Leader Age and International Conflict

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ABSTRACT. In recent years, social scientists have explored what types of leaders are the most likely to behave violently in international affairs. A central question in this research program is the relationship between leader age and aggression. Many studies in biology, psychology, and physiology have found that younger males tend to behave more aggressively than older males across a wide range of contexts, and it is worth testing if this pattern appears at the international level as well. However, this subject has been difficult to study because of the endogeneity problem. We overcome this issue by using a regression discontinuity design. Specifically, we look at close elections of national leaders from 1815-2010. We find that when younger candidates barely defeat older ones, countries are more than twice as likely to engage in military conflict. This finding highlights the important role that individuals play in shaping major historical processes.

The last two decades have seen a wave of interest in which types of leaders are the most likely to engage in international conflict (Horowitz, McDermott, and Stam 2005; Jones and Olken 2009; Chiozza and Goemans 2011; Colgan 2013; Horowitz and Stam 2014; Fuhrmann and Horowitz 2015; Dafoe and Caughey 2016; Horowitz and Fuhrmann 2018; Wu and Wolford 2018; Mattes and Weeks 2019; Dube and Harish 2019). Looking at seven famous leaders from history, including Hitler and Napoleon, Byman and Pollack (2001) conclude that countries are more likely to go to war when they are ruled by leaders who are risk-tolerant, delusional, or highly ambitious. Saunders (2011) finds that major U.S. foreign policy decisions can be explained by the personal beliefs of U.S. presidents,

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particularly their views about the dangers posed by the governments of other countries. Using quantitative analysis, Horowitz, Stam, and Ellis (2015) find that a number of leader characteristics predict the likelihood of military conflict, including if the leader had served in the military (without combat experience) or had a troubled childhood.

While studies on this subject have examined a wide range of leader qualities, age has been a factor of special interest because of the close association between younger men and other forms of aggression (Daly and Wilson 1988; Daly and Wilson 1990; Wilson and Daly 1993; Birditt, Fingerman, and Almeida 2005; Birditt and Fingerman 2005; Williams et al. 2006; Neupert, Almeida, and Charles 2007). The hypothesis that younger leaders tend to behave more aggressively in international affairs also receives anecdotal support from the many international confrontations that have been attributed to the desire of youth to overturn the status quo. These cases range from Alexander the Great's conquest of Central Eurasia in the 4th century BCE to the 23-year-old Austro-Hungarian Emperor Franz Josef's break with Russia during the Crimean War, a decision he made against the strong advice of his 80-year-old elder statesman, Prince Metternich (Rich 1985; Trager 2012). This disastrous decision that the Emperor made as a young man arguably led him to have to fight the First World War at the age of 83 because that early blunder precipitated the security competition with Russia in the Balkans. Yet, social scientists have demonstrated the existence of a strong correlation between advanced age and the likelihood of conflict initiation (Horowitz, McDermott, and Stam 2005; Horowitz, Stam, and Ellis 2015). This finding is the more puzzling in that it applies much more strongly to democracies than autocracies.

In this article, we identify the effects of electing younger or older leaders on conflict by using an approach that overcomes a significant dilemma in research on leaders and political outcomes, namely, the fact that leaders are selected into particular domestic and international environments in non-random ways. For example, older leaders may be more likely to emerge if the international system seems particularly dangerous or if the public favors military expansion. In these cases, electorates may prefer candidates with more experience. The opposite is probably true for younger politicians, who might not be as trusted as their older counterparts. Thus, if younger and older leaders tend to engage in military conflict at different rates, it is hard to know whether the difference is explained by the leaders themselves or by the background factors that influenced their chances of

coming to power. In short, who rules a country is not random, so observational studies that test how different types of leaders affect international conflict could be biased.

We analyze a natural experiment to test whether democracies are more likely to start military conflicts when they are ruled by younger or older leaders. Specifically, we employ a regression discontinuity design using close elections between presidential candidates with large differences in age. We examine all presidential elections in democracies from 1815-2010. We also include all parliamentary elections over this time period that determined the election of the executive with primary responsibility for foreign policy and in which a norm or explicit rule existed that the party with the largest vote share would form the government. From this set, following our pre-analysis plan, we focus on the elections where the top two candidates differed in age by at least ten years and where both were within two percentage points of winning the election. This design builds on the insight that the outcomes of close large national elections in democracies should be approximately random, making our approach similar to a randomized experiment (Eggers et al. 2015).

Our results indicate that electing younger leaders tends to make countries much more likely to act aggressively on the international stage. For the cases in our dataset, we found that the countries that barely elected younger leaders were about twice as likely to engage in military conflict as the countries that barely elected older ones. Our results hold for a number of important robustness checks, as well as when we adjust some of the design choices that we made in our pre-analysis plan. Moreover, our estimates suggest that electing younger leaders has a substantively large impact on the likelihood that countries will take military action against other states.

These findings are consistent with much prior work on age and aggression in other fields. Further, they have important implications for the study of international relations more broadly. They support the idea that many young leaders throughout history, like Alexander the Great, the young Henry VIII, and Napoleon, may have gone to war partly because of their youth. Our results also suggest that present-day conflict may be more likely when younger leaders are in power. Lastly, our findings emphasize the importance of individual leader traits as drivers of international outcomes and should encourage more research in this area.

AGE AND AGGRESSION

The association between youth and violence is well-documented across types of violence, gender groups, and cultural contexts. Criminoligists have described an "age-crime curve" according to which violent criminal behaviors rapidly decline from late adolescence through young adulthood and continue decreasing through old age. Although crime rates vary substantially across sub-populations, the relationship between age and violent crime is remarkably consistent across them (Hirschi and Gottfredson 1983; Steffensmeier and Streifel 1991; Sweeten, Piquero, and Steinberg 2013). The relationship is also consistent across time periods with available data from the 19th through the 21st centuries, and holds across societies in spite of large differences in crime rates (Hirschi and Gottfredson 1983; Steffensmeier and Streifel 1991; Sweeten, Piquero, and Steinberg 2013; Daly and Wilson 1988; Daly and Wilson 1990; Wilson and Daly 1993). Psychologists have demonstrated that older adults adopt less aggressive strategies in interpersonal relationships (Carstensen et al. 2000; Birditt and Fingerman 2005; Birditt, Fingerman, and Almeida 2005; Neupert, Almeida, and Charles 2007; Hay and Diehl 2011). All else equal, they are less likely to yell or name call, and more likely to endorse withdrawing from conflictual situations.

Some explanations of these changes focus on life-stage or role changes associated with aging, such as entry into marriage and raising children, which are associated with declines in crime rates. It is likely that such role changes are only part of the explanation, however. A principle reason for this is that even within sub-populations that experience role changes, the incidence of violent behaviors tends to decline with age (Siennick and Osgood 2008). Existing studies of role changes also have not employed causal identification strategies, and thus it is possible that other age-related changes drive these associations.

Psychologists have identified several psychological and physiological processes associated with aging that may relate to declines in aggressive behaviors. We group the most significant findings into four areas: (1) changes in emotion regulation, (2) testosterone decline, (3) changes in attention and focus, and (4) changes in amygdala activity. First, older adults tend to be better at regulating their emotional states after negative or adverse experiences. They move out of negative emotional states more quickly and are less reactive to interpersonal stressors. In part, but only in part, this is because they employ less inflammatory interpersonal conflict strategies (Mather 2012). The shorter time horizons of adults in the later stages of their lives may also lead them to prioritize well-being in

the moment and therefore allocate more cognitive and social resources to the regulation of emotion (Carstensen, Fung, and Charles 2003; Carstensen 2006).

Second, because testosterone levels decline predictably and continuously in men after the mid 20s (Schatzl et al. 2003; Seidman 2003; Fabbri et al. 2016; Handelsman, Sikaris, and Ly 2016), they offer another plausible explanation for the age-related changes in aggressive behaviors. However, the exact nature of the link between testosterone and aggression in men is highly contested (Archer 1991, 2006; Eisenegger et al. 2010; van Honk et al. 2012). The most convincing evidence of a causal relationship between testosterone and aggression comes from experimental animal studies. These show that aggression can be induced by manipulating testosterone levels (Allee, Collias, and Lutherman 1939; Beeman 1947; Edwards 1969; Albert et al. 1990). Studies of humans show correlations between testosterone and aggression, but the direction of causality is contested (Berman, Gladue, and Taylor 1993; Book, Starzyk, and Quinsey 2001; Archer 2006). According to one alternative account, testosterone may be associated with high status or with challenges to status and status dynamics may engender aggression rather than the presence of testosterone itself (Archer 2006). Moreover, experimental studies on humans, which are limited for ethical reasons, come to mixed results (Pope, Kouri, and Hudson 2000; Eisenegger et al. 2010; Carré, McCormick, and Hariri 2011; van Honk et al. 2012). Nevertheless, the extensive research that has been conducted on the link between testosterone and aggression does provide some support for the hypothesis that testosterone increases aggression and that declines in testosterone levels with age may be a factor leading to the decline in aggressive behaviors.

Third, older adults develop the ability to focus on positive over negative information and even remember a higher proportion of positive information (Williams et al. 2006; Kisley, Wood, and Burrows 2007; Marquez-Gonzalez et al. 2008; Samanez-Larkin et al. 2009; Mather 2012). Relative to younger adults, they tend to look away from negative images (Knight et al. 2007). This tendency to avoid the negative is *reinforced* when they are induced into a negative mood, whereas younger adults will focus on the negative when in a negative frame (Isaacowitz et al. 2008). Moreover, older adults are less likely to be distracted by negative stimuli (in contrast to positive stimuli), and stressful recent events are less predictive of cognitive interference (Ebner and Johnson 2010; Stawski, Mogle, and Sliwinski 2011). Older adults also show higher relative activity in the region of the brain

associated with emotion regulation, the prefrontal cortex, in response to negative stimuli, an indication that the differences in response to negative stimuli are driven by differential recruitment of brain resources (Fischer 2005; Tessitore et al. 2005).

Fourth, younger and older adults show different amygdala responses to positive and negative stimuli. The amygdala has been shown to play a fundamental role in emotional decision-making, including in aggressive responses to stimuli. Heightened amygdala activity is associated with aggressive behaviors (Siever 2008). While younger adults show the highest amygdala responses to negative stimuli, older adults show the highest responses to positive stimuli and much lower amygdala responses to negative stimuli (Mather et al. 2004; Leclerc and Kensinger 2011). These differences do not appear to be driven by declines in amygdala function with age (Mather 2012, 44). Thus, in response to negative stimuli, older adults show both a relative increase in the activity of the prefrontal cortex, which regulates and moderates emotional responses, and a decrease in activity of the amygdala, which drives aggressive responses.

Thus, the reason why younger people tend to behave more aggressively than older people is still uncertain. Several plausible mechanisms have been proposed, and it is likely that some of them reinforce each other. Nevertheless, the research discussed in this section has established a clear link between age and aggression that has appeared across a wide range of contexts.

Given this link, we might expect countries to behave more aggressively when they are ruled by younger leaders.[1] However, the research on leaders and international relations has not confirmed this hypothesis. In fact, it has found the opposite. We turn to a discussion of this work in the next section.

LEADER AGE AND CONFLICT

In contrast to the well-established finding from other fields that aggressive behavior tends to decline with age, two studies in political science have found a strong link between older leaders and state aggression. Horowitz, McDermott, and Stam (2005) published the first study on this subject, which focused primarily on the period from 1946-1999. Using

1. One potential concern here is that an individual's aggressive tendencies might not translate into more hawkish foreign policy stances. However, recent research on the subject has found a strong association between how people score on a psychological aggression test and their likelihood of favoring aggressive foreign policy moves (McDermott and Hatemi 2017).

multinomial logistic regression to control for some baseline factors, they found that older leaders were associated with higher levels of military conflict. Moreover, their results were driven by intermediate regimes and democracies. Horowitz, Stam, and Ellis (2015) came to similar conclusions using cross-national regression analysis on data from 1875-2004. They found that a ten-year increase in the age of a leader is associated with a 15% increase in the likelihood that democracies will initiate military disputes.[2]

One possible explanation for this anomalous finding is that world politics operate in a different way than the other domains in which age and aggression have been studied, particularly when it comes to democracies and intermediate regimes. The authors of these studies advance some arguments in favor of this possibility. Specifically, they contend that (1) older leaders may have more consolidated political power, giving them more freedom to take military action abroad, (2) older leaders may have shorter time horizons, and therefore be in a greater rush to establish their legacies, and (3) older leaders may have more confidence in their abilities to manage international crises and conflict.

Nonetheless, we see some reasons to question these arguments. Regarding (1), it is not clear why older leaders would use their political capital to engage in conflict as opposed to pursue more cooperative policies that encourage international peace. In other words, why would increased freedom in foreign policy make a leader more likely to start conflicts rather than to sign treaties and negotiate with other countries to resolve disputes peacefully? There may be some causal logic for why greater autonomy would make it easier for leaders to take aggressive foreign policy moves as opposed to more conciliatory ones. However, it is not clear to us why this would necessarily be true. It seems that increased leader autonomy could encourage either international peace or conflict, depending on what the leader's goals were. Therefore, we see some reason to question (1).

2. In addition to these two studies, an article by Potter (2007) that focuses on how U.S. presidents' prior time in office and electoral cycles affect U.S. foreign policy also finds a positive relationship between leader age and MID initiation (although it finds no clear relationship between leader age and crisis engagement). Likewise, an article by Horowitz and Stam (2014) on how leaders' previous military experience affects their likelihood of military conflict also finds a positive (albeit not robust) relationship between leader age and military conflict. However, in both of these articles, the tests appear as secondary analyses. In fact, in the Horowitz and Stam (2014) study, it is not clear that the authors designed their statistical model to test how leader age affects state aggression. We therefore focus our attention on the other two studies in this paper, which examine the relationship between leader age and military conflict much more directly.

Regarding (2), we do not think that shorter time horizons can easily account for the results of either of the two studies. This is because there is a difference between an individual's biological time horizons and a national leader's political time horizons. While older individuals may have shorter biological time horizons, older leaders do not necessarily have shorter political time horizons, especially in democracies. In fact, in the datasets of both studies, older democratic leaders tended to stay in power significantly longer than younger democratic leaders. For example, in the Horowitz, Stam, and Ellis (2015) data, democratic leaders who took office at about age 30 had tenures that lasted around two years on average, whereas democratic leaders who took office around age 70 had tenures that lasted for about four years on average. Therefore, depending on whether one is referring to biological or political time horizons, the time-horizons mechanism seems to lead to conflicting predictions when it comes to democracies.

Regarding (3), we do not think that this finding can easily be explained by older leaders having more confidence in their ability to manage international conflict. They may have more experience, but that experience could teach them humility rather than hubris. Past research on how confidence in performing cognitive tasks changes with age comes to mixed results (Crawford and Stankov 1996; Touron and Hertzog 2004; Bruine de Bruin, Parker, and Fischhoff 2012). Moreover, even if older leaders do tend to have more confidence than younger ones, we do not believe that it would necessarily make them more likely to engage in conflict. Rather, it might make them more confident in their ability to reach favorable settlements without fighting. Their additional experience over younger leaders may help them in this regard. Furthermore, this mechanism does little to explain why the effect only appears for democracies. In fact, it seems that it would predict that older leaders in non-democracies would behave more aggressively as well. However, the researchers do not find an effect for non-democracies. Therefore, it is not clear to us that the confidence mechanism can account for the results that the researchers found.

Given the limitations of these proposed mechanisms, we will now turn to an alternative explanation for the anomalous finding. Because these studies analyze observational data, they are susceptible to selection bias. That is, older leaders may be more likely to be selected into environments where the baseline level of conflict is much higher. In fact, an examination of specific cases suggests that such selection may be present. Winston Churchill, for instance, was appointed Prime Minister of Great Britain shortly after the

start of the Second World War. Then, despite overwhelming popularity as a result of his successful prosecution of the conflict, he was voted out of office shortly after the Allied victory in Europe. The British people judged him the best leader to fight the war, but not the best candidate to lead Britain in peacetime (Jenkins 2001). He was succeeded by the decade younger Clement Attlee.

Thus, a plausible alternative explanation for the observed relationship between leader age and conflict could be that older leaders tend to come to power in more dangerous times. In fact, we found strong evidence for this in the datasets of both studies. In the Horowitz, McDermott, and Stam (2005) data, the number of military disputes that the countries engaged in the year before the leader came to office is highly predictive of the leader's age ($p<0.001$, $n=1278$). The same selection effect appears in the Horowitz, Stam, and Ellis (2015) data ($p<0.0001$, $n=2245$). Thus, these observational studies could badly misestimate the relationship between leader age and state aggression.

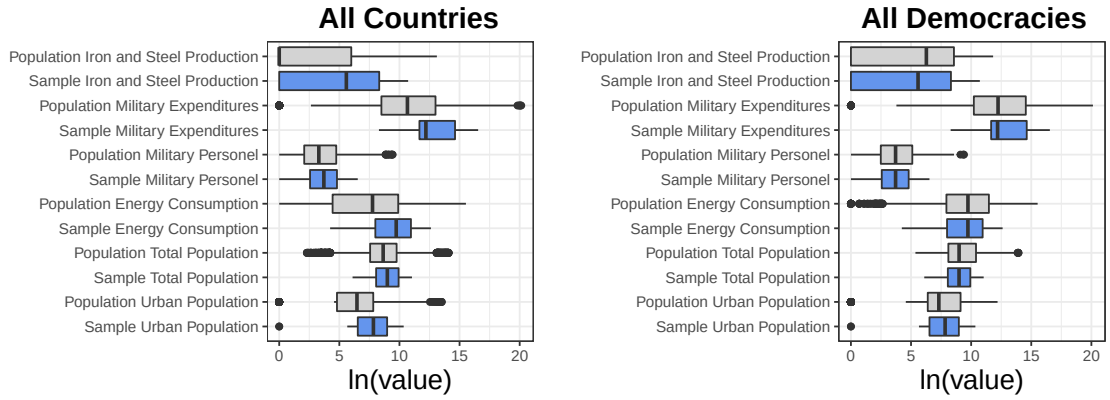
In the next section, we outline a regression discontinuity approach that gets around this selection effect. The findings from this approach indicate that younger leaders are more likely to engage in militarized disputes, which is consistent with both intuition and with the findings on the psychology and physiology of aging. We return to the evidence that some form of selection bias is driving the results of the two observational studies in the discussion section.

RESEARCH DESIGN

To test whether younger or older leaders are more prone to engage in military conflict, we employ a regression discontinuity design. Specifically, we look at close elections of national leaders from 1815-2010. It should effectively be a toss-up who won these races given the inherent randomness in large national elections (Eggers et al. 2015; Bertoli, Dafoe, and Trager 2019). To avoid cases where elections may have been rigged, we leave non-democracies out of our analysis. We also exclude parliamentary elections where coalition bargaining decided who would lead the country. Thus, we focus specifically on presidential elections and parliamentary elections where it was clear who the leader would be based on the results.

As we specified in our pre-analysis plan, we focus on elections where the top-two candidates were within 2% of the cut-point and were at least ten years apart in age. In total, our

Figure 1. Checking for External Validity



sample includes 33 cases, where the average age difference was about 17.1 years. Even though this sample size is not very large, the statistical power of our analysis is still fairly high because we focus on cases where we have significant variation in our independent variable. In fact, the power tests that we ran at the very beginning of this project indicated that we would identify a medium-sized effect (0.5 x SD) 25% of the time, a large effect (0.8 x SD) 65% of the time, and a very large effect (1.2 x SD) 89% of the time. The power tests also showed that if the effect was very small, our confidence intervals would probably be narrow enough to rule out large and very large effects.

Although we limit our analysis to a specific subset of democracies, our data appears to be highly representative. Figure 1 uses box plots to compare our sample to all other countries (on the left) and all other democracies (on the right). As the figure shows, the sample is fairly similar to all other countries, and it is very similar to all other democracies. Based on this comparison, we can say that the treatment effect that we find for our data is probably indicative of a broader trend for democracies more generally. It is harder to extrapolate to non-democracies, however, as leadership decision-making differs in those countries compared to democracies. Nonetheless, it is worth noting that our sample looks fairly representative across the factors in Figure 1 even when non-democracies are included.

To measure aggression, we use the standard method in political science of looking at the number of Militarized Interstate Disputes (MIDs) that countries initiated.[3] These disputes

3. Although the Militarized Interstate Dispute dataset is widely used, some scholars have argued that it contains inaccuracies. Due to this concern, Gibler, Miller, and Little (2016) made a number of revisions to

are cases where countries explicitly threatened, displayed, or used military force against other states (Ghosn, Palmer, and Bremer 2004; Palmer et al. 2015). Since the lengths of the presidential terms varied, we rescaled this variable to be military disputes per year during the term of the winning candidate. We also looked at all disputes that a country engaged in per year, including ones that it did not initiate, as well as high-level disputes per year. High-level disputes are defined as cases where countries used force against other states or initiated international war.

Since the goal of the design was to avoid looking at cases where older leaders were selected into more conflict-prone environments than younger leaders or vice-versa, it is important to check that this did not occur. Fortunately, the cases where younger and older leaders barely won were well-balanced on past levels of military conflict. There were no disparities for any of our four measures of past conflict: military disputes initiated (p=0.61), all military disputes (p=0.53), high-level military disputes initiated (p=0.76), and all high-level military disputes (p=0.63). Therefore, the design appears to have worked very well. Neither the younger nor older leaders in our sample seem to have been selected into significantly more conflict-prone environments.

RESULTS

Table 1 shows the aggression levels of the countries in our sample. The ones where the younger candidate barely won started about 0.15 more military disputes per year than the ones where the older candidate barely won. Moreover, 57% of them had at least one military dispute, compared to only 26% of the countries where the older candidate barely won. Similarly, the countries where the younger candidate barely won started many more high-level military disputes. They averaged 0.08 high-level disputes per year, compared to 0.01 for the countries where the older candidate barely won. Moreover, 29% of them started at least one high-level military dispute, compared to only 5% of the countries where the older candidate barely won.

This difference in aggression levels between the two groups was very unlikely to have occurred by chance. Figure 2 shows the estimates and confidence intervals for our four

the dataset in an effort to improve accuracy. Fortunately, none of the changes that they made affected the results of this study. Thus, our findings are the same regardless of whether we use the standard or revised MID dataset.

Table 1. Military Disputes per Year for Countries in the Sample

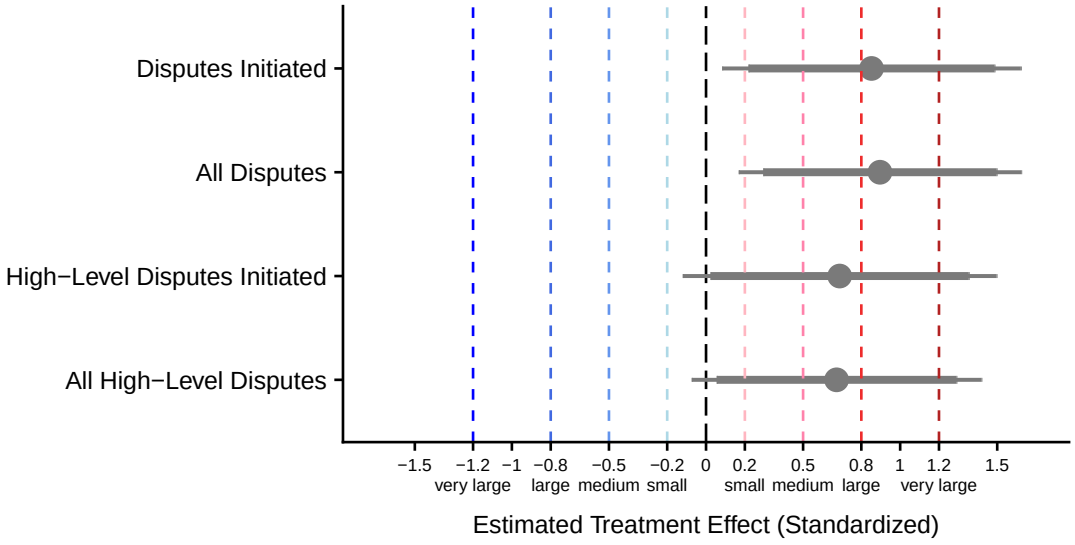
Cases Where the Younger Candidate Barely Won

Country (Election Year)	Winner (Age)	Runner-up (Age)	Disputes Initiated per Year	High-Level Disputes Initiated per Year
1. Canada (1957)	John Diefenbaker (61)	Lous St. Laurent (75)	0.00	0.00
2. Venezuela (1968)	Rafael Caldera (53)	Gonzalo Barrios (67)	0.20	0.20
3. Chile (1970)	Salvador Allende (62)	Jorge Alessandri (74)	0.00	0.00
4. Colombia (1970)	Misael Pastrana Borrero (46)	Gustavo Rojas Pinilla (70)	0.00	0.00
5. Cyprus (1988)	George Vassiliou (56)	Glafcos Clerides (68)	0.00	0.00
6. Bulgaria (1991)	Philip Dimitrov (36)	Alexander Lilov (58)	0.00	0.00
7. Thailand (1992)	Chuan Leekpai (54)	Pramarn Adireksarn (78)	0.75	0.38
8. Costa Rica (1994)	Jose M. Figueres (39)	Miguel Rodriguez (54)	0.25	0.25
9. Poland (1995)	Aleksander Kwaśniewski (41)	Lech Wałęsa (52)	0.40	0.00
10. Dominican Republic (1996)	Leonel Fernandez (42)	Jose Pena Gomez (59)	0.00	0.00
11. Israel (1996)	Binyamin Netanyahu (46)	Shimon Peres (72)	0.33	0.00
12. Colombia (1998)	Andres Pastrana (44)	Horacio Serpa (55)	0.25	0.25
13. South Korea (2002)	Ron Moo-hyun (56)	Lee Hoi-chang (67)	0.20	0.00
14. Taiwan (2004)	Chen Shui-vian (53)	Lien Chan (67)	0.50	0.00
			Avg=0.21	**Avg=0.08**
	Avg age=50	**Avg age=66**	**Percent with at least one dispute=57%**	**Percent with at least one dispute=29%**

Cases Where the Older Candidate Barely Won

Country (Election Year)	Winner (Age)	Runner-up (Age)	Disputes Initiated per Year	High-Level Disputes Initiated per Year
1. Germany (1925)	Paul von Hindenburg (77)	Wilhelm Marx (62)	0.14	0.00
2. New Zealand (1957)	Walter Nash (75)	Keith Holyoake (53)	0.00	0.00
3. Ireland (1966)	Eamon de Valera (83)	Thomas F. O'Higgins (49)	0.00	0.00
4. Ireland (1973)	Erskine Childers (67)	Thomas F. O'Higgins (56)	0.00	0.00
5. Australia (1974)	Gough Whitlam (57)	Billy Snedden (47)	0.00	0.00
6. Dominican Republic (1986)	Joaquin Balaguer (80)	Jacobo Majluta (51)	0.25	0.00
7. Portugal (1986)	Mario Soares (61)	Diago Freitas do Amaral (44)	0.00	0.00
8. Cyprus (1993)	Glafcos Clerides (73)	George Vassiliou (61)	0.20	0.20
9. Dominican Republic (1994)	Joaquin Balaguer (87)	Jose F. Pena Gomez (57)	0.00	0.00
10. South Korea (1997)	Kim Dae-jung (74)	Lee Hoi-chang (62)	0.20	0.00
11. Cyprus (1998)	Glafcos Clerides (78)	George Iacovou (59)	0.00	0.00
12. Lithuania (1998)	Valdas Adamkus (71)	Arturas Paulauskas (44)	0.20	0.00
13. Chile (1999)	Ricardo Lagos (62)	Joaquin Lavin (46)	0.00	0.00
14. Finland (2000)	Tarja Halonen (56)	Esko Aho (45)	0.00	0.00
15. Cape Verde (2001)	Pedro Pires (66)	Carlos Viega (51)	0.00	0.00
16. Cape Verde (2006)	Pedro Pires (71)	Carlos Viega (56)	0.00	0.00
17. Costa Rica (2006)	Oscar Arias (65)	Otton Solis (51)	0.00	0.00
18. Albania (2009)	Sali Berisha (64)	Edi Rama (45)	0.00	0.00
19. Ukraine (2010)	Viktor Yanukovych (59)	Yulia Tymoshenko (49)	0.00	0.00
			Avg=0.05	**Avg=0.01**
	Avg age=70	**Avg age=53**	**Percent with at least one dispute=26%**	**Percent with at least one dispute=5%**

Figure 2. Testing How Electing Younger Leaders Affects Military Disputes per Year



Note: The thinner lines represent the 95% confidence intervals, while the thicker lines represent the 90% confidence intervals. All tests are two-tailed. The vertical dotted lines in this graph represent the effect sizes, often referred to as Cohen's *d*.

measures of aggression. The outcomes are standardized to facilitate interpretation of effect sizes. The confidence intervals indicate that electing younger leaders results in a notable increase in the likelihood that countries will initiate military disputes (p=0.032) and engage in military disputes (p=0.018). The results for high-level disputes are similar. Electing younger leaders appears to increase the chances that countries will initiate high level-disputes (p=0.090) and engage in high-level disputes (p=0.074). Although these two results are not statistically significant at the conventional 95% confidence level, it should be noted that the statistical power for these outcomes is lower because there were fewer high-level disputes. There were only ten high-level disputes that these countries engaged in, compared to 22 total disputes.

These findings prove very robust. For instance, they hold after controlling for a number of economic, military, and demographic factors using linear regression. They also prove

remarkably insensitive to adjusting the requirement that the two leading candidates be at least ten years apart in age. In fact, the estimates are essentially the same if the threshold is set anywhere between three and 20 years. Moreover, the results hold when we use permutation inference instead of t-tests, which has recently become a preferred way to analyze regression discontinuities (Cattaneo, Titiunik, and Vazquez-Bare 2016).

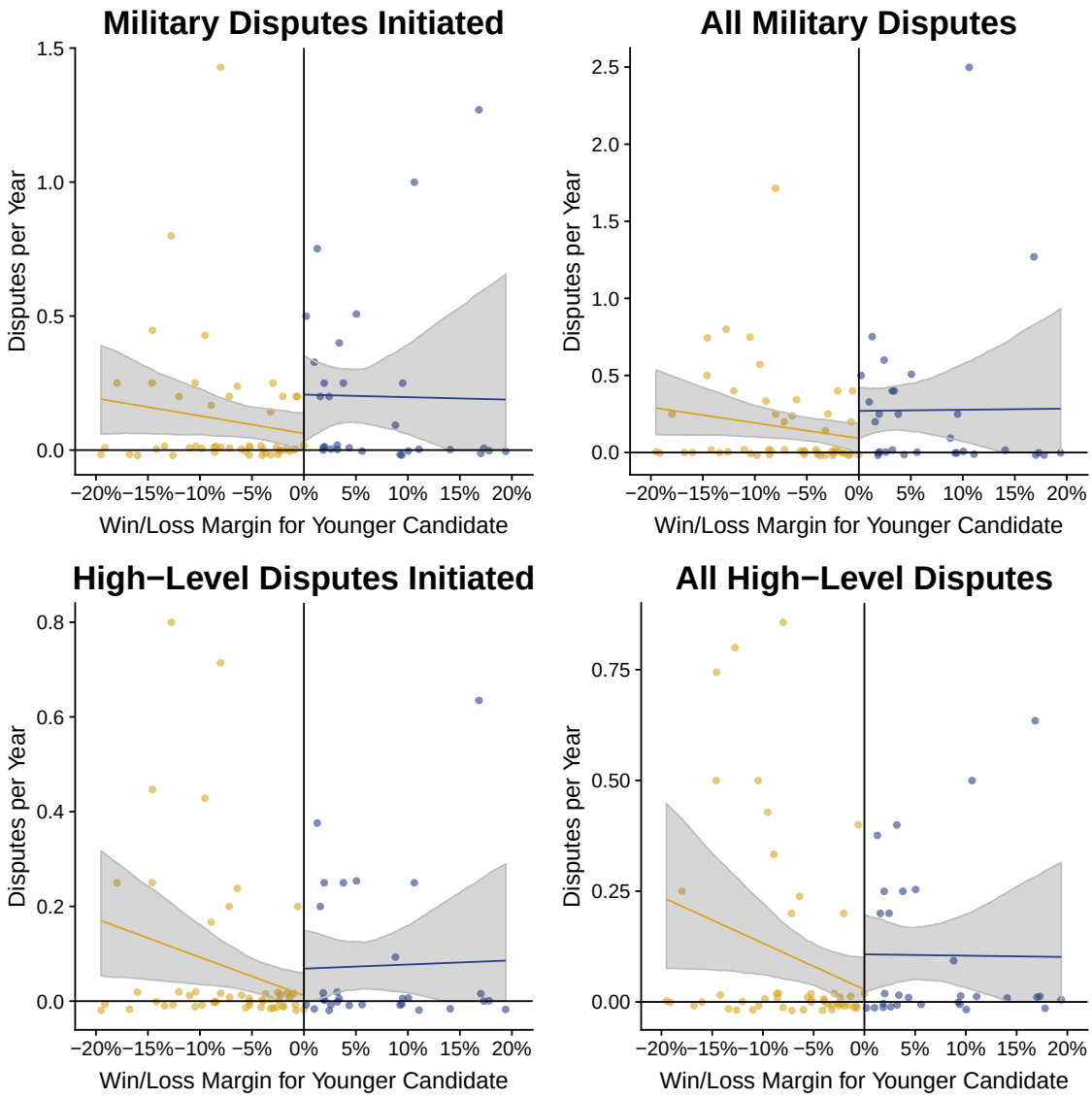
The results are also largely insensitive to our decision to look at cases in the 48%-52% range. For example, if we expand our sample to include cases in the 47%-53% range, our results become significant for all four of our measures of aggression at the 95% confidence level (n=42). Moreover, our results for disputes initiated are significant at the 95% level for local linear regression with the bandwidth set at 1% (p=0.022; n=15), 2% (p=0.014; n=33), 3% (p=0.029; n=42), 4% (p=0.025; n=47), and 5% (p=0.025; n=57).[4] They also remain significant for the **rdrobust** method developed by Calonico, Cattaneo, and Titiunik (2014), which is designed to correct for bias that can result from over-smoothing and to provide robust standard errors (p=0.028, n=45). A full presentation of the robustness checks can be found in the Supporting Information (S7-S12).

Figure 3 provides an illustration of the effect. As countries move from electing older leaders (on the left) to electing younger ones (on the right), they experience a notable change in their propensity to engage in military conflict. Consistent with the results from Figure 1, the discontinuity is a little more evident for all disputes than high-level disputes, which may simply be because there are not many high-level disputes. However, there is still a notable discontinuity for all four of our measures of aggression that can be seen by simply looking at how the raw data changes at the cut-point.

We also ran a separate test where we included all elections where the top two candidates were within 2% of the cut-point, regardless of their age difference (n=68). We then tracked how the estimated treatment effect changes as the difference in age between the two candidates increases. Figure 4 presents the results from this analysis. As the graph shows, the results strongly support our main hypothesis. When the candidates have a small difference

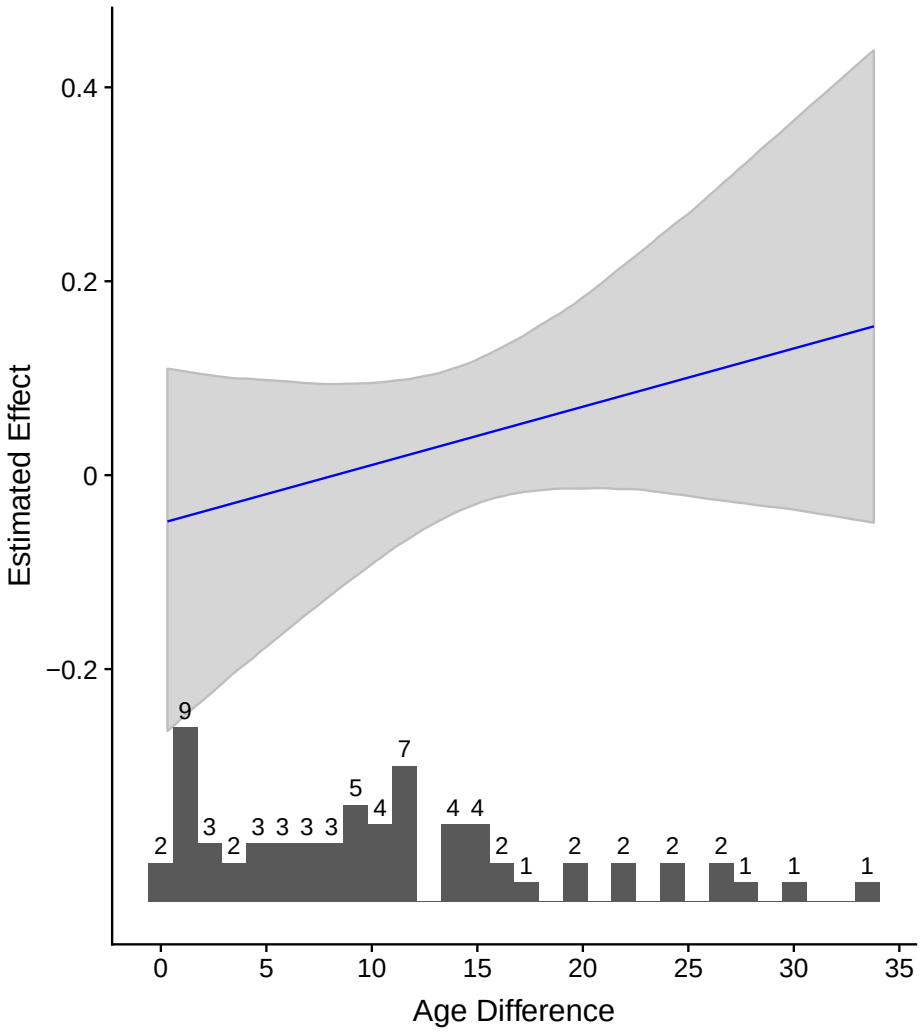
4. Local linear regression makes different assumptions than we do in our analysis. It avoids the "as-if" randomness assumption and instead assumes that the potential outcomes are smooth at the cut-point. For many scholars, it is the preferred way to analyze regression discontinuities (for example, see Eggers et al. 2015; Gelman and Imbens 2018). However, when we ran the power tests at the beginning of this project, we noticed that the false positive rate for local linear regression (specifically using the **rdrobust** software) was about 12% for our data. We therefore committed ourselves to t-tests in our pre-analysis plan, as they had a false-positive rate of about 5% in our power tests.

Figure 3. Visualizing the Discontinuity



Note: These graphs show a clear discontinuity as countries go from electing older leaders (on the left) to electing younger leaders (on the right). The confidence intervals were constructed using non-parametric bootstrapping. Points where y=0 were also jittered to make it easier to see the raw data.

Figure 4. The Estimated Effect as a Function of the Age Difference



Note: This graph shows that the estimated effect of electing younger leaders increases as the difference in the ages of the two candidates increases. The outcome variable here is the average number of military disputes that countries initiated per year. The results are very similar for our other three measures.

in age, the estimated effect is close to 0. However, as this age difference increases, so does the estimated effect. In other words, when the two candidates are about the same age, electing the younger candidate seems to have very little impact on state aggression. However, as the difference in age increases, electing the younger candidate appears to lead to a substantial increase in the propensity for countries to initiate military disputes.[5]

Lastly, for all four of our measures of aggression, our data strongly suggests that electing older leaders did not increase state aggression for the countries in our sample in any substantial way. For example, we can reject the null that electing older leaders increased dispute initiation for our countries by a small (p=0.010), medium-sized (p=0.002), or large (p<0.001) magnitude. We can also reject the notion that electing older leaders increased high-level dispute initiation by a small (p=0.033), medium (p=0.007), or large (p=0.001) magnitude. Therefore, our results cast much doubt on the idea that electing older leaders makes countries more likely to behave aggressively in international relations.

DISCUSSION

As we discussed earlier, the past finding that older leaders tend to be more likely to start conflicts than younger ones may be explained by older leaders being selected into more dangerous environments. In fact, in the datasets from both Horowitz, McDermott, and Stam (2005) and Horowitz, Stam, and Ellis (2015), the number of military disputes that a country engaged in the year before a leader came to office was highly predictive of the leader's age (p<0.001). However, since both studies controlled for various factors, they may have minimized this selection bias. We begin this section by considering the possibility that they did. However, we find that the specific statistical analyses from the two papers are unlikely to have sufficiently accounted for this bias.

5.Our exact method for calculating how the estimated treatment effect changes as the age difference increases was as follows: We first calculated the average number of military disputes that each country initiated per year. We then multiplied this number by -1 if the older candidate barely one. We next created a single $\{x, y\}$ point for each of the 68 cases, where x equaled the age difference between the two candidates and y equaled the average number of military disputes initiated per year (changed to a negative value if the older candidate barely won). We then used these points to construct the regression line in Figure 4. Therefore, when the value of the regression line is close to 0, it signifies that the younger candidates started about as many disputes per year as the older ones. However, as the value of the regression line increases (which occurs as the age gap gets larger), it means that the younger candidates started more military disputes per year than the older ones.

Figure 5. Evidence of Bias in Past Research

The key problem is that the statistical tests in both studies, which are intended to control for baseline factors, find that leader age affects conflict levels the year before the leader came to office. This pattern is illustrated in Figure 5. In the dataset from Horowitz, McDermott, and Stam (2005), there is a strong relationship between leader age and the past likelihood of military conflict that holds after controlling for the factors that the authors included in their model ($p<0.0001$). In the Horowitz, Stam, and Ellis (2015) data, we also find this strong relationship, even after controlling for all the factors that the authors included in their main analysis ($p=0.004$). Thus, if we were to believe that the statistical methods of these two studies sufficiently removed bias, we would have to conclude that the age of a country's leader had a strong causal impact on its propensity for military conflict in the past. In fact, according to the model from Horowitz, Stam, and Ellis (2015), leader age better explains past conflict than conflict during the leader's term. In our view, the most plausible explanation for this result is that the statistical models are not adequately addressing selection bias.

Let us now explore why the younger leaders in our dataset might have been more inclined to engage in military conflict than the older leaders. As we explained in the first section of the paper, researchers in several other disciplines have found a strong link between age and aggression, but they have not reached a clear consensus about what the

exact mechanism is. There are four main possibilities: (1) changes in emotion regulation, (2) testosterone decline, (3) changes in attention and focus, and (4) changes in amygdala activity. While it is beyond the scope of this paper to adjudicate between these potential mechanisms, we nevertheless can provide readers with a better understanding of our own data by discussing some of the observable differences between our younger and older leaders.

We actually found that the younger and older leaders in our sample were quite similar to each other. They were fairly well-balanced on party ideology (p=0.44), whether they had ever served in the military (p=0.86), and whether they had ever fought in a war (p=0.62). The younger and older leaders were also well-balanced on the occupational backgrounds that we looked at, including law (p=0.70), journalism (p=0.44), and medicine (p=0.86). We did find some notable differences: our older leaders were less likely to be married (p=0.16), tended to have more children (p=0.048), and were more likely to have been the incumbent (p=0.072). These differences are not too surprising. Moreover, our estimates and p-values remain largely unchanged when we control for these factors using regression, meaning that none of them are driving our results.[6]

In sum, the analysis presented in this paper provides strong evidence that younger leaders tend to be more inclined toward aggression than older leaders, but we cannot conclusively explain why. The similarities between our younger and older leaders across the observable factors that we collected data on suggests that the answer likely has to do with some mechanisms that have been proposed by psychologists and pysillologists. Such scholars are much better positioned to study individual human minds. Our contribution has been to show how the tendencies that they have identified manifest at the international level and shape world politics in important ways.

6. We acknowledge that the lack of balance on incumbency is concerning here, as a number of studies have found a link between new leaders and the likelihood and intensity of military conflict (Potter 2007; Wolford 2007; Wu and Wolford 2018; Bertoli, Dafoe, and Trager 2019; Smith and Spaniel 2019). However, we found no relationship between incumbency and dispute initiation in our data. Although new leaders tended to start slightly more military disputes per year than incumbents (p=0.48), both younger new leaders and younger incumbents started more military disputes per year on average than either older new leaders or older incumbents. Thus, the incumbency factor does not seem to be playing a pivotal role in our data.

CONCLUSION

In this paper, we use a natural experiment to test whether younger or older leaders tend to behave more aggressively in world politics. Consistent with much prior work on age and aggression, we find that younger leaders tend to be much more likely to engage in international conflict. The results are statistically significant for the procedures that we outlined in our pre-analysis plan, and they are also robust to a number of alternative specifications. However, they do contrast with the results of previous work in international relations, which finds that older leaders are more prone to engage in international conflict than younger ones. As we discussed before, in the vast literature on age and aggression that has been published by scholars in many other disciplines, there is to our knowledge not a single study that finds that aggressive tendencies increase over the adult lifespan. Our analysis of the two key datasets from international relations that produced the anomalous finding suggests that it may have been the result of selection bias as opposed to a true effect. Moreover, the results of our regression discontinuity approach indicate that electing younger leaders tends to make countries much more likely to engage in military conflict, consistent with the research in other fields.

Our findings have several important implications for the study of international relations and scientific research more generally. First, our results affirm the theory that youth may partly explain why some notable leaders of the past have launched aggressive military campaigns. For example, the wars of Alexander the Great, Napoleon Bonaparte, and Henry VIII may be partly explained by how young these leaders were when they came to power. Our findings should encourage historians and social scientists to take leader age very seriously when investigating the causes of international conflicts.

Second, these results suggest that the international community should be wary when young politicians come to power. These leaders appear much more likely to engage in military conflict than their older counterparts. In this study, we found a large difference between candidates who were mostly in their early 50s or younger compared to candidates who were mostly in their late 60s or over. Increased awareness that younger leaders tend to be more likely to use military force abroad could help avert conflicts in the future.

Third, this study highlights the importance of examining how the personal characteristics of leaders can impact international relations. Our large effect-sizes suggest that who

rules a country does have a major impact on that country's foreign policy. Therefore, social scientists should continue searching for leader characteristics that may be important drivers of state behavior. Such studies could shed light on the underlying causes of past wars, as well as make it easier to predict military conflict in the future.

SUPPORTING INFORMATION

Additional information may be found in the Supporting Information.

Appendix A: Further Information About Methods

Appendix B: Design Checks

Appendix C: Robustness Checks

Appendix D: Alternative Research Designs

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