MEASURING THE EXTENT OF VOICE PITCH BIAS IN VOTER BEHAVIOR

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ABSTRACT

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Keywords: voice pitch, female candidates, electability, political trust, competence

This thesis examines the extent of voice pitch bias on the electability of political candidates. In a survey experiment, undergraduate students listened to the manipulated voice recordings of both male and female candidates. These included different political statements to investigate any interactive impact of voice pitch and gender of the political candidates. I find that both from t-test and multivariate logistic regression analysis, candidates with the low voice, i.e. more masculine voices, increases their probability of winning an election, and also voters perceive the low voice candidates more trustworthy and competent compared to a high voice opponent. Manipulating the content of the political statements, I detect a disproportionate effect of voice pitch on male and female candidates' probability of winning the election. Female candidates maintain the advantage obtained from having a low voice longer than a low voice male candidate. I observe this case where both male and female candidates are running opposed to a same-sex candidate with a high-pitched voice who advocates for a more desirable policy. However, female candidates lose this advantage at some point. Hence, there is a trade-off between voice pitch and the policy stance of the candidates. Besides, voters' characteristics also have an impact on their probability of voting for the low voice candidates. Even though a female voter votes more for a low voice candidate than a male voter, this effect is not significant. However, I find that as the voter has more monthly household income, the more she votes for the low-pitched candidate.

ÖZET

SEÇMEN DAVRANIŞINDA SES FREKANSI ÖN YARGISININ BOYUTUNUN ÖLÇÜLMESİ

ASLI CEREN ÇINAR

EKONOMİ YÜKSEK LİSANS TEZİ, TEMMUZ 2020

Tez Danışmanı: Prof. Dr. Özgür Kıbrıs

Anahtar Kelimeler: ses frekansı, kadın adaylar, seçilebilirlik, politik güven, yetkinlik

Bu tez, ses freansının siyasi adayların seçilebilirliğine yönelik önyargı derecesini incelemektedir. Bir anket deneyinde, lisans öğrencileri hem erkek hem de kadın adayların manipüle edilmiş ses kayıtlarını dinlediler. Bu kayıtlar, ses frekansının ve siyasi adayların cinsiyetinin etkileşimli etkilerini araştırmak için farklı siyasi ifadeler içeriyordu. Hem t-testi hem de çok değişkenli lojistik regresyon analizinden, kalın sesli (düşük frekanslı) adayların, diğer bir deyişle daha maskülen sesli, seçim kazanma şanslarını arttırdığını ve aynı zamanda seçmenlerin kalın sesli adayları ince sesli (yüksek frekanslı) bir rakipten daha güvenilir ve yetkin gördüklerine ulaştım. Siyasi ifadelerin içeriğini değiştirerek, ses frekansının erkek ve kadın adayların seçimi kazanma olasılığı üzerinde orantısız bir etkisini olduğunu tespit ettim. Kadın adayların, kalın sesli erkek adaylardan daha uzun süre kalın sese sahip olmanın avantajını sürdüklerini buldum. Ancak, kadın adaylar bu avantajı bir noktada kaybederler. Dolayısıyla, adayların ses kalınlıkları ile adayların politika duruşu arasında bir değişkenlik vardır. Ayrıca, seçmenlerin karakteristik özellikleri kalın sesli adaylar için oy kullanma şanslarını da etkiler. Bir kadın seçmen, kalın sesli bir aday için bir erkek seçmenden daha fazla oy verse de, bu etki istatistiksel anlamda önemli bulunmamıştır. Ancak, seçmenlerin aylık hane gelirleri arttıkça kalın sesli adaylara daha fazla oy verdiğini görüyorum.

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I would like to extend my appreciation to my gorgeous friends. I am grateful to know such a wonderful woman, Cansu Sipahi, who has been in my life since the first day of high school. It has been an incredible journey to grow together and experience life together. She has always supported me with every dream I had and always been there for me with all the obstacles and brightness I went through. I am also indebted to my long-time roommate and friend, Tuğçe Çini, who has not only been a great roommate but also such a great supportive friend and listened to me and gave me her insightful comments both with my personal life and my academic journey. It has been wonderful to know a great woman like her, and I cannot thank her enough to be on my side for these years.

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To my family
who endlessly supports me

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1. INTRODUCTION

Working with a voice coach, Margaret Thatcher lowered her voice pitch by 46 Hz[1] which is tantamount to half the average difference between female voice pitch and male voice pitch. Lowering the pitch of her voice may be one of the crucial determinants on the election of Margaret Thatcher as the prime minister of the United Kingdom in the 1970s.

Why is lowering your voice pitch important in getting elected? The answer to this question has been a great interest in the literature especially for its focus on gender differences in the elections and female candidates. Low voices signal masculinity, trustworthiness, competence, and strength not only in our everyday interactions with other people but also in the elections where we observe power dynamics (Klofstad 2016, 2017; O'Connor and Barclay 2017; Pavela Banai, Banai, and Bovan 2017; Puts et al. 2007). A common finding in the literature suggests that candidates with lower-pitched voices increase their chance of being elected compared to an opponent with a higher-pitched voice (Anderson and Klofstad 2012; Klofstad, Anderson, and Peters 2012; Laustsen, Petersen, and Klofstad 2015; Tigue et al. 2012). Here arises the gender dimension of the importance of voice pitch in electoral settings. Typical female voice pitch ranges between 165-255 Hz while typical male voice ranges from 85 Hz to 180 Hz (Feinberg, Jones, Little, Burt, and Perrett 2005; Vieira, Gadenz, and Cassol 2015). Naturally, this makes male voices lower than typical female voices. As a result, the signals of masculinity, trust, and competence perceived from the voice pitch leverages a male candidate over a female candidate. Not only male candidates benefit from having a lower-pitched voice when there is a female opponent but when male-male and female-female candidates are running against each other the one with low voice has an increased probability of winning (Klofstad 2016). Lowering her voice, then, must have played an undeniably important role in the election of Margaret Thatcher.

The literature on voice pitch bias focuses on the isolated effect of voice pitch on

[1] "Voice pitch is the perceived "highness" or "lowness" of a voice as influenced by fundamental frequency (F0)" (Klofstad and Anderson 2018, 349).

electability. However, Laustsen, Petersen, and Klofstad (2015) take into account the partisanship of the voter and its interaction with the low-voiced political candidate. They found that voters with a more conservative stance prefer to vote for low voice candidates relatively more than the voters with a more liberal, left-wing ideological stance. But yet, the voice pitch literature rarely focuses on other determinants that can have an impact on the perception of competence, trustworthiness, and the electability. In this study, I account for the voter's ideology and income -besides voters' gender- to detect any idiosyncratic effects. However, our study differentiates from Laustsen, Petersen, and Klofstad (2015) by adding political statements to the candidates' voice recordings. This leads us to our key contribution to the voice pitch bias literature; to measure the extent of voice pitch bias by changing the candidates' policy statements.

This study experimentally tests whether the policy stance of a political candidate mitigates the impact of low-pitched voice on her or his electability. I conducted a survey experiment with undergraduate students at Sabancı University, a private university in Istanbul, Turkey. Participants chose to vote for either low- or high-pitched candidate for eighteen different electoral setup after rating candidates' trustworthiness and competence. Differentiating the extent of the voice pitch bias by the candidate's gender reflects if voice pitch nudges voters' gender stereotyping in the political arena. In this research, I would like to focus on voice pitch's impact on the candidates' electability and their perceived competency and trustworthiness.

This study will diverge from the current literature by testing the projected electoral advantage generated by the lower voice pitch with the aim of finding the condition when this advantage is lost as the candidate with lower voice pitch advocates for a less favorable policy. Findings on the perception of trust and competence are parallel with the literature where both male and female candidates benefit from having a lower-pitched voice. Moreover, the baseline comparison of high- and low-pitched voices where both candidates voice exactly the same political statements, the candidate with low voice gets significantly more votes. In addition to this, I find significant differences in the effect of voice pitch on the electability of male and female candidates. As the candidate with a low voice articulates a less desirable policy than her or his opponent, the advantage obtained from voice pitch gradually decreases. However, in this situation, voters are quicker to switch their votes to the high voice candidate in a male-male setup compared to the case when they are choosing between two female candidates. Hence, this study is, to my knowledge, the first in the field to study the extent of the trade-off between low-pitched voice and political stance. My analysis explores the gender perspective in voters' behavior and relatively different weights given to the importance of voice pitch for female and

male candidates.

This paper comprises of four main chapters where the first one is an overview of current literature on voice pitch bias and its impact on gender stereotyping of voters. The second main chapter is where we present the research design of our study in detail. The description of our data, the technicalities behind vocal manipulations, the choice for policy issues and the determination of the political statements of candidates, and the experimental procedure are meticulously presented in the research design chapter. Third, comes the section on the trust and competence perception analysis towards candidates. We begin this section by presenting our method of analysis and then following by a results subsection. Fourth and our last main chapter is about the electability of the low voice candidates. Our key contribution to the voice pitch bias literature is mainly included in this part. In the method of analysis subsection, we present our model identifications. The results subsection discusses our findings. After examining these chapters, conclusion section summarize our key findings, limitations for this study, and a future research agenda.

2. LITERATURE REVIEW

Personality traits enter the calculus of voting as determining variables. Considering the importance of vocal characteristics as an indicator of some personality traits, vocal signals reveal information about the signaler. Animals can collect information about a potential mate or a challenger from these vocal cues (Feinberg, Jones, DeBruine, Moore, Law Smith, Cornwell, Tiddeman, Boothroyd, and Perrett 2005; Jones et al. 2010; Puts et al. 2007). One prominent vocal property, voice pitch attracts attention in the literature for its importance in influencing humans' perspectives towards others. Voice pitch is "the number of vibrations per second made by the vocal folds to produce a vocalization" and is influenced by fundamental frequency (F_0) (Tusing and Dillard 2000, 150). Slower vibration of the larger vocal folds generates lower frequencies than are smaller vocal folds, hence lower sounding voice is obtained.

Voice pitch signals information about some physical and psychological traits such as attractiveness (Feinberg, Jones, DeBruine, Moore, Law Smith, Cornwell, Tiddeman, Boothroyd, and Perrett 2005), social and physical dominance (Puts et al. 2007; Rezlescu et al. 2015; Tigue et al. 2012), and reproductive capabilities (Feinberg, Jones, DeBruine, Moore, Law Smith, Cornwell, Tiddeman, Boothroyd, and Perrett 2005). Some recent studies also presented experimental and empirical evidence on the effect of voice pitch in the perception of competence, leadership abilities, electability, trustworthiness, as well as its effect on vote choice (Anderson and Klofstad 2012; Klofstad 2016; Klofstad and Anderson 2018; Klofstad, Anderson, and Nowicki 2015; Nagel, Maurer, and Reinemann 2012; O'Connor and Barclay 2017; Pavela Banai, Banai, and Bovan 2017; Sei Jin Ko, Judd, and Stapel 2009; Tigue et al. 2012). This line of research shows that people are inclined to find lower-pitched voices more attractive, more masculine, stronger, more dominant. Therefore, mating related instincts echo themselves in political contexts. These perceived physical and psychological traits lead lower voice pitch candidates to have a higher probability of winning an election .

One common crucial finding in these studies is that lower voice pitch reflects com-

petence and strength. Having higher pitched voice affects the perception of competence. Sei Jin Ko, Judd, and Stapel (2009) created some male and female sounding resumes for job applications and presented these resumes accompanied with a male or female voice. In an experimental setting where undergraduate students rated the presented both vocal and in-text resumes in terms of competence and warmth, they find that job applicants with lower voice pitch are rated higher for being competent whereas rated lower for their warmth. This finding applies to both male and female applicants. In an experimental study, Klofstad, Anderson, and Nowicki (2015) manipulates the pitch of recorded partisan neutral statements and finds that voters prefer lower voice pitched leaders since their voice reflects competence, strength, and physical prowess.

In the literature, the perceived trustworthiness of the lower-pitched voice has been discussed in some conflicting studies. O'Connor and Barclay (2017) find that perceived trustworthiness from voice pitch depends on the context. Moreover, their experimental study results show that low pitch female voices are more trustworthy in a general context which is parallel to Klofstad, Anderson, and Peters (2012). However, O'Connor and Barclay (2017) find that people trust high pitch male voices more in a general context. This finding differs from Tigue et al. (2012) where they show low pitch male voices are more trustworthy. This study contributes to this discussion by testing for the trustworthiness of both male and female candidates when they are recorded saying a policy-neutral statement; "Vote for me." Since participants rate their trust for both lowered and heightened versions of the same voice, I will present their perceptions of trust for the different voice pitched candidates from both sexes.

Tigue et al. (2012) manipulated voice recordings of nine US presidents to see if the lower-pitched version of these presidents' voices influence the voting behavior more than the higher-pitched version. After experimenting with the same stimuli with unfamiliar male voices, they find that both male and female voters prefer lower-pitched versions. However, this study does not reflect the voice pitch bias for female candidates. Klofstad, Anderson, and Peters (2012) and Anderson and Klofstad (2012) experimentally study the effect of lower-pitched voices for both male and female candidates. As a common finding, both male and female voters prefer female candidates with lower voice pitch. Unlike women, men preferred men with masculine voices. Women did not have a significant preference for voice pitch when they were listening to male candidates. The reason behind the difference in response of male and female candidates may arise from the physical strength signal perceived from low pitch voice. Low pitched male voices signal physical dominance to other males hence this physical threat is likely to be a determinant in the male-male competition

even in a political context (Puts et al. 2007).

Gender is also one of the most prominent traits voters can perceive at first sight. Hence this attribute can have an impact on their voting decisions, and this reflects itself sometimes in the shape of gender-based mistrust of political candidates and sometimes more subtle and implicit gender bias for competence on specific political issues.

In an empirical study, Koch (2000) finds that voters use gender stereotypes to presume a candidate's political ideology. Voters perceive female candidates more liberal than their male counterparts. This serves to increase the ideological distance between a female Democratic candidate and the citizens but decrease the distance between a female Republican candidate and most citizens. Voters characterize political issues as male-congenial or female-congenial according to an experimental study conducted by Eagly et al. (2003). The gender-based congeniality effect emerges when voters give emphasis on their sex and candidates' attitudes. This study finds that women but not men attach to the candidate characteristics that favor their gender's interests. To voters, some political issues sound as more male-competent policy areas while others sound as more female-competent (Dolan 2010) . Based on these studies, Searles et al. (2017) define the term gender issue ownership as "having reputation for handling political problems" (6). For example, issues related to the military, economy, or crime are associated with men while issues related to education, childcare, or senior citizens are associated with women.

The literature also finds that a voter's political alliances can play an important role in her voting decision. For example, partisanship can interact with the gender congeniality effect in voting such that Democratic voters are more likely to vote for a female than a male-congenial candidate whereas it is the opposite for Republican voters (Eagly et al. 2003). Dolan (2014) also emphasizes the importance of the political party in gender-stereotypical approach to political candidates. Yet, the findings can bring a controversial perspective to the discussion of gender in politics. The study, after surveying more than 3000 US adults, concludes that the political party remains the most important factor in voting decisions regardless of the candidate's gender. Mo (2015) takes into account the explicit and implicit gender bias that may arise during calculus of voting[1]. This means that a lot of studies fall into social desirability bias[2] since voters can still have implicit gender bias outside of their

[1] "Implicit (explicit) attitudes are defined as preferences that exist outside (inside) of conscious awareness." (Mo 2015, 359)

[2] Social desirability bias is the tendency of survey respondents to answer questions in a manner that will be viewed favorably by others. It can take the form of over-reporting "good behavior" or under-reporting "bad", or undesirable behavior.

conscious awareness. Moreover, the empirical results suggest that any explicit or implicit attitudes against a female leader decrease the tendency to vote for a female candidate.

This area of research is facing the lack of studying the interaction effects between gender stereotypes in politics and voice pitch which I am planning to tackle. Mainly the effect of lower-voice pitch can be modulated by different personality traits and political stances. The current experimental literature on voice-pitch uses policy-neutral audio recordings to present the voter to isolate the effect of voice-pitch from other electoral determinants. However, the political stance can be an extremely crucial factor for the electability of the candidates. Some political issues sound more male competent policy areas whereas voters evaluate other issues such as health and education as more female competent areas (Dolan 2010; Mo 2015; Searles et al. 2017). In another study by Koch (2000), the political ideology of female candidates is found to be a critical force to reduce the distance between the candidate's policy stance and voters' ideology. Therefore, voters may switch their votes to the candidate with a higher-voice pitch when the lower-voice pitch candidate advocates for a less-desirable policy.

3. RESEARCH DESIGN

3.1 Data

3.1.1 Participants

Participants (N= 186) included 70 female and 115 male -1 participant did not prefer to specify their birth sex and their gender identity- undergraduate students at Sabanci University.[1] Participants ranged in age from 19 to 29 (mean age of the participants were 22 with a standard deviation of 0.12). Students who are currently enrolled in the introductory courses of economics received an email link that gives them access to the survey in the Qualtrics platform.[2] Participants either listened to the voice recordings with computer speakers (n=142) or with headphones (n=45). Students received course credits in exchange for their participation. Only the course instructors had access to the student identification numbers but not to their answers to the survey questions. Anonymity of the participants is respected hence their identities are kept confidential.

Table 3.1 presents the summary statistics for demographic and political characteristics of survey participants. In this table, education level equals to 6 represents undergraduate students. Since, the survey is distributed to undergraduate students the standard deviation shows almost no variation. Monthly household income level ranges between 1 to 12, 1 representing a monthly income level of less than 600 $

[1]Students answered questions asking about both their birth sex and their gender identity with six different answer choices. All our participants but one defined their gender identity the same as their birth sex and none of them stated any gender identity different than female and male.

[2]Protocols for this study were approved by Sabancı University Ethics Committee.

whereas income level equals to 12 represents monthly household income more than 6600 $.[3] Monthly household income level creates the desired variation, which will be included as a control variable to the analysis of electability. Participation dummy variable indicates if the subjects to the survey voted in the last elections. General trust towards others shows 1 if the participant selected "Most people can be trusted" or 2 if the participant selected "I must be very careful in dealing with people". Satisfaction variable is a categorical variable ranging from "Strongly disagree to strongly agree" where the question asked was about the participants' satisfaction from education and healthcare policies.

Percent distribution of the participants' monthly income and their stance on a left-right scale is presented below in Figure 3.1 and Figure 3.2. Left right ideology scale ranging from 0 to 10, 0 representing extreme left and 10 representing extreme right is normalized to a 0-1 scale.[4] Their monthly household income level ranged from less than 600$ to 6600$ shown in Figure 3.1.

Table 3.1 Summary Statistics for the Participants to the Experiment

VARIABLES	Observations	Mean	Std Dev.	Min	Median	Max
Age	186	22.21	1.665	19	22	29
Education level	186	5.839	0.823	3	6	10
Monthly household income level	186	6.968	3.612	1	6	12
Participation	186	0.930	0.256	0	1	1
Left-Right Ideology	185	0.388	0.199	0	0.400	1
Trust towards others	186	1.957	0.203	1	2	2
Satisfaction	186	3.634	1.280	2	4	6

3.1.2 Vocal Stimuli

Six native Turkish speakers -three females with an average age of 38 and three males with an average age of 40- were recorded speaking the following policy statements

[3]Monthly household income level is adjusted for the TL/US dollars currency rate.

[4]The left-right ideology variable is self reported following CSES (Comparative Study of Electoral Systems)-Turkey questions.

Figure 3.1 Monthly Household Income Level

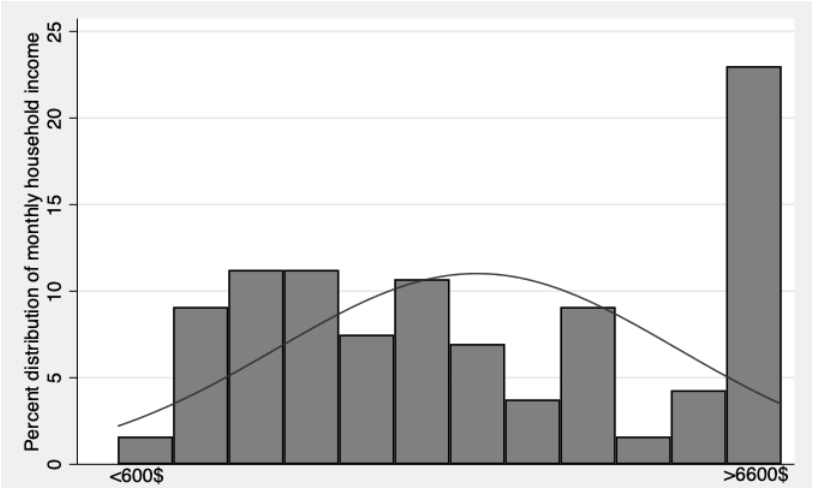
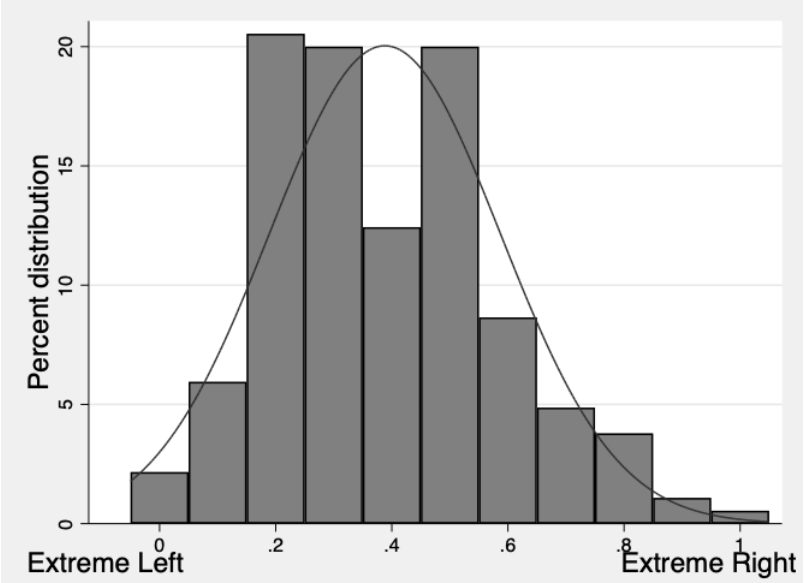


Figure 3.2 Left-Right Ideology



in Turkish:[5]

- "Please vote for me."
- "I will allocate X Turkish liras per person annually for education expenditures."
- "I will allocate X Turkish liras per person annually for health expenditures."

I chose to record more than one candidate for each gender to reduce the possible impact of the idiosyncrasies of any one candidate.

[5]All the candidates self identified as male or female. In this thesis I refer to them according to this identification. However, I am aware that the gender spectrum provides us a range and it is not binary. This is consistent with the previous literature. The survey did not inform participants about the candidates' gender. The participants only listened to the recording without any explanatory and identifiable information about the candidate.

The monetary amount X has the maximal value of 10 000 Turkish liras and this amount decreased by 200 Turkish liras in six increments. Hence, both education and health policy statements were recorded twelve times with different monetary amounts for male and female candidates.

Voices were recorded as .mp4 files using an iPhone microphone. I inspected each audio file aurally and visually in Audacity (v.2.3.3; audacityteam.org)[6]. Before converting the audio files into .wav format, I ensured that the recordings were without speech errors and background noise. Then, I used Get Pitch command in Praat software (Boersma and Weenink 2020, v.6.1.15) to determine the mean pitch of the recordings. The mean pitch of unaltered female voices is 239 Hz and standard deviation 14 Hz. The mean pitch of unaltered male voices is 134 Hz and standard deviation 12 Hz.

I created a lower-pitched and higher-pitched version of each voice recordings using the Pitch-Synchronous Overlap Add (PSOLA) method in Praat software. This method allows us to manipulate fundamental frequency and harmonics whilst controlling the other spectrotemporal aspects of the acoustic signal (Feinberg, Jones, Little, Burt, and Perrett 2005). Following the literature, I altered the recordings ± 0.5 equivalent rectangular bandwidth (ERB) where each recording was converted into a pair of recordings, one with higher-pithed and one with lower-pitched (Jones et al. 2010; Klofstad and Anderson 2018; Tigue et al. 2012). $\pm$ERB manipulation accounts for a perceivable shift of ± 20 Hz. Manipulating the recordings by ERB corrects for the logarithmic difference between actual fundamental frequency and perceived fundamental frequency hence I could produce a constant perceivable gap between the raised and lowered versions of the recordings regardless of their initial fundamental frequency. I conducted a pre-test to control for the perceivable gap between the manipulated voices and 90% of the participants reported the difference between manipulated voices.

3.1.3 Political Statements

I chose to use monetary units to test my hypothesis about mitigating the impact of low-pitched voices on electability with candidate's policy stance. Here, monetary units signal the candidate's policy stance to better measure the policy's impact

[6] Audacity® software is copyright © 1999-2020 Audacity Team. The name Audacity® is a registered trademark of Dominic Mazzoni.

on the electoral advantage of low-pitched voice. In this study I formed the candidates' policy statements around two issues; healthcare and education. The former quickly gained importance during Covid-19 pandemic in the first half of 2020. Besides, to compare the issue importance for the reduction in electoral advantage with a relatively less media-attention grabbing issue in Turkey during 2020 I decided to select education. Another determinant for the choice of these two issues are coming from their difference in public satisfaction as seen in Figure 3.3.

Figure 3.3 Satisfaction from Education and Healthcare Services

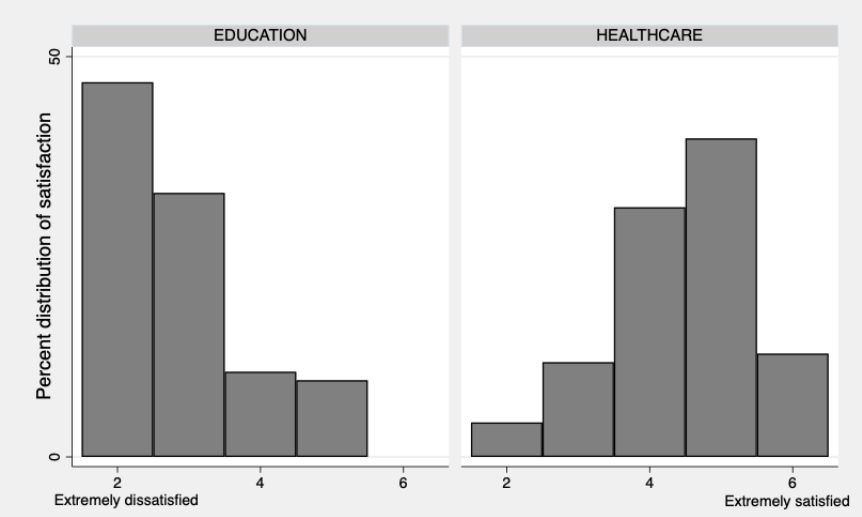
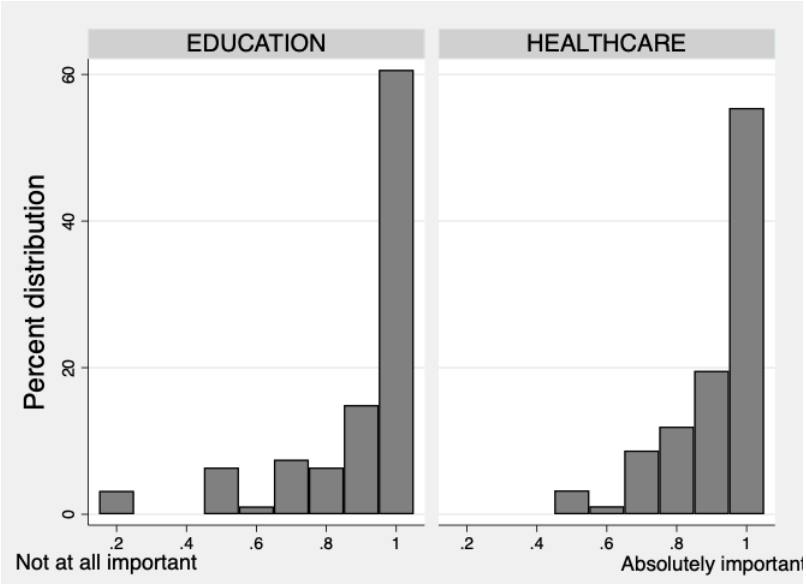


Figure 3.4 shows that it is crucial for the state to provide basic services like education (absolutely important: 60.64% of the participants) or healthcare (absolutely important: 55.91% of the participants) to the public. This is why in this paper, "less desirable monetary policy" is defined to be a monetary amount which is less than the opponent's offered amount.

To find a common monetary unit for both education and healthcare policy statements, I have consulted the OECD's education and healthcare reports for Turkey (OECD 2018, 2019*a*). The latest available data states that yearly spending per capita on education is 4505,48 $ whereas yearly government-financed healthcare expenditure per capita is 957,1 $. The mean of these two values is taken and then converted to Turkish lira with the currency exchange rate of January 2019. I then rounded this converted value to the nearest thousand steps. This is how I ended up with the maximal amount, 10 000 TL, spent on both education and healthcare services.

The main hypothesis here is to test whether the advantage obtained from having a lower-pitched voice can be reduced by advocating a less desirable monetary policy,

Figure 3.4 Importance of government spending for education and healthcare



Survey Question: "How important do you think that governments provide education/healthcare services?"

i.e. the trade-off between the voters' preference for a candidate with lower-pitched voice and the candidate's policy stance. I aim to find an exact switching point from voting for the candidate with a lower-pitched voice to the candidate with a higher-pitched voice by incrementally decreasing the monetary unit in the policy statement of lower-pitched voice for the expenditures of education and healthcare services. Analyzing the pre-test survey results, the increments are determined to be equal to 200 TL.[7] Thus, in six steps the budget proposed by the lower-pitched voice decreased to 9000 TL.

3.2 Procedure

I organized the experiments into two blocks, one for the education and the second one for the healthcare. In the education block, the voice recordings presented were "I will allocate X Turkish liras per person annually for education expenditures." The health block consisted of the recordings stating, "I will allocate X Turkish liras per person annually for health expenditures." Subjects listened to each pair of female

[7]I ran the pretest with 50 participants. There, the increments were 500 TL and the maximal amount proposed was 5,000 TL. After analyzing the results, I saw that a 500 TL incremental decrease did not capture any difference between male and female candidates with low-pitched voices on their electability. Moreover, 500 TL increments caused very significant shifts in votes. Hence, I decided to decrease the increments to 200 TL in the experiment.

and male voices through their computer speaker or headphones and then responded to the question, "If these two candidates were running against each other, who would you vote for?" Subjects participated multiple elections in order to minimize the pseudoreplication bias.[8]

Other than the policy statements, both blocks included the trust and competence perception questions towards the lower and higher-pitched versions of female and male candidates. For trust and competence questions subjects listened to the following recordings, "Please vote to me."

Voters chose whether to use computer speakers (n=142) or headphones (n=45).[9] The policy statements involving the budget for either healthcare or education expenditures were presented randomly to the subjects to eliminate the order effect (Holt and Laury 2005).

First, subjects rated the trustworthiness and competence for both lower and higher-pitched versions of a female and male voice. Then they were asked to vote for one of the randomly presented the policy statement recordings. They voted for both female-female candidates and male-male candidates. The difference in voice recordings other than the pitch is the monetary amount that the candidates proposed to spend on health or education expenditures. For a total of six candidates, the design involves 2 (candidate gender: female vs. male) $\times$ 2 (policy type: health vs. education) $\times$ 2 (voice pitch: high vs. low within gender) within-participant factors (Charness, Gneezy, and Kuhn 2012).

The results obtained from online voice pitch experiments are comparable to the results from laboratory experiments (Feinberg et al. 2008).

[8] "If treatments are spatially or temporally segregated, if all replicates of a treatment are somehow interconnected, or if "replicates" are only samples from a single experimental unit, then replicates are not independent. If one uses the data from such experiments to test for treatment effects, then one is committing pseudoreplication" (Hurlbert 1984, 198).

[9] At the end of the survey, subjects answered the question about any problems with listening the recordings. The participants stated any problems with listening were excluded from the sample of analysis.

4. TRUSTWORTHINESS AND COMPETENCE

4.1 Method of Analysis

Trust and competence questions were asked on a Likert-scale from 1 to 4, from not trustworthy/competent at all to completely trustworthy/competent. Participants rated the trustworthiness and competence of either female or male candidates. They listened to both low- and high-pitched versions of the same candidate hence they listened to a total of six recordings.

I take participants as the unit of analysis. I calculated a trustworthiness and a competence measure for each participant by taking the average of their ratings for each low- and high-pitched version of all of the candidates. To determine if there is a significant difference for trustworthiness and competence ratings of low- and high-pitched voices, I conducted a two-sample paired t-test and compared the mean trust and competence ratings for female and male candidates (Gerber and Green 2012).

4.2 Results

As shown in Figure 4.1, voters trust male candidates with low voice more than high voice male candidate (mean difference=.125±.05, p-value=.018). Voters also find low voice male candidates significantly more competent than high voice male candidates (mean difference=.194±.06, p-value=.001).

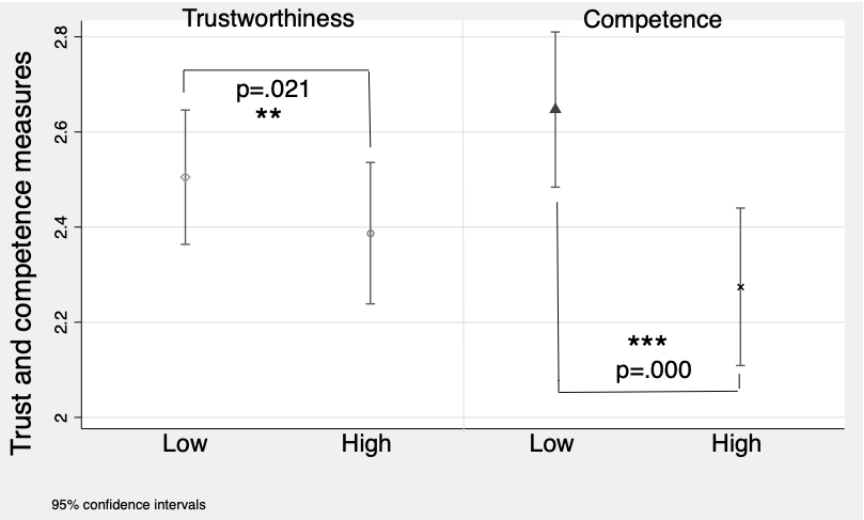
Figure 4.2 shows that the effect of low voice on the perception of trustworthiness

Figure 4.1 Trust and Competence Ratings for Male Candidates

* Error bars indicate 95% confidence intervals around the predictions calculated from conditional standard errors.

and competence maintains its importance in the case of female candidates. I found that participants find female candidates with low voice more trustworthy (mean difference=.159±.07, p-value=.021) and more competent (mean difference=.385±.07, p-value=.000) relative to a high voice female candidate.

Figure 4.2 Trust and Competence Ratings for Female Candidates



* Error bars indicate 95% confidence intervals around the predictions calculated from conditional standard errors.

Two-sample t-test results in Table 4.1 reveal in detail that both male and female candidates benefit from having low voice in terms of being perceived as more trustworthy and competent relative to their high voice opponents. The significance of the difference is higher when I look at the competence perceptions. The results indicate that the impact of having a low voice is higher for the perception of competence. Hence, voters' evaluation for competence is more sensitive to masculine

voices then for trustworthiness. Yet, voters evaluate the low voice candidates significantly higher. I also tested for the perceptions of trust and competence of candidates between male and female voters, but I did not find any significant difference. Lower-pitched voices' positive impact on their perceived trustworthiness and competence align with Anderson and Klofstad (2012); Tigue et al. (2012).

Table 4.1 Two Sample T-test Results for the Difference in Trust and Competence Ratings

	Observations	Mean (low)	Mean (high)	Difference	Std. Error	t-value	p-value
Trust/ Female Candidates	90	2.503	2.345	.159	.068	2.35	.021**
Trust/ Male Candidates	96	2.302	2.177	.125	.052	2.4	.018**
Competence/ Female Candidates	90	2.667	2.281	.385	.072	5.4	0***
Competence/ Male Candidates	96	2.406	2.212	.194	.058	3.35	.001***

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

5. ELECTABILITY

5.1 Method of Analysis

To study the electability of the candidates with lower-pitched voices, I conducted both two sample paired t-test and multivariate logistic regression analysis. For the t-test analysis, I take the participant as unit of analysis. As each participant voted for six different political statements for each of the three candidates, I calculated an average score for voting for low voice candidate for each political statement by following Laustsen, Petersen, and Klofstad (2015). Then, the average vote measure for each statement is normalized between 0 and 1 in order to treat the main dependent variable as a probability. To illustrate, for each participant, when low voice candidate states that she or he will annually spend 10,000 TL per person for education or healthcare, I assigned a probability of voting for low voice between 0 and 1. Being closer to 1 for this variable means that the participant is highly likely to vote for the low voice candidate when this candidates spends 10,000 TL for education or healthcare. Two sample t-test analysis allowed us to compare the mean probability of voting for the low voice whether there occurs any significant difference between different political statements. I conducted eight different two sample t-test to better test if candidate's gender and the political issue have an effect on the electability. T-test tables presented below represents the difference in means comparing each incremental decrease in the monetary policy of low voice candidate and also comparing the mean votes for low voice candidates when they offer 10,000 TL with his or her different policy statements.

Considering the probabilistic nature of the dependent variable, for the second analysis, I applied multivariate logistic regression to study for the effect of policy difference on the electability of the candidate with low-pitched voice. The model specification is as follows:

$$\Pr(\text{Voting for Low Voice}) = \hat{\beta}_0 + \hat{\beta}_1\,(\text{Policy Difference}) + \hat{\beta}_2\,(\text{Female Candidate}) + \hat{\beta}_3\,(\text{Policy Difference x Female Candidate}) + \hat{\beta}_4\,(\text{Healthcare}) + \hat{\beta}_5\,(\text{Healthcare x Female Candidate}) + \mu X$$

The unit of analysis to study the electability of low-pitched voices is the outcome of each comparison made by the participants. I adopted within subject design since each candidate is compared with his or her own voice but with different pitch. A vote for the candidate with low-pitched voice is coded as 1 whereas a vote for the high voice candidate is coded as 0. Therefore, the dependent variable for the analysis is the probability of voting for the low voice which ranges between 0 and 1. Considering the probabilistic nature of the dependent variable I applied multivariate logistic regression to study the effect of policy difference on the electability of the candidate with low-pitched voice.

I treated the main independent variable in two ways; first as a continuous variable and second as a categorical variable. The reason behind adding policy difference variable as a discrete variable is to better capture any vote switching behavior between male and female candidates. In addition, controlling for a continuous independent variable shows a more general impact of policy difference on the probability of voting for low voice. The discrete policy difference variable takes values 0, 200, 400, 600, 800, and 1000. The policy difference variable indicates the monetary difference in the political statements between the low- and high-pitched candidates. the second independent variable is a dummy variable for female candidates. The female candidate variable takes the value 0 if for that electoral comparison the voter compared male candidates and takes 1 if the candidates were females. To better understand the effect of policy difference's magnitude on the electability of the low-pitched voice and compare this effect between male and female candidates, I added an interaction term to the logistic regression model following Brambor, Clark, and Golder (2006*a*). The interaction of policy difference and female candidate variables is a categorical variable hence, I can be better able to differentiate the impact of low voice for male and female candidates.

Voters' gender, monthly household income level, and left-right ideology are also controlled for and represented as X variables in the above equation. Voter's gender is coded as Female Voter and it takes 0 if the voter is male and 1 if the voter is female. I add the voter's gender variable to control for any gender-related implications on the electability of low-voice candidates which may reveal any gender stereotyping difference between male and female voters. Monthly household income level is a measure between 1 and 12, 1 indicating the lowest income level which is less than

600 $ and 12 indicating the highest income level which is more than 6600 $. As I move on to the left-right ideology variable, a 0-10 scale is normalized to 0-1. 0 implies an extreme left-wing voter whereas 1 implies an extreme right-wing voter and accordingly the higher Left-Right Ideology variable is the more right-wing is the participant.

5.2 Results

I present the t-test results where two sample paired t-test results demonstrate if there is a significant change in the probability of voting for low voice when the candidate with the low voice suggests spending less money on education of healthcare than her or his opponent. The opponent is actually the manipulated higher-pitched version of the same candidate.

Table 5.1 Two Sample T-test for the Incremental Change in Votes of Low-Pitched Female Voice in Healthcare

Policy Change for Low Voice	Mean 1	Mean 2	Difference	Std. Error	t-value	p-value
from 10,000 TL to 9,800 TL	.637	.629	.008	.062	.1	.904
from 9,800 TL to 9,600 TL	.629	.629	0	.044	0	1
from 9,600 TL to 9,400 TL	.629	.599	.03	.043	.7	.479
from 9,400 TL to 9,200 TL	.599	.603	-.004	.051	-.05	.941
from 9,200 TL to 9,000 TL	.603	.492	.11	.062	1.75	.084*
Observations	46	44				

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

Table 5.2 Two Sample T-test for the Overall Change in Votes of Low-Pitched Female Voice in Healthcare

Policy Change for Low Voice	Mean 1	Mean 2	Difference	Std. Error	t-value	p-value
from 10,000 TL to 9,800 TL	.637	.629	.008	.062	.1	.904
from 10,000 TL to 9,600 TL	.637	.629	.008	.064	.1	.906
from 10,000 TL to 9,400 TL	.637	.599	.038	.065	.6	.559
from 10,000 TL to 9,200 TL	.637	.603	.034	.065	.55	.601
from 10,000 TL to 9,000 TL	.637	.492	.144	.066	2.2	.033**
Observations	44	44				

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

Table 5.1 shows the case when the participants votes only for female candidates and the policy issue is about healthcare. I present the difference in mean votes for low-pitched female voices when they are incrementally decreasing their monetary policy. Up until the point where the female candidate is suggesting spending 9,000 TL, low voice female candidates, on average, has more than .50 percent probability of winning. In consequence, this indicates that female candidates benefit from having a low-pitched voice even though they advocate for a less desirable monetary spending on healthcare policies. On this table, only the change between offering 9,200 TL and 9,000 TL significantly decreases the probability of winning the election for the female candidate with low voice. Although the advantage of having a low voice is carried out a long time for female candidates, Table 5.3 shows that voters significantly votes less for male candidates when they decrease the monetary amount spend on healthcare from 10,000 TL to 9,800 TL. Even though, the probability of voting for the low voice, on average, is greater than .50 until male candidates offer 9,200 TL. However, voters are more responsive in policy change for male candidates compared to female candidates. Tables 5.2 and 5.4 compares the difference in mean votes for low-pitched candidates offering to spend 10,000 TL in healthcare and the incrementally decreased monetary amount. Both Table 5.2 and Table 5.4 support the results obtained from Table 5.1 and 5.3.

Table 5.3 Two Sample T-test for the Incremental Change in Votes of Low-Pitched Male Voice in Healthcare

Policy Change for Low Voice	Mean 1	Mean 2	Difference	Std. Error	t-value	p-value
from 10,000 TL to 9,800 TL	.702	.517	.184	.057	3.2	.003***
from 9,800 TL to 9,600 TL	.517	.532	-.014	.044	-.3	.75
from 9,600 TL to 9,400 TL	.532	.553	-.021	.055	-.4	.701
from 9,400 TL to 9,200 TL	.553	.468	.085	.04	2.15	.038**
from 9,200 TL to 9,000 TL	.468	.408	.06	.045	1.35	.192
Observations	47	47				

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

Table 5.4 Two Sample T-test for the Overall Change in Votes of Low-Pitched Male Voice in Healthcare

Policy Change for Low Voice	Mean 1	Mean 2	Difference	Std. Error	t-value	p-value
from 10,000 TL to 9,800 TL	.702	.517	.184	.057	3.2	.003***
from 10,000 TL to 9,600 TL	.702	.532	.17	.06	2.85	.007***
from 10,000 TL to 9,400 TL	.702	.553	.149	.068	2.2	.034**
from 10,000 TL to 9,200 TL	.702	.468	.234	.062	3.75	.001***
from 10,000 TL to 9,000 TL	.702	.408	.294	.059	5	0***
Observations	47	47				

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

Table 5.5 Two Sample T-test for the Incremental Change in Votes of Low-Pitched Female Voice in Education

Policy Change for Low Voice	Mean 1	Mean 2	Difference	Std. Error	t-value	p-value
from 10,000 TL to 9,800 TL	.558	.652	-.094	.064	-1.5	.145
from 9,800 TL to 9,600 TL	.652	.602	.51	.043	1.2	.241
from 9,600 TL to 9,400 TL	.602	.584	.018	.035	.55	.602
from 9,400 TL to 9,200 TL	.584	.569	.014	.051	.3	.777
from 9,200 TL to 9,000 TL	.569	.468	.101	.066	1.55	.133
Observations	46	46				

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

Table 5.5 and Table 5.7 respectively refers the analysis with female candidates and male candidates when the policy issue is about education. For both female and male

candidates, we have a common finding where the low voice candidates from both genders have an electoral advantage. The mean votes for low voice candidates are above .50 percent up until the offer of 9,200 TL for female candidates and up until the offer 9,400 TL for male candidates. Yet even though the difference between the means suggests a decrease in voting, there is no significant decrease in the probability of voting for the low voice in female candidates whereas even a 200 TL decrease in education spending offer significantly decreases the votes received by low voice male candidates. Tables 5.6 and Table 5.8 also support these findings in an overall setting.

Table 5.6 Two Sample T-test for the Overall Change in Votes of Low-Pitched Female Voice in Education

Policy Change for Low Voice	Mean 1	Mean 2	Difference	Std. Error	t-value	p-value
from 10,000 TL to 9,800 TL	.558	.652	-.094	.064	-1.5	.145
from 10,000 TL to 9,600 TL	.568	.61	-.043	.065	-.65	.513
from 10,000 TL to 9,400 TL	.568	.592	-.025	.061	-.4	.685
from 10,000 TL to 9,200 TL	.568	.578	-.011	.065	-.15	.871
from 10,000 TL to 9,000 TL	.568	.465	.103	.064	1.6	.112
Observations	47	47				

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

Table 5.7 Two Sample T-test for the Incremental Change in Votes of Low-Pitched Male Voice in Education

Policy Change for Low Voice	Mean 1	Mean 2	Difference	Std. Error	t-value	p-value
from 10,000 TL to 9,800 TL	.68	.514	.167	.066	2.55	.015**
from 9,800 TL to 9,600 TL	.514	.528	-.014	.046	-.3	.767
from 9,600 TL to 9,400 TL	.528	.507	.021	.052	.4	.691
from 9,400 TL to 9,200 TL	.507	.452	.056	.045	1.25	.221
from 9,200 TL to 9,000 TL	.452	.476	-.024	.058	-.4	.675
Observations	48	25				

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

Table 5.8 Two Sample T-test for the Overall Change in Votes of Low-Pitched Male Voice in Education

Policy Change for Low Voice	Mean 1	Mean 2	Difference	Std. Error	t-value	p-value
from 10,000 TL to 9,800 TL	.68	.514	.167	.066	2.55	.015**
from 10,000 TL to 9,600 TL	.68	.528	.153	.065	2.35	.023**
from 10,000 TL to 9,400 TL	.68	.507	.174	.061	2.85	.007***
from 10,000 TL to 9,200 TL	.68	.452	.229	.059	3.9	.001***
from 10,000 TL to 9,000 TL	.68	.476	.205	.06	3.4	.002***
Observations	48	48				

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

The second method of analysis is the logistic regression. First, I present the regression results from the multivariate logistic regression analysis where independent variable, policy difference, is in the form of a continuous variable in Table 5.9. The standard errors are robust clustered by participants. In column 1, policy difference's effect on the probability of voting for low voice is significantly negative. Female candidate and healthcare dummy variables tell us that if the candidate with low-pitched voice is female or the policy issue is about healthcare, holding everything else on average, increases the probability of voting for low voice candidate however these effects are not significant. The female candidate and policy interaction term being positive is also not significant. Column 2 includes healthcare and female candidate interaction term. The model tells us that female candidates adopting healthcare policy do not significantly have higher chance of being elected compared to a female candidate adopting education policy or compared to a male candidate adopting healthcare policy. Other than that, policy difference continues to significantly decrease the probability of voting for low voice. In columns 3,4, and 5, I added the control variables one by one. As a result, I find that female voters, on average, vote more for the low voice candidates, in other words for the masculine voice, compared to male voters. However, this result is not significant. An increase in the monthly household income level significantly increases the probability of voting for low voice. Voters income level is then a determinant factor in voting for low voice candidate. I will talk more about this impact in the next analysis where I separately tested the findings for healthcare and education. Lastly, in column 5, a more left-wing a voter is she or he insignificantly votes more in probability for the low voice candidate.

Figure 5.1 shows the odds ratio of our results from Table 5.9 with %95 confidence intervals represented by the lines. Odds ratio means the ratio of the odds of an event occurring in one group to the odds of it occurring in another group. Hence,

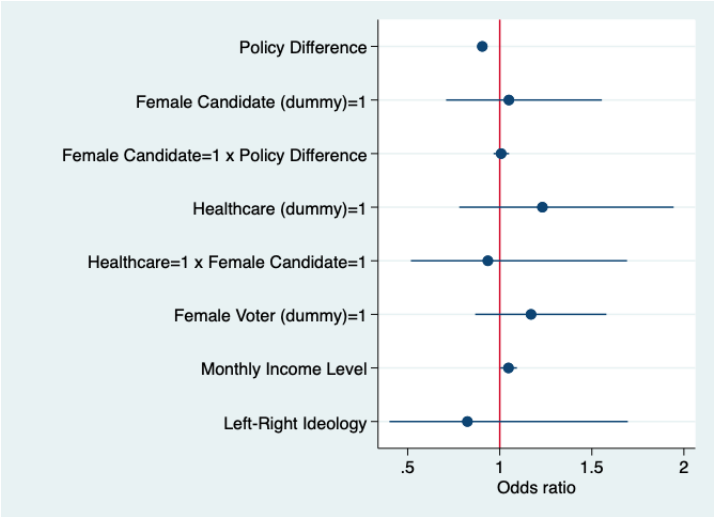
Table 5.9 Logistic Regression Results on Probability of Voting for Low Voice

Dependent Variable: Probability of Voting for Low Voice	1	2	3	4	5
Policy Difference	-0.101***	-0.101***	-0.0990***	-0.0995***	-0.0996***
	(0.0137)	(0.0137)	(0.0140)	(0.0140)	(0.0140)
Female Candidate (dummy)	0.0329	0.00462	0.0311	0.0542	0.0484
	(0.169)	(0.202)	(0.202)	(0.199)	(0.200)
Female Candidate x Policy Difference	0.0104	0.0104	0.00854	0.00851	0.00755
	(0.0208)	(0.0209)	(0.0210)	(0.0211)	(0.0213)
Healthcare (dummy)	0.0587	0.0305	0.107	0.195	0.208
	(0.149)	(0.222)	(0.225)	(0.230)	(0.233)
Healthcare x Female Candidate		0.0580	-0.0341	-0.0861	-0.0668
		(0.298)	(0.300)	(0.302)	(0.302)
Female Voter (dummy)			0.187	0.177	0.157
			(0.152)	(0.151)	(0.153)
Monthly Income Level				0.0432**	0.0462**
				(0.0216)	(0.0219)
Left-Right Ideology					-0.193
					(0.368)
Constant	0.547***	0.560***	0.474***	0.138	0.191
	(0.129)	(0.146)	(0.162)	(0.241)	(0.266)
Observations	3,330	3,330	3,294	3,294	3,276

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

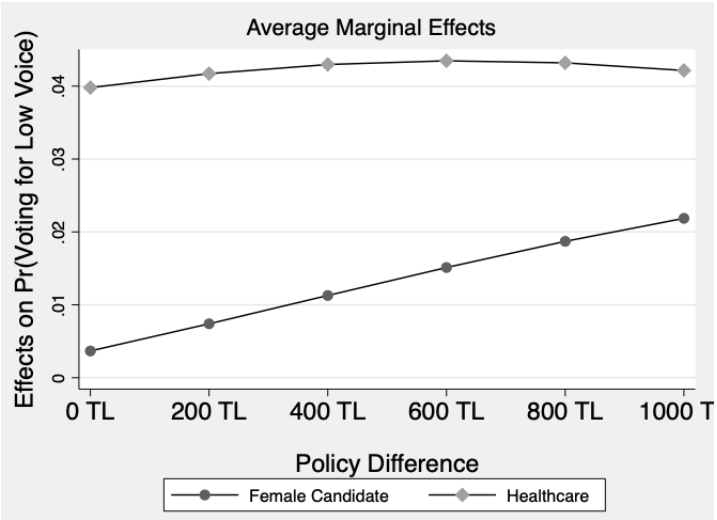
the odds on the left of vertical line on 1 represent a negative effect on the probability of voting for low voice whereas the ones on the right of vertical line on 1 represent a positive effect. I decided to present average marginal effects to better predict the results obtained from the logistic regression model with interaction terms. In Figure 5.2, the light grey curve on the above of the figure shows us the difference in the probabilities of voting for low voice between healthcare and education issues. As there is a slight increase in the probability of voting for low voice in healthcare policies compared to education policies, this difference gets smaller as the policy difference increases. The female candidate line represents the difference between male and female candidates in their probability of getting elected with respect to the change in policy difference. Hence, the dark grey line tells us that as the policy difference increases low voice female candidates' probability of getting elected gets higher than the low voice male candidates'. In Figure 5.3, I show the predicted fitted values of the votes of low voice for male, female candidates, and the overall decrease in votes with the increase in policy difference.

Figure 5.1 Logistic Regression Results with Odds Ratio and Confidence Intervals



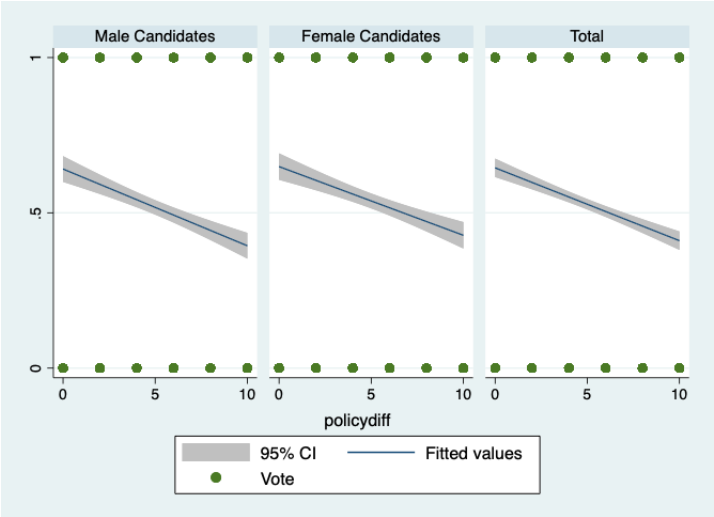
* Error bars indicate 95% confidence intervals around the predictions calculated from conditional standard errors.

Figure 5.2 Average Marginal Effects of Candidate Gender and Policy Issue on Voting for Low Voice



* Error bars indicate 95% confidence intervals around the predictions calculated from conditional standard errors.

Figure 5.3 Fitted Predictions for Voting for Low Voice



* Error bars indicate 95% confidence intervals around the predictions calculated from conditional standard errors.

Second, I decided to analyze the experimental subgroups case by case as it is shown in Table 5.10. I adopted univariate logistic regression, clustered standard errors by participants, with the following logistic regression equation;

$$\Pr\ (\text{Voting for Low Voice})_{i,j} = \beta_0 + \beta_1\ (\text{Policy Difference})_{i,j}$$

where i stands for the candidates' gender, male or female, and j stands for the policy issue, either education or healthcare. Policy difference is a categorical variable hence, I can be better able to detect if there is any switching effect of policy difference on the voting for low voice to high voice.

Other than the second column where I checked for the effect of policy difference on the probability of voting for low voice female candidates speaking for education, there is a gradual decreasing effect of policy difference on the probability of voting for low voice. To continue case by case, first, begin with the first column where the dependent variable is the probability of voting for the male candidates with low-pitched voices speaking for education. Here, the results show that there is a decrease in the probability of getting elected for the low voice caused by an increase in the policy difference. Moreover, significant decrease in the probability of voting for low-pitched male voices occurs in each incremental decrease in the monetary policy in education offered by the low-pitched. When I compare this result with the second column where the increasing policy difference only enhances the probability of voting for female candidates with low-pitched voices until the difference equals to 600 TL, I can claim that advocating for a less desirable monetary policy than her high-pitched opponent does not significantly change the probability of getting elected for the low

voice female candidate up until the point where the difference is 1000 TL. Whereas, an increased difference in high-pitched and low-pitched male candidates' spending on education have a significant negative impact on the probability of getting elected for the low voice male candidates.

Columns three and four in Table 5.10, respectively show the impact of policy difference between low-pitched and high-pitched candidates on the probability of voting for the low voice when the political statements are about healthcare. I see a negative effect on the electability of both male and female candidates with a low voice as the monetary difference between the policies of high-pitched and low-pitched candidates grow. Although this decrease in the probability of being elected is significant for male candidates on the point where the monetary difference is equal to 200 TL, I do not observe a significant negative impact for female candidates up until the policy difference is equal to 600 TL. Hence for healthcare statements, voters are less responsive to less desirable monetary policies when they are voting for female candidates compared to voting for male candidates. So, the advantage of having a low voice on the probability of getting elected lasts longer for female candidates.

Comparing columns 1 to 3 and 2 to 4, within candidates' gender, I claim that voters are more responsive to switch for the high-pitched voices when the low voice states spending a less desirable amount on both education and healthcare. Although, voters respond earlier to policy difference when they are comparing female candidates in healthcare relative to female candidates in education.

Table 5.10 Logistic Regression Results on Probability of Voting for Low Voice by Randomized Subgroups

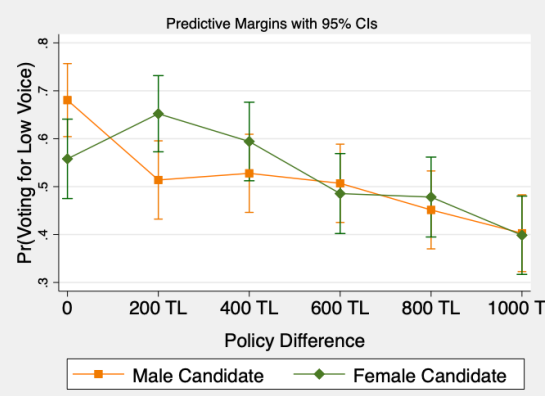
Dependent Variable:	(Education)	(Education)	(Healthcare)	(Healthcare)
Probability of Voting for Low Voice	Male Candidate	Female Candidate	Male Candidate	Female Candidate
Policy Difference = 200 TL	-0.701**	0.396	-0.786***	-0.0326
	(0.280)	(0.270)	(0.241)	(0.270)
Policy Difference = 400 TL	-0.645**	0.148	-0.730***	-0.0326
	(0.277)	(0.273)	(0.253)	(0.274)
Policy Difference = 600 TL	-0.729***	-0.291	-0.644**	-0.560**
	(0.259)	(0.236)	(0.288)	(0.268)
Policy Difference = 800 TL	-0.951***	-0.320	-0.985***	-0.590**
	(0.252)	(0.251)	(0.266)	(0.262)
Policy Difference = 1000 TL	-1.150***	-0.644***	-1.456***	-0.927***
	(0.239)	(0.247)	(0.256)	(0.271)
Constant	0.756***	0.233	0.857***	0.560**
	(0.193)	(0.188)	(0.189)	(0.224)
Observations	864	828	846	792

Robust standard errors in parentheses

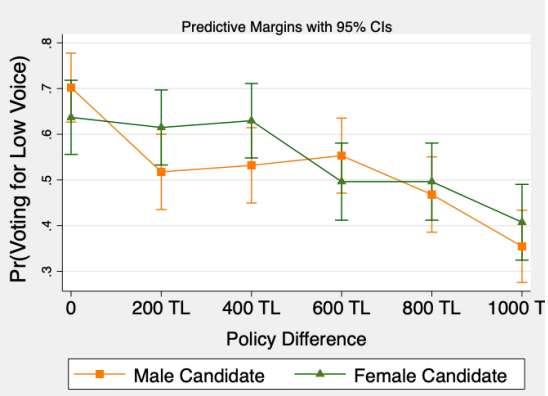
*** p<0.01, ** p<0.05, * p<0.1

Figure 5.4 Marginal Effect of Policy Differences Between Male and Female Candidates

(a) Education



(b) Healthcare



* Error bars indicate 95% confidence intervals around the predictions calculated from conditional standard errors.

In Figure 5.4, I present the marginal effects of policy differences on the probability of voting when the running candidate is female and male. Predictive margins are clustered with a 95% confidence interval. Subfigure 5.4a shows the marginal effect of policy difference in the case when the candidates adopted education in their political statements and subfigure 5.4b shows when the political statements are about healthcare government spending. Comparing female candidates to the male candidates, voters are more responsive to a smaller amount of monetary change when the candidate is male rather than a female candidate.

During the survey, respondents answered some demographic and political questions. I decided to include some of them in the multivariate logistic regression model to better understand any voter characteristics that may have an impact on voting for the low-pitched voice. The results are presented in Table 5.11 where the first two columns echo the results in Table 5.10 by integrating a female candidate dummy variable. Focusing on columns 3 and 4, I can see if voter's birth sex has an effect on the probability of voting for the low voice. The female voter variable is a dummy variable taking value 1 if the voter is female and 0 if the voter is male. Although both columns have positive coefficients, female voters do not significantly increase the probability of voting for low voice when they account for government spending on healthcare compared to male voters, Figure 5.5b. Moreover, voter's sex does not have any significant increasing effect on the probability of voting for low voice in education, Figure 5.5a. So, I claim that voter's sex does not create any significant bias against voting for low voice candidates.

Columns 5 and 6 include a discrete income level variable which ranges between 1 to

12, 1 being the lowest level. The results are intuitive as monthly household income level does not have any significant positive impact on the probability of voting for low voice when the policy issue is about healthcare. However, when voters evaluate the government's spending on education, column 6, an increase in voters' income level increases the probability of voting for low voice. Here, I conclude that voters' income level becomes a determinant factor in the increase of voting for low voice probability in education policies, Figure 5.6, compared to healthcare policies.

The left-right ideology positions of voters are added as another control variable to the multivariate regression model in columns 7 and 8. This variable takes values between 0 and 1, 0 representing an extreme leftist voter. Hence investigating the coefficient of Left-Right ideology variable on column 7 shows us positive impact of ideology on the probability of voting for low voice. This means that the more right-wing a voter is the more they vote for the candidate with low voice in healthcare. However, this result is not statistically significant. Interestingly, the direction of the ideology coefficient changes when voters evaluate education policies. In column 8, the ideology coefficient shows that the more right-wing a voter is the probability of voting for low voice decreases. Voter's monthly household income level variable maintain its significance levels and the direction of their coefficients do not change in columns 7 and 8. Thus, the ideology variable in columns 7 and 8 demonstrates the importance of low voice on the probability of voting for low voice by the change in ideology. Right-wing voters are more responsive to low-pitched voices relative to left-wing voters when the policy proposal is about healthcare whereas left-wing voters are more responsive to low-pitched voices in policies about education. Unfortunately, this intuition behind the direction of coefficients is not supported by statistical significance.

In all columns, policy difference in all levels have a significantly negative effect on the probability of voting for low voice. And the interaction terms leads us to interpret the coefficient parallel to what I presented in t-test tables and Table 5.10. Female candidates benefit from the advantages of having a low-pitched voice more than male candidates, since their probability of getting elected, holding everything else constant, is relatively higher than male candidates when they advocate for a less desirable monetary policy.

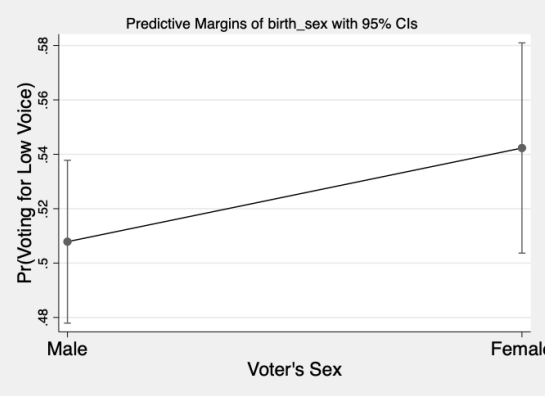
Table 5.11 Logistic Regression Results on Probability of Voting for Low Voice

Dependent Variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Probability of Voting for Low Voice	Healthcare	Education	Healthcare	Education	Healthcare	Education	Healthcare	Education
Policy Difference= 200 TL	-0.786***	-0.701**	-0.668***	-0.702**	-0.668***	-0.715**	-0.669***	-0.720**
	(0.240)	(0.278)	(0.235)	(0.279)	(0.235)	(0.284)	(0.235)	(0.286)
Policy Difference= 400 TL	-0.730***	-0.645**	-0.608**	-0.646**	-0.608**	-0.659**	-0.609**	-0.662**
	(0.252)	(0.275)	(0.247)	(0.276)	(0.247)	(0.281)	(0.247)	(0.283)
Policy Difference= 600 TL	-0.644**	-0.729***	-0.518*	-0.729***	-0.518*	-0.744***	-0.518*	-0.748***
	(0.287)	(0.257)	(0.286)	(0.258)	(0.286)	(0.263)	(0.286)	(0.265)
Policy Difference= 800 TL	-0.985***	-0.951***	-0.877***	-0.953***	-0.877***	-0.972***	-0.877***	-0.977***
	(0.264)	(0.251)	(0.261)	(0.251)	(0.261)	(0.256)	(0.262)	(0.259)
Policy Difference= 1000 TL	-1.456***	-1.150***	-1.397***	-1.152***	-1.396***	-1.175***	-1.397***	-1.181***
	(0.255)	(0.238)	(0.261)	(0.238)	(0.261)	(0.241)	(0.261)	(0.242)
Female Candidate (dummy)	-0.298	-0.523*	-0.284	-0.511*	-0.288	-0.482*	-0.300	-0.492*
	(0.291)	(0.268)	(0.296)	(0.269)	(0.297)	(0.279)	(0.300)	(0.284)
Policy Difference= 200 TL x Female Candidate	0.754**	1.096***	0.636*	1.098***	0.636*	1.118***	0.636*	1.132***
	(0.360)	(0.387)	(0.357)	(0.387)	(0.357)	(0.391)	(0.357)	(0.398)
Policy Difference= 400 TL x Female Candidate	0.697*	0.794**	0.576	0.794**	0.576	0.810**	0.576	0.817**
	(0.371)	(0.387)	(0.368)	(0.387)	(0.368)	(0.393)	(0.369)	(0.399)
Policy Difference= 600 TL x Female Candidate	0.0843	0.438	-0.0439	0.438	-0.0441	0.448	-0.0444	0.445
	(0.392)	(0.348)	(0.392)	(0.349)	(0.392)	(0.354)	(0.392)	(0.360)
Policy Difference= 800 TL x Female Candidate	0.395	0.631*	0.285	0.632*	0.285	0.646*	0.285	0.643*
	(0.371)	(0.354)	(0.369)	(0.355)	(0.370)	(0.360)	(0.370)	(0.366)
Policy Difference= 1000 TL x Female Candidate	0.529	0.506	0.466	0.506	0.466	0.519	0.466	0.508
	(0.371)	(0.342)	(0.376)	(0.343)	(0.376)	(0.347)	(0.376)	(0.353)
Female Voter (dummy)			0.238	0.142	0.237	0.115	0.246	0.0433
			(0.239)	(0.195)	(0.239)	(0.189)	(0.237)	(0.191)
Monthly Income Level					0.00621	0.0763***	0.00301	0.0836***
					(0.0334)	(0.0275)	(0.0338)	(0.0283)
Left-Right Ideology							0.282	-0.599
							(0.596)	(0.449)
Constant	0.857***	0.756***	0.748***	0.698***	0.711**	0.118	0.617*	0.304
	(0.188)	(0.192)	(0.213)	(0.202)	(0.297)	(0.297)	(0.365)	(0.340)
Observations	1,638	1,692	1,602	1,692	1,602	1,692	1,602	1,674

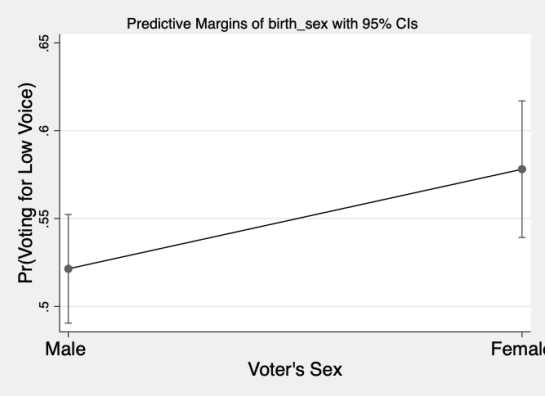
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 5.5 Marginal Effect of Voter's Sex on the Probability of Voting for Low Voice

(a) Education



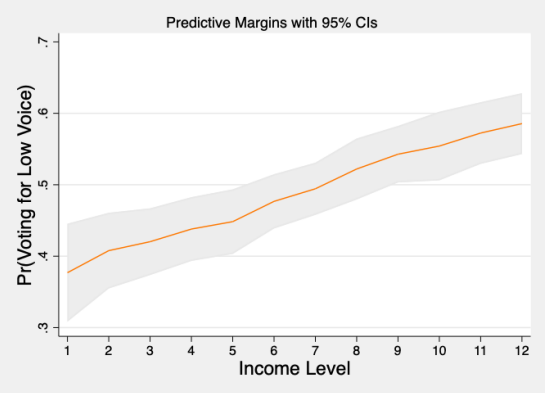
(b) Healthcare



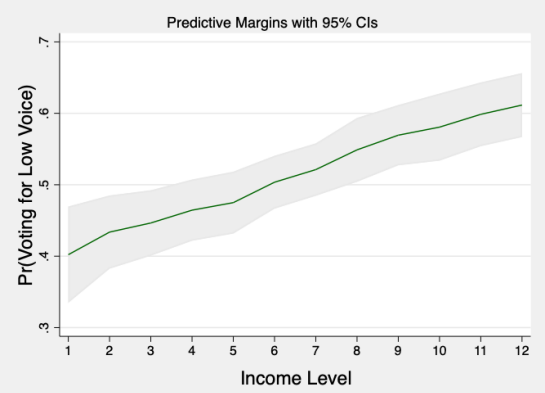
* Error bars indicate 95% confidence intervals around the predictions calculated from conditional standard errors.

Figure 5.6 Marginal Effect of Voter's Income Level on the Probability of Voting for Low Voice in Education

(a) Male Candidate



(b) Female Candidate



* Light grey areas indicate 95% confidence intervals around the predictions calculated from conditional standard errors.

6. CONCLUSION

Past literature demonstrated the political benefits of having a low-pitched voice both empirically and experimentally (Anderson and Klofstad 2012; Klofstad 2017; Laustsen, Petersen, and Klofstad 2015; Tigue et al. 2012). This study contributes to the voice pitch bias literature by integrating voice pitch manipulation and candidates' policy stance. Moreover, the results obtained from the baseline model for the candidates' comparison and voters' perception of trustworthiness and competence strengthen the literature which lacks to integrate the trade-off between low-pitched voice and policy stance.

Low voice, a physiological characteristic, sounds more masculine (Feinberg, Jones, DeBruine, Moore, Law Smith, Cornwell, Tiddeman, Boothroyd, and Perrett 2005; Feinberg et al. 2008; Jones et al. 2010). As previous research shows, voters perceive the candidates with a low-pitched voice more trustworthy and more competent (Klofstad, Anderson, and Nowicki 2015; O'Connor and Barclay 2017; Puts et al. 2007). Here, I find that trustworthiness and competence perceptions are significantly higher for both female and male candidates with a low voice. However, this effect is stronger for the perception of competence. Hence, masculine voices,i.e. low voices, are perceived as more trustworthy and more competent. In a political and electoral environment, both trust and competence characteristics play determinant roles in increasing the probability of being elected. In parallel with this intuition, the electability of the candidates with low voices is higher compared to an opponent with a high voice (Klofstad and Anderson 2018; Pavela Banai, Banai, and Bovan 2017; Searles et al. 2017; Tigue et al. 2012).

This thesis studies the effect of policy stance on the electability of candidates with low-pitched voices under two political issues; education and healthcare. Multivariate logistic regression results show that voters significantly switch voting from the low-pitched candidate to the high-pitched candidate as the low-pitched candidate incrementally offers to lower his or her expenditures on basic public services. The effect of policy difference on the decrease in the probability of voting for low voice maintains its importance and significance in both education and healthcare issues

and also when the candidate is female or male. Even though there is a decrease in their probabilities of winning the election, for a long period, low voice candidates still received more than .50% of the votes on average. However, what I found is that voters are more responsive to a small incremental decrease in the monetary policy of low voice male candidates compared to low voice female candidates. Female candidates, both in education and healthcare issues, benefit from their low-pitched voice characteristics longer than male candidates. Also, the findings show that voters' gender does not create any significant discrimination between voting for low voice female or male candidate. Hence, I claim that both female and male voters prefer more masculine voices in both education and healthcare policies, similar to the findings of Tigue et al. (2012). This study differs from the findings of Klofstad, Anderson, and Peters (2012) since their findings suggested that male voters prefer low voice male candidates.

Voters' monthly household income level significantly increases votes for low voice in education policies however this increase is negligible in healthcare policies. I assert that this difference in the preference for low voice by policy issue comes from the survey sample from a private university and the effect of the current global pandemic, Covid-19. Since the findings and the literature suggest that voters perceive low voices as more masculine and more competent, asking for a more stable and well-functioning education system in Turkey can be one of the underlining reasons why the voters with more monthly household income significantly vote more for the low voice candidate, i.e. more masculine and hence more competent and trustworthy. Hence, in our sample, as the participants' monthly household income level increases, they pay less attention on the differences in the monetary policy and more attention to the personal characteristics of the candidates. On the other hand, the healthcare system in Turkey provides public services in a stabilized system to citizens. However, due to the Covid-19 pandemic, health policies become more and more important hence, any monetary decrease in healthcare spending may lessen the votes received by the low voice candidate. Overall, I believe this thesis has real-life implications especially on increasing the probability of being elected by lowering the candidate's voice pitch, especially the electability of female candidates. Since women have naturally more high-pitched voice range than men, women can be in a disadvantageous position when running with a male opponent.

This study had some limitations. First of all, the sample included mainly undergraduate students which caused to lessen variation in some voter characteristics such as age and education. Future research should include a more representative data that allows controlling for a variety of voter characteristics. In future research, the sample should be larger to increase the external validity of the study. The survey

included only two policy issues, education, and healthcare which are mostly associated with women (Searles et al. 2017). Hence adding more variety of policy issues can help distinguish the impact of policy differences on the electability of low voice candidates on issues such as military, foreign policy, and economics. Lastly, I believe this study lacks to take into account a more comparative analysis of voter behavior. Experimenting in different countries will give us a broader perspective about the implications.

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APPENDIX A

Sabancı University's Approval

Figure A.1 Ethics Committee Approvals for the Study

Sabancı Üniversitesi

Sabancı University Research Ethics Council (SUREC)

Date: February, 2020

To: Prof. Özgür Kıbrıs / Principal Investigator; Aslı Ceren Çınar / MA Student C-Investigator
From: Prof. Mehmet Yıldız, Chair of the Research Ethics Committee

Protocol Number: FASS-2020-08
Protocol Name: Modulation of the Effect of Lower-Voice Pitch in Female Candidates

Subject: SUREC Approval
Official Approval Date: April 7th, 2020

Sabancı University Research Ethics Council has approved the above named and numbered protocol through expedited review. You are responsible for promptly reporting to the SUREC:

- any severe adverse effects
- any unanticipated problems involving risks to subjects or others;
- any proposed changes in the research activity

Enclosed you can find the below noted approved documents.

☒ Protocol Application

☒ Informed Consent Form

If you have any questions please feel free to contact me via phone at 216-483 9010 or via e-mail at meyildiz@sabanciuniv.edu

Best Regards,

Prof. Mehmet Yıldız
Chair of the Ethics Committee

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FRG-A410-01-03

For SUREC Use Only	
Protocol No: FASS-2020-08	Approval Date: April 7th, 2020
Modification Requested Date:	Modification Approval Date:

Title: Modulation of the Effect of Lower-Voice Pitch in Female Candidates
Principal Investigator: Prof. Özgür Kıbrıs
Co-Investigator: Aslı Ceren Çınar

THIS SPACE FOR SUREC USE ONLY

☐ The protocol has been determined to be exempt from SUREC review in accordance with Sabancı University Research Ethics Council procedure.
☒ The protocol has been approved through expedited review in accordance with Sabancı University Research Ethics Council procedure.
☐ The Institutional Review Board has been approved the protocol through full review review in accordance with Sabancı University Research Ethics Council procedure.

APPROVED BY THE SABANCI UNIVERSITY RESEARCH ETHICS COUNCIL

Prof. Mehmet Yıldız
SUREC Chair

Prof. Arzu S. Wasti
SUREC Member

Assist. Prof.Asuman Büyükcan Tetik
SUREC Member

Prof. Cengiz Kaya
SUREC Member

Assist. Prof. Nedim Nomer
SUREC Member

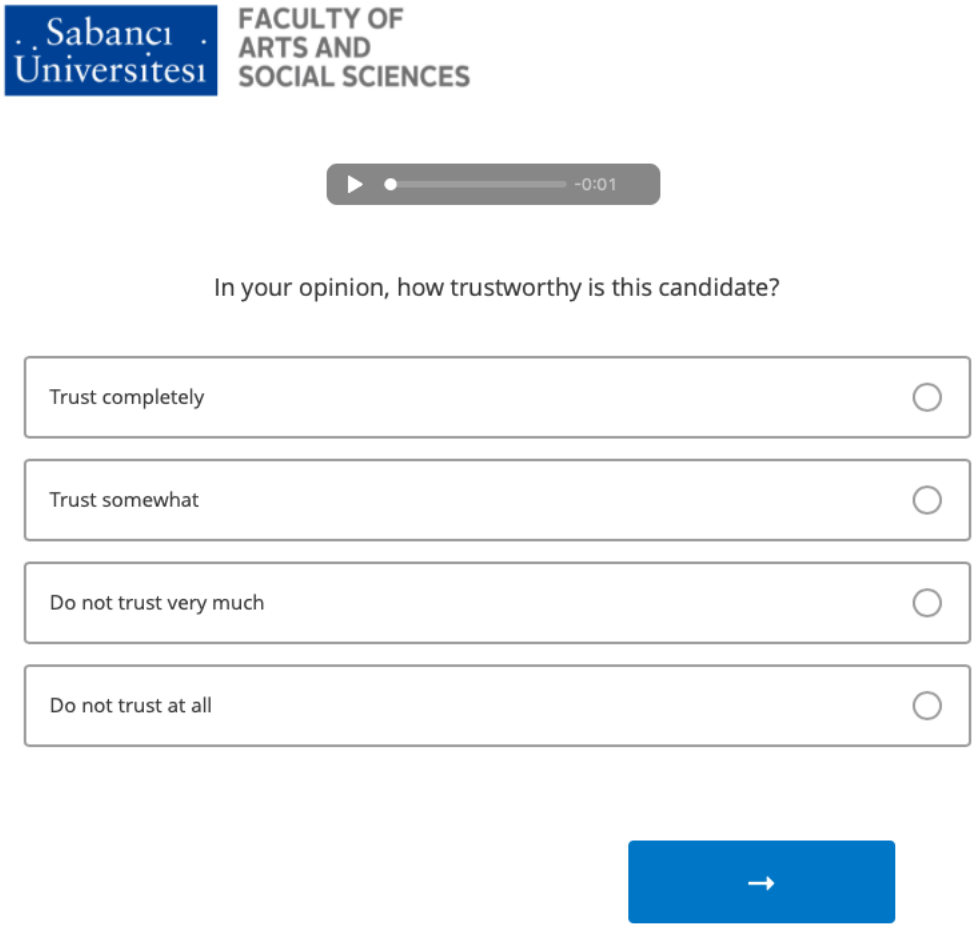
Assist. Prof. Ogün Adebali
SUREC Member

Prof. Zafer Gedik
SUREC Member

FRG-A410-01-03

APPENDIX B

Survey Questions including Voice Recordings



Sabancı Üniversitesi FACULTY OF ARTS AND SOCIAL SCIENCES

In your opinion, how competent is this candidate?

- Completely competent
- Somewhat competent
- Not very much competent
- Not competent at all

→

Sabancı Üniversitesi FACULTY OF ARTS AND SOCIAL SCIENCES

Please listen to the audio recordings of the following candidates. If these two candidates were running against each other, who would you vote for?

→

Survey Questions including Demographics

Please mark the appropriate answers to all questions below:

What is your year of birth?

__

What sex were you assigned at birth?

__ Male
__ Female
__ Intersex
__ Don't know
__ Prefer not to answer

How would you describe your current gender identity?

__ Man
__ Woman
__ Trans
__ GenderQueer
__ Other
__ Prefer not to answer
__ Don't know

What is the highest educational level that you have attained?
__No formal education
__Primary school
__High school
__ Associate degree in college (2-year)
__Undergraduate degree in college (4-year)
__Student in an undergraduate program (4-year)
__Graduate degree
__Student in a graduate program

If you consider the past six months, salary, rent, pension, etc. of all family members, considering their income, the average total monthly household income is closest to

which of the following groups?
__Less than 1000 TL
__1000 TL - 2999 TL
__3000 TL - 4999 TL
__5000 TL - 6999 TL
__7000 TL - 8999 TL
__9000 TL - 10 999 TL
__11 000 TL - 12 999 TL
__13 000 TL - 14 999 TL
__15 000 TL - 16 999 TL
__17 000 TL - 18 999 TL
__19 000 TL - 20 999 TL
__More than 21 000 TL

Did you vote in the last election?
__Yes
__No

We often hear that "right" and "left" are mentioned in political matters. Below is a scale consisting of 10 points, with '1' on the far left of the score and '10' on the right. Where would you place yourself on this scale?
__

Generally speaking, would you say that "Most people can be trusted" or "that you must be very careful in dealing with people"?
__Most people can be trusted
__I must be very careful in dealing with people

In general, do you think men or women in elected office are better at handling issues with regard to education?
__Men
__Women
__No difference

How satisfied are you with the education system in Turkey?
__Extremely satisfied

__Somewhat satisfied
__Neither satisfied nor dissatisfied
__Somewhat dissatisfied
__Extremely dissatisfied

How important is it for the state to provide education to the public? Can you answer according to this ruler, which means "0" is not important at all and "10" is absolutely important?

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Finally, when completing this questionnaire, with which tool did you listen to the voice recordings?
___ Headphone
___ Speakers