media exposure and gender attitudes

Appendix 8: Robustness of the results when controlling for additional aggregate-level variables and for age-differences in the gender gap

Appendix 9: Robustness of the main results when accounting for differences in level of democratization during respondents' formative years

Appendix 10: Testing for the impact of a more general indicator of gender equality (historical gender equality index)

Appendix 11: The Effect of the Percentage of Women in Parliament at 18-21 years among different age groups

Appendix 12: Alternative dependent variable: political expression

Appendix 13: Historical evolution of women's political representation in the countries included