

The tradeoffs of using female suicide bombers

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Abstract

Why are there so few female suicide bombers despite their tactical effectiveness? To explain the rarity of this phenomenon, I examine the tradeoffs that armed groups face when using female suicide bombers. While rigid gender norms make female bombers more effective because security personnel are less suspicious of them, gender inequality also drives down the demand for female suicide bombers. I posit that the tradeoffs of using female bombers induce a curvilinear relationship between women's status and the prevalence of female suicide bombers. Specifically, I argue that female bombers will be more common in countries with middling levels of gender equality than in highly equal or unequal societies. Using data on over 5,500 suicide attacks, from 1974 to 2016, I find support for this hypothesis.

Keywords

Civil war, gender and conflict, suicide terrorism, terrorism

Female suicide bombers serve as a valuable asset for terrorist organizations, providing unique tactical advantages (Cunningham, 2003, 2007; Bloom, 2005, 2007, 2011). Female suicide bombers more effectively avoid the suspicion of security personnel, enabling them to more easily reach their targets (Bloom, 2005, 2007, 2011; Cunningham, 2003, 2007; Schweitzer, 2000). Indeed, empirical evidence shows that female suicide bombers are more lethal than their male counterparts (Alakoc, 2018; O'Rourke, 2009; Thomas, 2019).¹

Female suicide bombers also provide a useful propaganda tool for groups (Bloom, 2005, 2007, 2011; Davis, 2013; Hasso, 2005). Attacks perpetrated by female bombers garner significant media attention, shocking many in the general public because they challenge gender stereotypes about men's and women's roles in violent conflict (Bloom, 2005, 2007, 2011; Davis, 2013; Hasso, 2005; Von Knop, 2013). Armed groups utilize this increased media attention to recruit more members (Bloom, 2005, 2007, 2011; Hasso, 2005), distinguish themselves from other armed groups (Davis, 2013; Speckhard, 2008) and increase public support and sympathy for their cause (Davis, 2013). Female perpetrators have carried out deadly and highly publicized suicide attacks across the world, including in Israel and the

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Palestinian Occupied Territories, Nigeria, Russia, Sri Lanka, Turkey, and Iraq (Bloom, 2005, 2007, 2011; Bloom and Matfess, 2016; Cunningham, 2003, 2007; Davis, 2013; Rajan, 2011; Speckhard, 2008; Von Knop, 2013).

Thus, female bombers are more effective at evading security personnel, are more lethal, and receive greater media attention than their male counterparts. However, despite these numerous benefits, data from the Chicago Project on Security and Threats-Suicide Attack Database (CPOST-SAD) reveal that only approximately 5% of all suicide attacks involved a female bomber. This in contrast to the 35–40% of armed groups that incorporated women into combat roles more generally (Henshaw, 2016a, b; Wood and Thomas, 2017). The rarity of female suicide bombers presents an interesting puzzle: why do so few groups employ female suicide bombers, despite their tactical effectiveness? To address this puzzle, I argue that armed groups face tradeoffs when deciding whether to use female suicide bombers.

Specifically, there is a tradeoff between the tactical effectiveness of female bombers, the supply of high quality recruits, and the reputational costs of using them. This tradeoff is rooted in the overall status of women in the society of the attack. Female bombers are more effective in less gender egalitarian societies where security forces are more susceptible to gender stereotypes, causing them to take the threat less seriously (Thomas, 2019). However, armed groups with conservative supporters face backlash for expanding the role of women in their organizations (O'Rourke, 2009). Militant groups are sensitive to gender norms in broader society, and modify their behavior to avoid backlash from the public beyond their direct constituents (Huber, 2019). Thus, armed groups face more backlash from their supporters for using female suicide bombers in less gender egalitarian societies.

Additionally, armed groups view women with greater autonomy and resources as more attractive recruits (Thomas and Wood, 2018). Thus, while security personnel stop female bombers less in unequal societies, female bombers are not as adequately equipped to succeed as those in more egalitarian countries.

Based on these premises, I expect that female suicide bombers will be most common in countries with middling levels of gender equality. In countries with low levels of women's status, security forces will be the least likely to stop female bombers, but armed groups avoid using them out of fear of facing significant resistance from their supporters. The supply of female bombers is also less attractive to militant groups. At the highest levels of gender equality, armed groups face less resistance to using female bombers, and will have a higher quality recruitment pool. Conversely, gender equality undermines the tactical benefits, as security personnel will better overcome gender stereotypes to adapt to the threat of female suicide terrorism. However, in countries with moderate levels of gender equality, female bombers provide a fairly strong tactical advantage, possess more personal resources for success, and pose less risk of reputational costs.

I test this argument, using data from CPOST-SAD on over 5,500 suicide attacks from 1974 to 2016, and find strong support for a nonlinear relationship between women's status and the prevalence of female suicide bombers. The probability that a suicide attack involves a female bomber is greater at middling levels of gender equality than it is at the highest or lowest levels. However, I find that certain aspects of women's status matter more than others.

Previous work finds a positive linear relationship between women's status and the incorporation of women into combat roles in rebel groups (Thomas and Wood, 2018), as well as the overall prevalence of female suicide bombers (Jahanbani and Willis, 2019). Thus, my findings help shed light on a more complex relationship between gender equality and the

tradeoffs groups face when using female bombers. This paper also contributes to a growing body of quantitative literature on women's participation in political violence (Alakoc, 2018; Choi, 2019; Dalton and Asal, 2011; Henshaw, 2016a, 2016b; Jahanbani and Willis, 2019; Thomas and Bond, 2015; Thomas and Wood, 2018; Wood and Thomas, 2017).

The tactical advantages of female suicide bombers

Suicide attacks are more lethal than other forms of terrorism, receive significant media attention, and signal the resolve of perpetrating groups (Atran, 2003; Hoffman and McCormick, 2004; Pape, 2006). Thus, even though militant organizations typically suffer from power asymmetries between themselves and governments, suicide terrorism serves as a signal of strength that facilitates mobilizing supporters and coercing governments into making concessions (Hoffman and McCormick, 2004).

Armed groups also build emotionally charged narratives around the martyrdom of suicide bombers, portraying the perpetrators as heroes, demonizing enemies, and mobilizing supporters from around the world (Hafez, 2007). Acosta (2016a) argues that suicide terrorism enables groups to live longer because it helps mobilize and maintain supporters, and identify ideologically similar groups to connect with. Despite these advantages, groups that use suicide terrorism are less successful than other armed movements because they tend to face greater public backlash and harsh counterterrorism campaigns (e.g. Abrahms, 2010; Acosta, 2014; Cronin, 2009).

Female bombers amplify many of the advantages of suicide terrorism. Indeed, female bombers represent a tactical innovation for groups trying to adapt to security crackdowns by governments (Cunningham, 2003). Women's ability to hide weapons under their clothing and pass by security forces without arousing much suspicion is particularly beneficial in the face of a security crackdown by the government (Bloom, 2005, 2007, 2011; Cunningham, 2003; Schweitzer, 2000). Bloom (2011) argues that women surpass security checkpoints more easily because existing gender stereotypes drive security personnel to construct a profile in which a potential attacker is necessarily male. Bloom further posits that traditional clothing in the Middle East and South Asia allows women to better conceal weapons than men. These person-borne improvised explosive devices help female attackers get into more confined spaces, such as buses and restaurants, making suicide attacks more effective.

Such tactical innovations occurred in Palestine, where multiple groups turned to women to carry out suicide attacks because male members could no longer get through security checkpoints (Cunningham, 2007; Speckhard, 2008). Nacos (2005) argues that the stereotypical ways in which the media reports on female suicide bombers enhance these tactical advantages by perpetuating the stereotype that female terrorists do not pose a threat. Consequently, female bombers perpetrate more lethal attacks than their male counterparts (Alakoc, 2018; O'Rourke, 2009; Thomas, 2019). More generally, groups succeed more often when they use female combatants (Braithwaite and Ruiz, 2018), and informal social networks of women make militant groups more resilient to military crackdowns (Parkinson, 2013). Thus, female suicide bombers help groups overcome power asymmetries.

Thomas (2019) argues that while these stereotypes make female suicide bombers a threat across all societies, lower levels of gender egalitarianism exacerbate the problem as security forces in these places view women as less of a threat, and thus, do not adequately adapt. Thomas finds that the lethality of female bombers, relative to male bombers, declines as

women's status increases, showing that gender inequality enhances the effectiveness of female bombers. Thus, groups operating in less gender egalitarian countries have greater incentive to use female bombers for tactical purposes.

Members of government security forces hold hypermasculine views on gender that are much different from those of the rest of society (Ducanson, 2009; Higate, 2007; Kronsell, 2006). Related literature suggests that individuals with rigid gender beliefs disproportionately select into government security forces and that the socialization process in these institutions instills hypermasculine norms. Thus, security forces in general might be less likely to view women as potential security threats than other members of society, making female bombers effective in all contexts. However, I still expect variation between security forces of different countries based on prevailing gender norms, as beliefs about gender form from a young age (Bian et al., 2017) and vary widely across societies.

The reputational costs of female suicide bombers

Terrorist organizations are sensitive to public opinion, and thus, tailor their actions based on the attitudes of civilians (Huber, 2019; Nemeth, 2010; Polo and Gleditsch, 2016; Weinstein, 2007). The reaction of the public is particularly relevant for suicide terrorism. Acosta (2014) argues that while suicide attacks bring militant groups various benefits, including the strengthening of constituent and external support, and creation of alliances, frequent use of the tactic intensifies enemy resolve through strengthening civilian opposition to the perpetrators, and brings about harsh government-led counterterrorism campaigns. Similarly, while groups increase their tactical advantages by employing female suicide bombers, they may also face backlash for using such a tactic. Groups also consider the reactions of members, constituencies, the civilian opposition, governments, and international actors.² I discuss the importance of these audiences below.

O'Rourke (2009) finds that armed groups with secular ideologies more frequently employ female suicide bombers and tend to use them from the outset of campaigns, while religious groups use them less often and do so later in conflicts. O'Rourke attributes this to religious groups attempting to avoid backlash from their constituents, who often oppose the expansion of women's roles. She notes that religious groups still promote traditional gender norms when using female bombers in order to prevent loss of support. Cunningham (2003) argues that terrorist organizations intentionally inflate or deflate the public attention to female members based on strategic considerations.

Huber (2019) argues that armed groups also consider potential reactions of government supporters, and thus, avoid targeting civilians in countries with higher levels of gender equality because of strong norms against attacking civilians in these places. She grounds this argument in the need for groups to impose high costs on governments, while incurring as few costs as possible. Thus, groups avoid using female bombers in less egalitarian countries because the general public would also react negatively. Participation in combat roles has given women higher prestige in many conflicts (Coulter, 2008; Kampwirth, 2002; Viterna, 2013), and thus, civilian populations with more rigid gender beliefs will be likely to oppose integrating women into combat roles. As in Huber's theory, if groups need civilians to pressure their governments into making concessions, they need to try to avoid alienating civilians further.

Relatedly, scholars argue that some individuals turn to suicide bombing as an avenue for empowerment. Victor (2003) argues that women become suicide bombers to challenge repressive gender roles that have brought them personal trauma. Thus, one might expect that in societies where women are more oppressed, there will be a higher rate of female suicide bombers because women turn to suicide terrorism as an avenue for empowerment. However, if suicide bombing really is a pathway to liberation, then men, especially in repressive societies, will be likely to block women from such action. Thus, the group demand for female bombers should be lower in these societies. MacKenzie (2009) argues that female soldiers who participated in the civil war in Sierra Leone were encouraged to return to their traditional pre-war roles following the end of the conflict, preventing them from challenging prevailing gender norms. Similarly, women might be barred from participating in suicide terrorism in order to prevent other women from gaining any sense of empowerment. Thus, female suicide bombers should be more common in societies in which women already have more power because men will be less likely to fear challenges to prevailing gender norms.

Additionally, terrorist groups make strategic calculations based on how they believe governments will respond to their use of terrorism (Huber, 2019; Stanton, 2013). Thus, if groups need concessions from governments that view the use of women as illegitimate, they have less incentive to recruit female cadres. However, the presence of female combatants sometimes increases public perceptions of the legitimacy of the group. Manekin and Wood (2020) argue that audiences view these organizations as more legitimate, in part because they view female combatants as having more altruistic motives. Similarly, Davis (2013) argues that female suicide bombers increase public perceptions of groups' legitimacy. Loken (2019) argues that militant groups present images of armed mothers to legitimize their use of violence in response to upheaval in society and to signal that changes in gender roles during the conflict are temporary.

However, O'Rourke (2009) finds that groups with conservative constituencies avoid using female bombers, but if they do, they emphasize traditional gender roles to compensate. Cross-national evidence also suggests that female combatants are rarer in conflicts in less egalitarian societies (Thomas and Wood, 2018). Jahanbani and Willis (2019) find a positive association between women's status and the prevalence of female suicide bombers.³

I do not discount the importance of group-level dynamics. However, I still expect societal gender norms to matter and that religious audiences in egalitarian societies will be more supportive of female bombers than religious audiences in less egalitarian countries, and that the same dynamic holds for secular groups because of how individuals in these societies have been socialized. Thomas and Wood (2018) control for several group-level factors and still find that female combatants are more prevalent in gender egalitarian countries.

Quality of recruitment pool

Scholars have also examined how gender equality affects the pool of potential female recruits. This has nothing to do with inherent capabilities, but instead is related to the resources available to individuals. Thomas and Wood (2018) argue that a variety of skills make potential recruits more attractive, including political experience, technical abilities, and literacy. As the authors note, Viterna (2013) finds that the FMLN intentionally sought women who were highly skilled in a variety of areas. Armed groups also seek out well-educated individuals for suicide attacks because they are generally more successful

(Benmelech and Berrebi, 2007). Thus, militant groups have greater incentives to recruit women for suicide terrorism in more egalitarian countries where women, on average, possess more skills because of greater access to resources like education.

The tradeoff of using female suicide bombers

Gender inequality increases the tactical benefits of female bombers, thus increasing the incentive for groups in these societies to employ them (Thomas, 2019). However, in more egalitarian countries, female combatants have more skills to successfully execute attacks and militant groups face less backlash for using them.

To summarize, armed groups face a variety of tradeoffs when using female suicide bombers, which drive down their prevalence, despite tactical and propaganda-based advantages. Female bombers are most lethal when gender equality is low because security personnel do not take the threat as seriously. However, female bombers in these societies, on average, possess fewer personal skills. Thus, because there are multiple kinds of advantages female bombers provide, middling societies present the best balance between inept security forces and skilled female recruits. Furthermore, in less egalitarian countries, groups face greater backlash from their constituents for using female bombers. This particularly undermines propaganda-based advantages. Thus, middling status countries present the ideal conditions for female suicide bombers: groups avoid facing significant backlash while female bombers still effectively evade security forces.

This leads me to the hypothesis that:

H1: *Suicide attacks involving female suicide bombers will be more common in countries with moderate levels of gender equality than in countries with high or low levels of gender equality.*

Research design

Sample

The data on suicide attacks come from CPOST-SAD.⁴ The dataset includes just over 5,500 attacks, in more than 50 countries, spanning from 1974 to 2016.⁵ CPOST-SAD contains a variety of variables that are essential to this analysis, including the sex of the bomber (CPOST-SAD, 2018). For an event to enter CPOST-SAD, a non-state actor must carry out the attack and the attackers must kill themselves in the process of executing the attack.

Failed suicide attacks (e.g. the explosives were not detonated or were set off by another source, like police gunfire) and “suicide missions” (i.e. when attackers expect to die perpetrating the attack, but do not directly kill themselves) are not in CPOST-SAD. The omission of failed attacks could bias the results if gender equality is systematically related to the probability, relative to male bombers, that female bombers get captured or do not execute the attack. From an empirical standpoint, CPOST-SAD does not collect information on failed attacks, so it is not possible to include them. Additionally, it would be difficult to *systematically* collect data on suicide bombers that got caught before executing the attack or decided not to follow through.

From a theoretical standpoint, it is unclear how the potential bias caused by the lack of data on failed attacks would induce a curvilinear relationship. For instance, if security forces

more frequently catch female bombers in egalitarian countries, then we should expect a negative and linear, not a curvilinear, relationship, as there would be relatively fewer female bombers in more egalitarian societies if they get caught more often. A similar logic should hold true even if female bombers are more/less likely to follow through with planned attacks in more/less egalitarian countries.

The unit of analysis is the attack because I am interested in how women's status affects the prevalence of female suicide bombers, relative to their male counterparts. There is the potential criticism that the analysis selects on the dependent variable. However, I do not expect female bombers, or suicide terrorism in general, to be more prevalent in all countries with middling levels of women's rights. Rather, when armed groups already exist, and use suicide terrorism, they turn to female suicide bombers when there is an ideal balance between the tactical and reputational benefits of using them. Thus, the theory is not about variation in the quantity of suicide attacks, but whether the bomber is female or male.

Dependent variable

In order to test the central hypothesis, I employ a binary indicator of *whether the attack involved a bomber that was identified as female*.⁶ I conduct logistic regression analysis because the dependent variable is a binary indicator and cluster the standard errors on the country of the attack to account for any unobserved variation between countries.

The sex of the attacker(s) cannot be identified in approximately 51% of the events. In the main analysis, I treat these cases as involving only male bombers for several reasons. First, although CPOST-SAD does identify when the sex of the attacker is unknown, the notes in the full data file provided by CPOST-SAD indicate to treat these cases as attacks perpetrated by males. Additionally, given that the vast majority of bombers whose sex is identified are male, it is unlikely that female bombers constitute a large proportion of the unknown cases. Third, because female bombers are rarer and tend to generate more news coverage, the media is likely to view the sex of a female bomber as worthy of reporting (Warner, 2017). However, as a robustness check, I drop all of the cases in which the sex of the perpetrators of the attack cannot be identified. This does not change the core results.

Independent variables

Women's status is difficult to measure, necessitating the use of multiple variables to assess the robustness of the findings. Additionally, militants and civilians respond to various elements of gender norms in different ways (Huber, 2019). I include two measures of women's status: female labor force participation and women's political empowerment.

In the first set of models, I use a *squared measure of female labor force participation* in the country and year of the attack. I obtain this variable from the World Bank's gender data (World Bank, 2019). In the next set of models, I employ a *squared measure of women's political empowerment* developed by Sundström et al. (2017), which I obtained from the Varieties of Democracy (V-Dem) Dataset. This variable captures women's status across a variety of dimensions, as it is an index measure of women's civil liberties, women's civil society participation, and women's political participation. Sundström et al. define women's political empowerment as the "process of increasing capacity for women, leading to greater choice, agency, and participation in societal decision-making" (p. 4).⁷

These variables are theoretically relevant because they capture a variety of aspects of women's status. Female labor force participation provides women with better access to social, political, and economic networks (e.g. Thomas and Wood, 2018) and increases their visibility in public spheres (Karim and Hill, 2018). This is directly relevant to my theory as security personnel who are more accustomed to the presence of women in public life are likely to take them more seriously. Additionally, in societies in which women are traditionally relegated to private spheres, armed groups will be likely to face greater backlash from using them in high-publicity attacks.

Female labor force participation, however, is often critiqued as a poor measure of women's empowerment (Karim and Hill, 2018). Thus, I also employ the measure of women's political empowerment that was developed by Sundström et al. (2017). As noted above, it is intended to capture choice, agency, and participation in decision making in society. The authors define choice as the ability of women to make meaningful decisions in important areas of their everyday lives. They conceptualize agency as involvement in change by the ability to define one's goals. The core of the third dimension—participation—is the ability of women to have their political preferences realized in a conflict over them.

While conceptually distinct from women's presence in public spheres, women's empowerment also has important implications for my theory. Higher levels of agency and skill make female recruits more attractive to militant groups (e.g. Thomas and Wood, 2018), and thus, the willingness of groups to use female bombers should increase with women's empowerment. However, at the highest levels of women's empowerment, security personnel are likely to take women more seriously.

Control variables

I control for a variety of factors associated with the conflicts in which the attacks occurred. First, I control for a *logged running count of the number of suicide attacks in the country* of the event. Women's status is related to the quantity (Harris and Milton, 2016; Robison, 2010) and quality (Huber, 2019) of terrorism, and the previous use of suicide terrorism might influence the decision by groups to employ female bombers in the future. Next, I control for the *proportion of suicide attacks that are against soft targets* (civilian and political)—as opposed to hard targets (security)—in the country and year of the attack. Gender equality affects terrorist target selection (Huber, 2019) and female bombers are more often used to attack soft targets (Bloom, 2014). I constructed both of these variables using data from CPOST-SAD. I further control for the duration of the terrorist campaign associated with the attack, which is also taken from CPOST-SAD.

I also include country-level control variables. Davis (2013) argues that groups struggling to garner press attention turn to female suicide bombers because of the propaganda value they generate. Thus, I control for the level of *press freedom* using a five-point ordinal indicator of government censorship of the media from V-Dem (Pemstein et al., 2019). I control for the regime type of the country of the attack because of democracy's high correlation with women's status and because of the complex nature of the relationship between terrorism and regime type (Chenoweth, 2013). I employ the *polity2 measure of regime type* from the Polity IV dataset (Marshall et al., 2019).

Groups often deploy female suicide bombers in response to government security crackdowns (Cunningham, 2003). I control for the *logged per capita GDP* in the country of the attack to account for the state's capacity to crackdown on armed movements, obtaining the

data from the World Bank Development Indicators. I control for the *percentage of the population that practices Islam* in the country of the attack because groups avoid using female suicide bombers, especially early on in campaigns, when they have audiences that adhere to stricter gender norms (O'Rourke, 2009). This measure comes from the World Religion Dataset (Maoz and Henderson, 2013).

Internal dynamics of armed groups influence leaders' decisions to integrate women (Thomas and Bond, 2015). Thus, I also include a set of group-level control variables. To collect the data, I drew from a variety of sources including the Revolutionary and Militant Organizations dataset (REVMOD) (Acosta, 2019), the Extended Data on Terrorist Groups (EDTG) (Hou et al., 2020), and the Women in Armed Rebellion Dataset (Wood and Thomas, 2017). The group associated with the attack is known in just over half of the cases in CPOST-SAD, meaning that including these control variables drops many observations.

I include a binary indicator of whether a group is *Islamist* (as opposed to secular). Approximately 94% of the known groups are Islamist. I also include a binary indicator of whether a group has a thousand or more members (*large group*), as bigger groups tend to recruit more women and better absorb the internal costs of doing so (Thomas and Bond, 2015). I further control for the *age of the group*, as armed groups frequently incorporate women later in conflicts (Alison, 2009). Groups also turn to forced recruitment when desperate for resources (e.g. Eck, 2014). Thus, I include a binary indicator of whether the group responsible for the attack uses *forced recruitment*. I present the summary statistics in the Online Appendix.

Results

Table 1 displays the results for female labor force participation and those for women's political empowerment in Table 2. Both sets of results show strong support for a curvilinear relationship between women's status and the prevalence of female suicide bombers. Across all models, the squared term for each measure of women's status has a negative and statistically significant relationship with the probability that the attack involves a female bomber. These findings provide evidence for the hypothesis that female bombers will be more common in countries with middling levels of gender equality than in societies with very high or very low levels. I plot the predicted probabilities to determine the exact nature of the relationship.

The predicted probabilities of the squared values of both female labor force participation and women's political empowerment provide support for the core hypothesis. Figures 2 and 4 reveal that the association between women's political empowerment and the prevalence of female suicide bombers is not statistically significant at the highest and lowest levels. However, Figures 1 and 3 show that the relationship between female labor force participation and the dependent variable achieves statistical significance at the highest values of the independent variable, although the strongest substantive impact is still not at the very highest levels. Thus, the predicted probabilities provide strong evidence that female bombers will be most common at moderate levels of gender equality and some evidence that female bombers attack more in the most egalitarian societies than in the least.

In most models, the duration of the suicide terrorism campaign has a negative and statistically significant association with the probability that the bomber is female, suggesting that female bombers are often employed earlier in campaigns or in shorter campaigns. Surprisingly, the proportion of soft targets attacked has a positive but statistically insignificant association with the dependent variable in most models. The logged number of previous suicide attacks produces inconsistent effects.

Table 1. Female labor force participation and female suicide bombers.

	(1)	(2)	(3)
Female Labor Force Participation	0.523*** (0.181)	0.745*** (0.165)	0.548*** (0.188)
Female Labor Force Participation Squared	-0.00612** (0.00267)	-0.00889*** (0.00243)	-0.00566** (0.00261)
Proportion of Soft Targets	0.496 (0.602)	0.958 (0.751)	1.290 (1.011)
Previous Suicide Attacks (Logged)	0.132 (0.113)	0.333* (0.180)	0.437* (0.236)
Campaign Duration	-0.0613** (0.0240)	-0.0577*** (0.0178)	-0.0779*** (0.0238)
Press Freedom		-0.235 (0.243)	-0.119 (0.263)
Polity		-0.00752 (0.0546)	-0.0398 (0.0590)
GDP per Capita (logged)		-0.522** (0.244)	-0.249 (0.280)
Percentage Muslim		-0.868 (0.780)	-0.467 (1.197)
Islamist Group			-1.799* (0.991)
Large Group			-1.621*** (0.559)
Group Age			0.00759 (0.0213)
Forced Recruitment			0.195 (0.863)
Constant	-12.22*** (2.795)	-12.51*** (3.597)	-10.41*** (3.172)
Observations	5,532	3,043	1,679

Robust standard errors in parentheses.

*** $P < 0.01$; ** $P < 0.05$; * $P < 0.1$.

Press freedom does not have a statistically significant association with the dependent variable in any model. This finding is surprising given the prominent role that female bombers have played in the propaganda of several groups. There is not a statistically significant association between regime type and the use of female bombers in any model. The percentage of the country that practices Islam has a negative association with the dependent variable in all models but is only statistically significant in one. Finally, economic development has a negative association with the bomber being female in all models, but only achieves statistical significance in one.

Large groups appear less likely to use female bombers, suggesting that smaller groups attempt to gain attention and/or turn to female bombers because of resource constraints. The age of the group has a positive but statistically insignificant association with the dependent variable in both models. Finally, the use of forced recruitment by groups has a positive but insignificant effect.

Table 2. Women's political empowerment and female suicide bombers.

	(1)	(2)	(3)
Women's Political Empowerment	44.40** (19.05)	26.78** (11.72)	25.04** (10.35)
Women's Political Empowerment Squared	-30.03** (14.41)	-17.82** (8.134)	-17.18** (8.302)
Proportion of Soft Targets	1.227 (1.025)	2.468** (1.233)	2.833 (1.749)
Previous Suicide Attacks (logged)	-0.310** (0.138)	0.0112 (0.303)	0.0319 (0.302)
Campaign Duration	-0.0257 (0.0355)	-0.0604* (0.0337)	-0.0775** (0.0363)
Press Freedom		-0.321 (0.275)	-0.492 (0.308)
Polity		0.0516 (0.0633)	0.00803 (0.0800)
GDP per Capita (logged)		-0.474 (0.412)	-0.0105 (0.485)
Percentage Muslim		-2.725*** (0.756)	-2.213 (1.457)
Islamist Group			-1.393 (1.341)
Large Group			-1.456*** (0.424)
Group Age			0.00338 (0.0305)
Forced Recruitment			0.867 (1.008)
Constant	-17.02*** (6.342)	-6.952* (4.101)	-8.090** (3.154)
Observations	5,108	3,022	1,668

Robust standard errors in parentheses.

*** $P < 0.01$; ** $P < 0.05$; * $P < 0.1$.

Robustness checks

I conduct a battery of robustness tests to assess the strength of the findings. First, I employ a variety of alternative measures of women's status, including fertility rates, the percentage of females in national legislatures, gender equality in the distribution of political power, and women's freedom of domestic movement. The first measure is taken from the World Bank's gender data. The other three measures come from V-Dem (Pemstein et al., 2019; Sundström et al., 2017).

Fertility rates are associated with expectations about motherhood and reproductive rights, providing a general association with gender equality (Huber, 2019). Larger percentages of female legislatures signal higher visibility of women in the public sphere and affect how governments respond to terrorism (Huber, 2019). However, I also employ the aforementioned measure of the distribution of political power, as inclusion in state legislatures does not always equate with the interests of women being represented (Htun, 2016). Lower values of this measure indicate that men hold a near monopoly on political power while higher levels

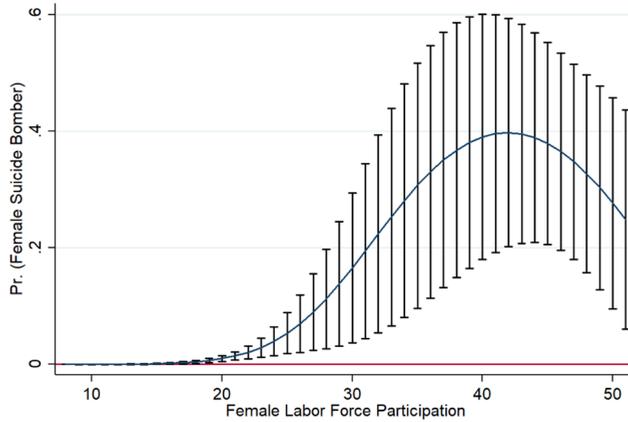


Figure 1. Predicted probabilities without group-level controls.

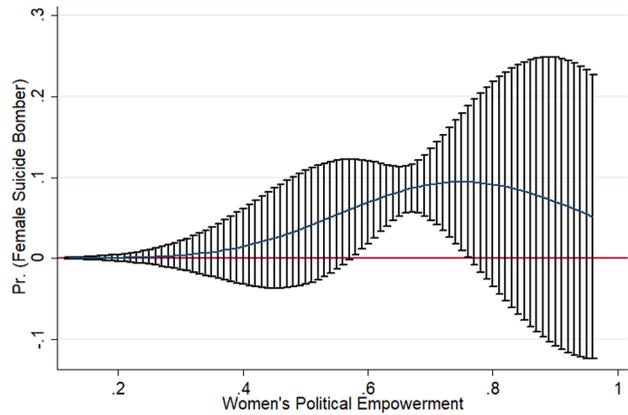


Figure 2. Predicted probabilities without group-level controls.

indicate a more equal distribution. Finally, freedom of movement is an important part of women’s agency (Sundström et al., 2017) and is theoretically relevant because female bombers need to efficiently travel to their targets (Stack-O’Connor, 2007). I use the indicator of women’s freedom of domestic movement developed by Pemstein et al. (2019), which measures both the legal and social restrictions that women face moving in public.

The results for these alternative measures are somewhat mixed. The squared term is positive for fertility rates and negative for female legislatures, but neither achieve statistical significance and there is not a clear curvilinear relationship between these indicators and the main dependent variable. However, the results provide strong evidence that female bombers are more prevalent at middling levels of women’s freedom of movement and equal distributions of political power, indicating that certain aspects induce the proposed tradeoffs of

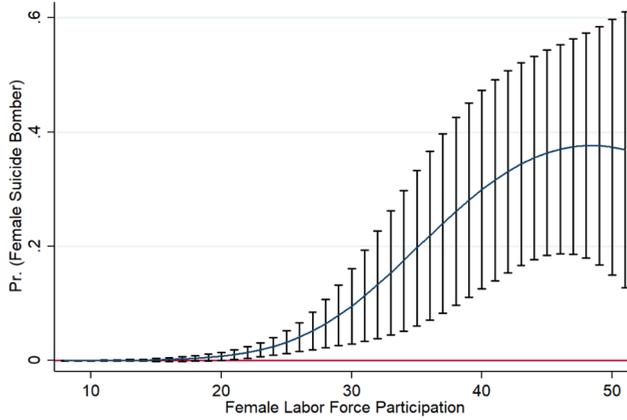


Figure 3. Predicted probabilities with group-level controls.

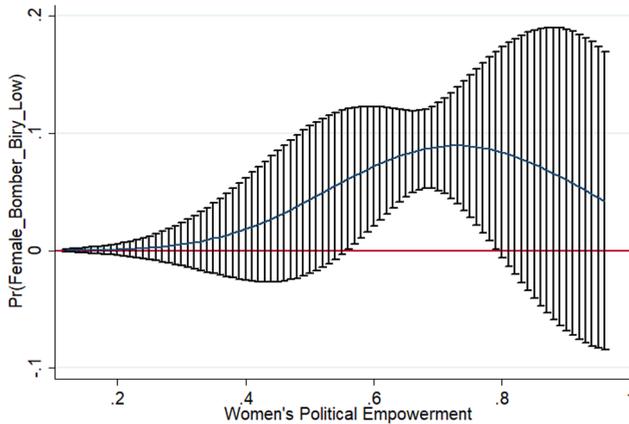


Figure 4. Predicted probabilities with group-level controls.

female bombers more than others. For instance, while the presence of female legislatures might increase the visibility of women, it is not really an indicator of women’s empowerment, unlike the distribution of political power.

Next, I drop all observations in which the sex of at least one bomber in the attack is unknown and does not involve a female bomber. While this drops a significant number of observations, the main results hold. Additionally, I rerun the main analysis employing rare events logistic regression analysis to account for the low number of female bombers in the data (King and Zeng, 2001). Once again the results remain robust.

To ensure that the results are not driven by idiosyncrasies or potential miscodings in CPOST-SAD, I rerun the main analysis using data from the Suicide Attack Network Dataset (SAND), which was developed by Acosta (2016b). SAND is also an event dataset of

suicide attacks, covering 6,224 incidents from 1980 to 2016. Other quantitative studies on suicide terrorism use SAND (Acosta and Childs, 2013; Acosta, 2016a), including research on female suicide bombers (Choi, 2019). The squared term for women's status remains negative and statistically significant in five of the six models. In the model with all control variables, female labor force participation squared remains negative, but drops below traditional levels of statistical significance ($p = 0.182$). This null result might be driven by the large number of observations dropped when the full set of control variables is added. Overall, the results appear robust to the use of a different dataset.

Lastly, I create a group-year dataset of all groups in CPOST-SAD. Group-level decision making plays a prominent role in the proposed theory, making it important to examine whether the findings are robust to an alternative unit of analysis. Using this dataset, I rerun the primary analysis, employing tobit and logistic regression models, with dependent variables that measure the percentage of suicide attacks involving female bombers, and the use of any female bombers respectively. The results remain robust. The findings and more details on all robustness checks are available in the Online Appendix.

Alternative mechanisms

Other types of female combatants

It is also important to consider a variety of alternative mechanisms that could drive the results. Thomas and Wood (2018) highlight several reasons why higher levels of women's status increase the recruitment of women into armed groups. They argue that in gender egalitarian countries, socialization processes make individuals more accepting of women in a broader cross-section of roles; women play a more active role in institutions that armed groups recruit from; and women have more agency.

While these mechanisms are useful for explaining women's participation in rebel group combat roles more broadly, they do not fit the logic of female suicide attacks as well. Based on the mechanisms described by Thomas and Wood (2018), it is possible that the tradeoff is not between reputational costs and the tactical advantages of female bombers, but between reputational costs and a variety of other factors. For instance, it is possible that in more egalitarian societies, women's participation in political organizations makes it easier for armed groups to recruit them into these roles, or that women have more agency, facilitating their mobilization into armed groups as suicide bombers. However, from a theoretical standpoint, we would predict a linear relationship as armed groups would face less backlash for using female bombers and they would have an easier time recruiting women for these reasons.

We could also observe a curvilinear relationship based on the motivations that women have to mobilize into armed groups. At the lowest levels of gender equality, women might join a group to fight for equality, but be barred from doing so because of rigid gender norms. Similarly, women in the most gender egalitarian societies might have little reason (at least related to gender equality) to rebel (Harris and Milton, 2016). This argument assumes that women largely engage in political violence in order to combat gender inequality. However, women fight for armed non-state groups for a variety of reasons, and often have the same motivations as male combatants (Loken and Zelenz, 2018).

To address these alternative mechanisms empirically, I replicate the results of Thomas and Wood (2018) who, using a variety of measures, find that gender equality has a positive association with women's involvement in combat roles more broadly. However, I construct

additional models that test for nonlinearity between women's status and integration into combat roles. Thomas and Wood focus on women in all combat roles, rather than female suicide bombers specifically. Of the 211 groups in their analysis, only 28 (13.27%) use suicide terrorism at all, and only 17 of those 28 groups use women. In contrast, approximately 40% of the 211 groups use female combatants.

If updating Thomas and Wood's models reveals a curvilinear relationship, then there might be support for these alternative mechanisms. However, if there is no evidence supporting this relationship, then it suggests a unique association between women's status and the prevalence of female suicide bombers that does not transfer to women in other types of rebel combat roles. I test for a curvilinear relationship in the models developed by Thomas and Wood and do not find support for one.

Reinforcing gender norms

Some scholars have challenged the notion that suicide terrorism serves as a path of empowerment for the women who engage in it. Bloom (2007) asserts that female bombers operate under patriarchal structures, rather than challenging them. She writes that "The message female suicide bombers send is that they are more valuable to their societies dead than they ever could have been alive" (p. 102). If female bombers primarily operate under patriarchal structures, they should be more common in less gender egalitarian societies.

O'Rourke (2009) argues that female bombers are often motivated by the desire to reassert themselves into traditional gender roles after they have been perceived to deviate from them. Therefore, in societies with strict gender norms, we should expect a higher proportion of female bombers because women can deviate from these norms in more ways and because such deviations constitute greater transgressions. Schweitzer (2006) argues that female suicide bombers operate in more conservative societies where they receive the false promise of emancipation in exchange for their participation. If Schweitzer is correct that the potential for emancipation in repressive societies motivates female bombers, and that they are most effective against security forces that hold rigid beliefs about gender, then female bombers should be most common in countries with low levels of women's status. An implication of these arguments is that there should be a negative and linear relationship between gender egalitarianism and the prevalence of female bombers. However, this study provides robust evidence of a curvilinear relationship.

Generalizability

Rarity of female suicide bombers

The rarity of female suicide bombers could pose problems for the analysis, necessitating examination of the CPOST data in more depth. While male suicide bombers launched attacks in over 50 countries, female bombers carried out missions in just under 20. Female bombers were concentrated in a small number of countries. Almost 40% of attacks involving female bombers occurred in Nigeria, Cameroon, or Chad, where Boko Haram, the most frequent user of these bombers, operates (Warner and Matfess, 2017). Additionally, nearly half of attacks in this region involved women. Approximately 10% of events involving female bombers occurred in Russia (Chechen insurgents) and about the same proportion

occurred in Sri Lanka. Iraq accounts for around 19% of female suicide bombers, but such events represent only approximately 2% of all attacks in Iraq.

Correspondingly, the distribution of female suicide bombers across groups that use suicide terrorism is also uneven. Just under one-third of militant groups in the dataset used female suicide bombers. Furthermore, among attacks where a perpetrating group is identified, Boko Haram and the LTTE—the two most frequent users of female suicide terrorism—account for about 25% of such attacks. Post-2003, when the number of suicide attacks surged following the US invasion of Iraq, there were a greater number of female bombers, but they comprised a smaller percentage of the overall number of attacks.

The data reveal that the phenomenon of female suicide terrorism is concentrated among relatively few countries and militant groups. However, the same dynamic is true for male suicide bombers. Almost 42% of attacks involving only male perpetrators occurred in Iraq, with about another 22% occurring in Afghanistan, and almost 10% in Pakistan. Additionally, among incidents with a known perpetrator, Al-Qaeda in Iraq, its successor ISIS, and the Afghan Taliban carried out just over 30% of these attacks. Thus, while suicide attacks involving only male bombers have occurred in more countries, and have been carried out by more groups, most are still limited to fairly select contexts.

These results are not generalizable to all contexts. They do not suggest that all countries with middling levels of gender equality experience a large number of attacks from female suicide bombers. The fact that the majority of suicide attacks have occurred in either Iraq or Afghanistan suggests that suicide terrorism does not occur in a wide variety of contexts. Instead, the results from the main analysis, and the above descriptive statistics, reveal that female and male suicide bombers operate in systematically different contexts.

Several examples highlight the ways in which female bombers operate in markedly different contexts than their male counterparts. While Turkey has experienced fewer suicide attacks than several other countries, female bombers carried out about 40% of the attacks by the PKK, as well as the Kurdistan Freedom Falcons. Historically, the PKK has also been one of the most frequent users of female bombers (Skaine, 2006). Turkey's mean value for women's political empowerment is less than one standard deviation away from the mean value for the entire sample, and just over one standard deviation away from the mean level of female labor force participation.

In addition to having a high total number of female bombers, a high proportion of suicide attackers in the LTTE (~30%) were female. Sri Lanka's mean level of women's political empowerment is about one standard deviation above the mean of the sample. Stack-O'Connor (2007) argues that the LTTE began using female suicide bombers because (1) security forces in the country would not suspect women and (2) the group wanted to present itself as representing all Tamils, especially because other Tamil insurgent groups recruited women.

Finally, despite the ill-preparedness of Israeli security forces for the threat of female suicide terrorism (Cunningham, 2007), female bombers did not feature in early stages of the Palestinian–Israeli conflict, and were expected to support the Palestinian struggle through fulfillment of traditional gender roles, particularly motherhood (Tzoreff, 2006). While still expected to take a backseat to other concerns of Palestinian nationalism, women's issues featured much more prominently in the fight for Palestinian liberation, and women's roles in the conflict changed in several ways, including with the introduction of female suicide bombers (Tzoreff, 2006). To capitalize on their tactical advantages, both secular and religious Palestinian groups tailored their rhetoric to justify the use of female suicide bombers to their

constituents (Tzoreff, 2006). Thus, gender norms had to change sufficiently before female suicide bombers featured prominently.

Domestic vs. international audiences

The theory I put forward applies more directly to groups operating in domestic contexts. Much of the argument centers on the idea that the supporters of militant groups, and the security forces they target, hold relatively the same views on gender because they were socialized in the same society. However, many groups launch transnational attacks, and thus, the targets of the attacks might exist in very different societies than the supporters of the perpetrating groups do. Groups operating in more conservative countries, for instance, could launch attacks in countries with higher levels of gender equality, or vice versa. Thus, the tradeoff between reputational costs and tactical effectiveness is not straightforward because the different audiences hold different views about gender.

Differing audiences might partially explain the rarity of female suicide bombers. For instance, if a group operating in a less egalitarian country wants to carry out an attack in a more liberal country, using a female bomber would be likely to cause backlash from supporters at home and be ineffective against security forces of the target country. A group operating in a more egalitarian society that launched attacks in a more traditional society could benefit from using female bombers because they would provide tactical advantages without reputational costs. However, transnational terrorism targets liberal states more because of their interventionist foreign policies (Savun and Phillips, 2009), making this second scenario unlikely. Even if the sending and receiving states have similar gender norms, the tradeoff would be similar to the one described in the main theory. Thus, when transnational suicide terrorism is used, groups must account for both their domestic support bases as well as government security forces abroad, presenting groups with further obstacles to using these combatants. Thus, the central theory of this paper fits more closely with domestic suicide terrorism.⁸

Discussion and conclusion

I argue that the rarity of female suicide bombers is due in part to the tradeoffs armed groups face when deciding whether to use these combatants. In the least gender egalitarian societies, female bombers have the greatest tactical advantage, as they are less likely to be viewed as suspicious by security personnel. However, groups in these societies also face the strongest potential of backlash for using women and have a lower quality recruiting pool. Thus, countries with middling levels of women's rights are prime targets for female suicide bombers as they strike a balance between these tradeoffs.

Using data from CPOST-SAD on over 5,500 suicide attacks, I find strong evidence that female suicide bombers are more common in countries with middling levels of women's rights. I also find some evidence that female bombers are more common in the most egalitarian countries than in the least (although countries with middling women's rights are still the most prone). I discuss other potential mechanisms, but offer theoretical and empirical evidence against them.

The findings of this study highlight a few important dynamics. First, women's status does not appear to affect the incorporation of women into different roles in armed groups in the same way. Second, militant leaders face tradeoffs when incorporating women into armed

movements, and these tradeoffs vary by role. Third, the findings reinforce the idea that armed groups, in part, must choose tactics based on how they expect the public to react.

Ignorance about female suicide bombers makes them more lethal (e.g. Thomas, 2019), and thus, it is imperative we understand more about them. The use of systematic quantitative analysis helps add clarity to the complex relationship between women's status, strategic considerations, and the prevalence of female bombers. Female suicide bombers can serve armed organizations effectively; however, complex dynamics affect the prevalence of this threat.

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Supplemental material

Supplemental material for this article is available online.

Notes

1. As a point of conceptual clarity, I use the terms suicide terrorism and suicide attacks interchangeably. I do not use either term to denote attacks on civilians vs. non-civilians. Rather, I am focused on attacks by non-state actors in which the perpetrator kills themselves as part of executing the attack. Additionally, I use the terms female suicide bomber and female suicide attacker interchangeably.
2. This is akin to Putnam's (1988) "two-level game" of international bargaining in which states attempt to balance the demands of their domestic constituents and the international actors they are negotiating with, often leaving states with a tradeoff between strengthening their support domestically or internationally.
3. However, Thomas and Bond (2015) and Henshaw (2016a, b) do not find evidence of a link between gender equality and the incorporation of women into armed groups.
4. I obtained the suicide attack dataset in a private correspondence with the CPOST-SAD research team.
5. While the year of the first suicide attack is disputed, according to CPOST-SAD, one suicide attack occurred in 1974, one in 1981, and one in 1982, with no other suicide bombings in the years between.
6. While the modal attack is carried out by a single perpetrator, some incidents involve multiple bombers. Thus, the dependent variable is coded as 1 if at least one of the bombers in the incident is identified as female and 0 otherwise.
7. Data on female labor force participation is not available until 1990. Thus, while this variable is available for more observations overall, the measure of women's political empowerment is available for the entire temporal range of the study.
8. CPOST-SAD does not distinguish between domestic and transnational attacks; however, SAND includes a variable that differentiates domestic and transnational targets. I reran the initial robustness checks that used SAND, adding in the target location variable. The results remained the same (see Online Appendix).

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