

Appendix to
Public Opinion and Nuclear Use: Evidence from
Factorial Experiments

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A Summary of Previous Designs

Table A.1: Variation in advantages and disadvantages in existing experimental research.

Study	Same side effects			Nuclear worse side effects			D-in-D
	Equally effective	Nuclear more effective	Diff.	Equally effective	Nuclear more effective	Diff.	
PSV 2013	18.9%	51.4%	32.5%	-	39%	-	-
SV 2017	-	55.6%	-	-	47.7%	-	-
RS 2020	15.5%	45.6%	30.1%	-	-	-	-
KW 2020	-	22%	-	-	14%	-	-
CM 2020	-	54%	-	-	46%	-	-

Note: Table shows point estimates on subject preference for nuclear use when (1) nuclear weapons offer military advantages but have worse side effect, (2) when nuclear weapons offer military advantages and have similar side effects to a conventional alternative, (3) when nuclear weapons offer no military advantages and have worse side effects, and (4) when nuclear weapons have no military advantages and similar side effects to a conventional alternative. PSV stands for [Press et al. \(2013\)](#), SV for [Sagan and Valentino \(2017\)](#), RS for [Rathbun and Stein \(2020\)](#), KW for [Koch and Wells \(2020\)](#), CM for [Carpenter and Montgomery \(2020\)](#). “D-in-D” stands for difference-in-differences. One study that we reference in the literature review but that is not listed here is ([Haworth et al. 2019](#)). This is because they do not present a choice to respondents between a conventional and a nuclear strike, only a choice of whether to strike or not, with one of the treatments being weapon type.

B Survey Information

B.1 Vignette Experiment Design

Table B.1: Design Table, vignette experiments.

		$d = 0$		$d = 1$	
		Equal chance of success, equal destruction		Equal chance of success, nuclear more destructive	
		<i>Nuke</i>	<i>Conv.</i>	<i>Nuke</i>	<i>Conv.</i>
$s = 0$	<i>Success</i>	90%	90%	<i>Success</i>	90%
	<i>Civilians</i>	1,000	1,000	<i>Civilians</i>	100
	<i>Damage</i>	Minimal	Minimal	<i>Damage</i>	Severe
	<i>Backlash</i>	No	No	<i>Backlash</i>	No
		Nuke better chance, equal destruction		Nuke better chance, nuclear more destructive	
		<i>Nuke</i>	<i>Conv.</i>	<i>Nuke</i>	<i>Conv.</i>
$s = 1$	<i>Success</i>	90%	70%	<i>Success</i>	90%
	<i>Civilians</i>	1,000	1,000	<i>Civilians</i>	100
	<i>Damage</i>	Minimal	Minimal	<i>Damage</i>	Severe
	<i>Backlash</i>	No	No	<i>Backlash</i>	No

B.2 Comparison Table, Vignette Experiments

Table B.2: Comparison between Press, Sagan, and Valentino (2013) and this paper

Design Element	PSV (2013)	Pilot	Main Study
Treatment groups	(1) Equal chance of success (2) Nuclear 0.9, conventional 0.7 (3) Nuclear 0.9, conventional 0.45	(1) Equal chance of success (2) Nuclear better chance	(1) Equal chance of success, equal collateral damage ($s = 0, d = 0$) (2) Nuclear 0.9, conventional 0.7, equal collateral damage ($s = 1, d = 0$) (3) Equal chance of success, nuclear more destructive ($s = 0, d = 1$) (4) Nuclear 0.9, conventional 0.7, nuclear more destructive ($s = 1, d = 1$)
Consequences of failure	Possible al-Qaeda nuclear attack on U.S. homeland	Possible al-Qaeda nuclear attack on U.S. homeland	Possible al-Qaeda nuclear attack on U.S. homeland
Syrian civilian deaths	1,000 for both nuclear and conventional strike options	1,000 for nuclear strike and 100 for conventional strike	If $d = 0$: 1,000 for both. If $d = 1$: 1,000 for nuclear and 100 for conventional.
Environmental damage	Not mentioned for either strike option	None for conventional option, substantial for nuclear option	If $d = 0$: Not mentioned. If $d = 1$: substantial damage.
Approval of allies	Not mentioned	Not mentioned	If $d = 0$: not mentioned. If $d = 1$: may provoke disapproval.
U.S. military casualties	None	None	None

Note: A downside of focusing on the difference between two treatment effects is that statistical power is limited. To boost our power to detect differences between the two conditions, we elected not to include a scenario in which conventional weapons were only 45 percent effective, which was included in Press et al. (2013). The 30+ percentage point treatment effect for strike preference shown in Press et al. (2013) when conventional weapons were varied from 90 to 70 percent effectiveness gives us further confidence that omitting the 45 percent scenario does not constitute under-dosing the probability of success treatment.

B.3 Vignette Screen Shots

Figure B.1: Pilot, Equal Probability of Success

Joint Chiefs Report Concludes Nuclear and Conventional Options for Destroying Al Qaeda Nuke Lab Equally Effective

But Nuclear Option Expected to Result in Far Greater Civilian Casualties and Environmental Destruction

The Associated Press

A report from General Joseph Dunford, Chairman of the Joint Chiefs of Staff, to the President concludes that military strikes using either nuclear or conventional weapons would be “equally effective” in destroying an Al Qaeda nuclear weapons facility in Syria. However, a nuclear strike could kill 10 times as many civilians as a conventional strike and result in widespread environmental destruction, possibly provoking international outrage.

The report compares two American military options, a conventional strike using nearly one hundred conventionally-armed cruise missiles, and an attack using two nuclear-armed cruise missiles. The report estimates that both options have a high probability of successfully destroying the Al Qaeda nuclear weapons lab.

Conventional and nuclear options would be “equally effective” in destroying the deeply buried target

The Joint Chiefs’ assessment comes two weeks after Russian intelligence agents intercepted a shipment of centrifuges and low-enriched uranium, which could be used to produce nuclear weapons. The bomb-making equipment was being smuggled out of Russia to an Al Qaeda facility located near the town of Al-Safih in northern Syria.

The suspects in the smuggling operations were employed at a Russian nuclear lab. The smugglers confirmed under questioning that other shipments of centrifuges and low-enriched uranium had already been delivered to the Al Qaeda base, where the centrifuges are being used to make fuel for a nuclear bomb. The smugglers stated that there will be enough bomb grade material produced for at least one weapon within several months. Syria has refused to allow international inspectors access to the facility.

The Joint Chiefs’ report to the President does not recommend a specific course of action. However, it concludes that “because the Al Qaeda facility is comprised of a series

of deeply buried bunkers, a strike would require either large numbers of conventional missiles, or two nuclear weapons, to destroy the facility.” Either option would have a strong chance of success, according to the report.

The report was leaked to the Associated Press by a high-ranking administration official involved in planning the strike. According to the official, the centrifuges and nuclear materials are too large to be moved without detection. For this reason, a US intelligence official stated that he has high confidence that there would be an opportunity to conduct additional strikes if an initial attack failed to fully destroy the target.

Intelligence indicates that there would be time to conduct a follow-on strike should initial attack fail to fully destroy weapons lab

Dr. David Wright, a nuclear weapons expert at the Union of Concerned Scientists, an independent think-tank based in Washington, D.C., said that it was possible that Al Qaeda would seek to target the US homeland if the group acquired nuclear weapons.

The report states that although the location of the Al Qaeda facility is remote, the destructive power of nuclear weapons would result in significantly more Syrian civilian fatalities than the conventional option. Military planners estimate 100 civilian casualties from a conventional strike, compared with 1,000 or more from a nuclear attack. Moreover, in addition to destroying much of the city, radiation from a nuclear strike could harm additional civilians not killed in the initial blast and would make the surrounding area uninhabitable for a year or more.

Nuclear option could kill 10 times as many civilians as the conventional strike, cause widespread environmental damage

Given the collateral damage expected from the nuclear option, some military and diplomatic officials fear that a nuclear strike could provoke condemnation in the international community. As both operations will rely on cruise missiles launched from U.S. naval vessels, the report concludes “no U.S. military personnel are at risk in either operation.”

Figure B.2: Pilot, Nuclear Higher Probability of Success

Joint Chiefs Report Concludes Nuclear Option Only Provides Moderate Increase in Chances of Destroying Nuke Lab Over Conventional Strike

Nuclear Option Would Also Result in Far Greater Civilian Casualties and Environmental Destruction

The Associated Press

A report from General Joseph Dunford, Chairman of the Joint Chiefs of Staff, to the President concludes that a military strike using nuclear weapons would be “moderately more effective” than a strike using conventional weapons in destroying an Al Qaeda nuclear weapons facility in Syria. However, a nuclear strike could kill 10 times as many civilians as a conventional strike and result in widespread environmental destruction, possibly provoking international outrage.

The report compares two American military options, a conventional strike using nearly one hundred conventionally-armed cruise missiles, and an attack using two nuclear-armed cruise missiles. The report estimates that both options have a relatively high probability of success, with the nuclear option judged to offer a moderate increase in the chances of destroying the Al Qaeda nuclear weapons lab.

Nuclear weapons would be “moderately more effective” in destroying the deeply buried target

The Joint Chiefs’ assessment comes two weeks after Russian intelligence agents intercepted a shipment of centrifuges and low-enriched uranium, which could be used to produce nuclear weapons. The bomb-making equipment was being smuggled out of Russia to an Al Qaeda facility located near the town of Al-Safih in northern Syria.

The suspects in the smuggling operations were employed at a Russian nuclear lab. The smugglers confirmed under questioning that other shipments of centrifuges and low-enriched uranium had already been delivered to the Al Qaeda base, where the centrifuges are being used to make fuel for a nuclear bomb. The smugglers stated that there will be enough bomb grade material produced for at least one weapon within several months. Syria has refused to allow international inspectors access to the facility.

The Joint Chiefs’ report to the President does not recommend a specific course of action. However, it concludes

that “because the Al Qaeda facility is comprised of a series of deeply buried bunkers, a strike would require either large numbers of conventional missiles, or two nuclear weapons, to destroy the facility.”

The report was leaked to the Associated Press by a high-ranking administration official involved in planning the strike. According to the official, the centrifuges and nuclear materials are too large to be moved without detection. For this reason, a US intelligence official stated that he has high confidence that there would be an opportunity to conduct additional strikes if an initial attack failed to fully destroy the target.

Intelligence indicates that there would be time to conduct a follow-on strike should initial attack fail to fully destroy weapons lab

Dr. David Wright, a nuclear weapons expert at the Union of Concerned Scientists, an independent think-tank based in Washington, D.C., said that it was possible that Al Qaeda would seek to target the US homeland if the group acquired nuclear weapons.

The report states that although the location of the Al Qaeda facility is remote, the destructive power of nuclear weapons would result in significantly more Syrian civilian fatalities than the conventional option. Military planners estimate 100 civilian casualties from a conventional strike, compared with 1,000 or more from a nuclear attack. Moreover, in addition to destroying much of the city, radiation from a nuclear strike could harm additional civilians not killed in the initial blast and would make the surrounding area uninhabitable for a year or more.

Nuclear option could kill 10 times as many civilians as the conventional strike, cause widespread environmental damage

Given the collateral damage expected from the nuclear option, some military and diplomatic officials fear that a nuclear strike could provoke condemnation in the international community. As both operations will rely on cruise missiles launched from U.S. naval vessels, the report concludes “no U.S. military personnel are at risk in either operation.”

Figure B.3: Main Study, Equal Probability of Success, Equal Collateral Damage ($s = 0$, $d = 0$)

Joint Chiefs Report: Nuclear and Conventional Options for Destroying Al Qaeda Nuke Lab Equally Effective

Expected Civilian Casualties, Physical Destruction Equivalent for Both Options

The Associated Press

A report from General Mark Milley, Chairman of the Joint Chiefs of Staff, to the President concludes that military strikes using nuclear or conventional weapons would be “equally effective” in destroying an Al Qaeda nuclear weapons facility in Syria. The nuclear and conventional strike options would cause equal levels of civilian casualties and environmental destruction.

The report compares two American military options, a conventional strike using nearly one hundred conventionally-armed cruise missiles, and an attack using two nuclear weapons. The report estimates that both options have a 90 percent chance of successfully destroying the Al Qaeda nuclear weapons lab.

Conventional and nuclear weapons would be “equally effective” against the buried Al Qaeda nuclear weapons base.

The Joint Chiefs’ assessment comes two weeks after intelligence agents intercepted a shipment of centrifuges and low-enriched uranium, which could be used to produce nuclear weapons. The bomb-making equipment was being smuggled out of Russia to an Al Qaeda facility located near the town of Al-Safih in northern Syria.

The suspects in the smuggling operations were employed at a Russian nuclear lab. The smugglers confirmed under questioning that other shipments of centrifuges and low-enriched uranium had already been delivered to the Al Qaeda base, where the centrifuges are being used to make fuel for a nuclear bomb. The smugglers stated that there will be enough bomb grade material produced for at least one weapon within several months. Syria has refused to allow international inspectors access to the facility.

The Joint Chiefs’ report to the President does not recommend a specific course of action. However, it concludes that “because the Al Qaeda facility is comprised of a series of deeply buried bunkers, a strike would require either large numbers of conventional missiles, or two nuclear

weapons, to destroy the facility.” Either option would have roughly a 90 percent chance of success, according to the report.

The report was leaked to the Associated Press by a high-ranking administration official involved in planning the strike. According to the official, the centrifuges and nuclear materials are too large to be moved without detection. A U.S. intelligence official states that he has high confidence that Al Qaeda is within months of producing an operational nuclear bomb. After that, the official said, “all bets are off.”

Target: Al Qaeda Nuclear Lab		
	U.S. Nuclear Strike	U.S. Conventional Strike
Probability of Success	90%	90%
Estimated Syrian Civilian Deaths	1,000	1,000

Chart from Joint Chiefs’ report describing nuclear and conventional options for strike on Al Qaeda nuclear lab.

According to Dr. David Wright, a nuclear weapons expert at the Union of Concerned Scientists, an independent think-tank based in Washington, D.C., “If a bomb of this size exploded in New York City, it could easily kill 50,000 to 70,000 people.”

The report states that the remote location of the Al Qaeda facility should limit Syrian civilian fatalities for either option. Because many conventional weapons would be required to destroy the Al Qaeda base, the report estimates that “the two options would kill approximately the same number of Syrian civilians” – about 1,000, including immediate deaths and long term consequences of the conventional or nuclear strikes. The nuclear and conventional options would also cause roughly the same amount of physical and environmental damage.

Nuclear and conventional options would kill the same number of civilians, cause equivalent environmental harm

Neither strike option would rely on U.S. ground forces. For this reason, the report concludes that “no U.S. military personnel are at risk in either operation.”

Figure B.4: Main Study, Nuclear Higher Probability of Success, Equal Collateral Damage ($s = 1, d = 0$)

Joint Chiefs Report: Nuclear Option Provides Moderate Increase in Chances of Destroying Al Qaeda Nuke Lab

Expected Civilian Casualties, Physical Destruction Equivalent for Both Options

The Associated Press

A report from General Mark Milley, Chairman of the Joint Chiefs of Staff, to the President concludes that nuclear weapons would be “moderately more effective” than conventional strikes in destroying an Al Qaeda nuclear weapons facility in Syria. The nuclear and conventional strike options would cause equal levels of civilian casualties and environmental destruction.

The report compares two American military options, a conventional strike using nearly one hundred conventionally-armed cruise missiles, and an attack using two nuclear weapons. The report estimates that the conventional strike has a 70 percent chance of successfully destroying the atomic bomb lab while nuclear weapons increases the chances of success to approximately 90 percent.

Nuclear weapons would be “moderately more effective” against this deeply buried target.

The Joint Chiefs’ assessment comes two weeks after intelligence agents intercepted a shipment of centrifuges and low-enriched uranium, which could be used to produce nuclear weapons. The bomb-making equipment was being smuggled out of Russia to an Al Qaeda facility located near the town of Al-Safih in northern Syria.

The suspects in the smuggling operations were employed at a Russian nuclear lab. The smugglers confirmed under questioning that other shipments of centrifuges and low-enriched uranium had already been delivered to the Al Qaeda base, where the centrifuges are being used to make fuel for a nuclear bomb. The smugglers stated that there will be enough bomb grade material produced for at least one weapon within several months. Syria has refused to allow international inspectors access to the facility.

The Joint Chiefs’ report to the President does not recommend a specific course of action. However, it concludes that “because the Al Qaeda facility is comprised of a series

of deeply buried bunkers, nuclear weapons would be more effective for destroying this target.”

The report was leaked to the Associated Press by a high-ranking administration official involved in planning the strike. According to the official, the centrifuges and nuclear materials are too large to be moved without detection. A U.S intelligence official states that he has high confidence that Al Qaeda is within months of producing an operational nuclear bomb. After that, the official said, “all bets are off.”

Target: Al Qaeda Nuclear Lab		
	U.S. Nuclear Strike	U.S. Conventional Strike
Probability of Success	90%	70%
Estimated Syrian Civilian Deaths	1,000	1,000

Chart from Joint Chiefs’ report describing nuclear and conventional options for strike on Al Qaeda nuclear lab.

According to Dr. David Wright, a nuclear weapons expert at the Union of Concerned Scientists, an independent think-tank based in Washington, D.C., “If a bomb of this size exploded in New York City, it could easily kill 50,000 to 70,000 people.”

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Nuclear and conventional options would kill the same number of civilians, cause equivalent environmental harm

Neither strike option would rely on U.S. ground forces. For this reason, the report concludes that “no U.S. military personnel are at risk in either operation.”

Figure B.5: Main Study, Equal Probability of Success, Nuke More Collateral Damage ($s = 0$, $d = 1$)

Joint Chiefs Report: Nuclear and Conventional Options for Destroying Al Qaeda Nuke Lab Equally Effective

Nuclear Option Expected to Result in Far Greater Civilian Casualties and Environmental Destruction

The Associated Press

A report from General Mark Milley, Chairman of the Joint Chiefs of Staff, to the President concludes that military strikes using either nuclear or conventional weapons would be “equally effective” in destroying an Al Qaeda nuclear weapons facility in Syria. However, a nuclear strike could kill 10 times as many civilians as a conventional strike and result in widespread environmental destruction, possibly leading to criticism from American allies.

The report compares two American military options, a conventional strike using nearly one hundred conventionally-armed cruise missiles, and an attack using two nuclear weapons. The report estimates that both options have a 90 percent chance of successfully destroying the Al Qaeda nuclear weapons lab.

Conventional and nuclear options would be “equally effective” against the buried Al Qaeda nuclear weapons base.

The Joint Chiefs’ assessment comes two weeks after intelligence agents intercepted a shipment of centrifuges and low-enriched uranium, which could be used to produce nuclear weapons. The bomb-making equipment was being smuggled out of Russia to an Al Qaeda facility located near the town of Al-Safih in northern Syria.

The suspects in the smuggling operations were employed at a Russian nuclear lab. The smugglers confirmed under questioning that other shipments of centrifuges and low-enriched uranium had already been delivered to the Al Qaeda base, where the centrifuges are being used to make fuel for a nuclear bomb. The smugglers stated that there will be enough bomb grade material produced for at least one weapon within several months. Syria has refused to allow international inspectors access to the facility.

The Joint Chiefs’ report to the President does not recommend a specific course of action. However, it concludes that “because the Al Qaeda facility is comprised of a series of deeply buried bunkers, a strike would require either large numbers of conventional missiles, or two

nuclear weapons, to destroy the facility.” Either option would have roughly a ninety percent chance of success, according to the report.

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Target: Al Qaeda Nuclear Lab		
	U.S. Nuclear Strike	U.S. Conventional Strike
Probability of Success	90%	90%
Estimated Syrian Civilian Deaths	1,000	100

Chart from Joint Chiefs’ report describing nuclear and conventional options for strike on Al Qaeda nuclear lab.

According to Dr. David Wright, a nuclear weapons expert at the Union of Concerned Scientists, an independent think-tank based in Washington, D.C., “If a bomb of this size exploded in New York City, it could easily kill 50,000 to 70,000 people.”

The report states that despite the remote location of the Al Qaeda facility, the destructive power of nuclear weapons would result in significantly more Syrian civilian fatalities than the conventional option. Military planners estimate 100 civilian deaths from a conventional strike, compared with 1,000 or more from a nuclear attack. Moreover, in addition to destroying much of the city, radiation from a nuclear strike could have negative health consequences for the local populace and would make the surrounding area uninhabitable for a year or more.

Nuclear option could kill 10 times as many civilians as the conventional strike, cause widespread environmental damage

Given the collateral damage expected from the nuclear option, some military and diplomatic officials fear that a nuclear strike could provoke condemnation from some U.S. partners and allies.

Neither strike option would rely on U.S. ground forces. For this reason, the report concludes that “no U.S. military personnel are at risk in either operation.”

Figure B.6: Main Study, Nuclear Higher Probability of Success, Nuclear More Collateral Damage ($s = 1, d = 1$)

Joint Chiefs Report: Nuclear Option Provides Moderate Increase in Chances of Destroying Al Qaeda Nuke Lab

Nuclear Option Expected to Result in Far Greater Civilian Casualties and Environmental Destruction

The Associated Press

A report from General Mark Milley, Chairman of the Joint Chiefs of Staff, to the President concludes that nuclear weapons would be “moderately more effective” than conventional strikes in destroying an Al Qaeda nuclear weapons facility in Syria. However, a nuclear strike could kill 10 times as many civilians as a conventional strike and result in widespread environmental destruction, possibly leading to criticism from American allies.

The report compares two American military options, a conventional strike using nearly one hundred conventionally-armed cruise missiles, and an attack using two nuclear weapons. The report estimates that the conventional strike has a 70 percent chance of successfully destroying the atomic bomb lab while nuclear weapons increases the chances of success to approximately 90 percent.

Nuclear weapons would be “moderately more effective” against this deeply buried target.

The Joint Chiefs’ assessment comes two weeks after intelligence agents intercepted a shipment of centrifuges and low-enriched uranium, which could be used to produce nuclear weapons. The bomb-making equipment was being smuggled out of Russia to an Al Qaeda facility located near the town of Al-Safih in northern Syria.

The suspects in the smuggling operations were employed at a Russian nuclear lab. The smugglers confirmed under questioning that other shipments of centrifuges and low-enriched uranium had already been delivered to the Al Qaeda base, where the centrifuges are being used to make fuel for a nuclear bomb. The smugglers stated that there will be enough bomb grade material produced for at least one weapon within several months. Syria has refused to allow international inspectors access to the facility.

The Joint Chiefs’ report to the President does not recommend a specific course of action. However, it concludes that “because the Al Qaeda facility is comprised of a series of deeply buried bunkers, nuclear weapons would be more

effective for destroying this target.”

The report was leaked to the Associated Press by a high-ranking administration official involved in planning the strike. According to the official, the centrifuges and nuclear materials are too large to be moved without detection. A U.S. intelligence official states that he has high confidence that Al Qaeda is within months of producing an operational nuclear bomb. After that, the official said, “all bets are off.”

Target: Al Qaeda Nuclear Lab		
	U.S. Nuclear Strike	U.S. Conventional Strike
Probability of Success	90%	70%
Estimated Syrian Civilian Deaths	1,000	100

Chart from Joint Chiefs’ report describing nuclear and conventional options for strike on Al Qaeda nuclear lab.

According to Dr. David Wright, a nuclear weapons expert at the Union of Concerned Scientists, an independent think-tank based in Washington, D.C., “If a bomb of this size exploded in New York City, it could easily kill 50,000 to 70,000 people.”

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Nuclear option could kill 10 times as many civilians as the conventional strike, cause widespread environmental damage

Given the collateral damage expected from the nuclear option, some military and diplomatic officials fear that a nuclear strike could provoke condemnation from some U.S. partners and allies.

Neither strike option would rely on U.S. ground forces. For this reason, the report concludes that “no U.S. military personnel are at risk in either operation.”

Figure B.7: PSV, Equal Probability of Success

Joint Chiefs Report Concludes Nuclear and Conventional Options for Destroying Al Qaeda Nuke Lab Equally Effective

Expected Civilian Casualties, Physical Destruction Equivalent for Both Options

The Associated Press

A report from Admiral Mike Mullen, Chairman of the Joint Chiefs of Staff, to the President concludes that military strikes using nuclear or conventional weapons would be "equally effective" in destroying an Al Qaeda nuclear weapons facility in Syria.

The report compares two American military options, a conventional strike using nearly one hundred conventionally-armed cruise missiles, and an attack using two small, nuclear-armed cruise missiles. The report estimates that both options have a 90 percent chance of successfully destroying the Al Qaeda nuclear weapons lab.

The Joint Chiefs' assessment comes two weeks after Russian intelligence agents intercepted a shipment of centrifuges and low-enriched uranium which could be used to produce nuclear weapons. The bomb-making equipment was being smuggled out of Russia to an Al Qaeda facility located

near the remote town of As-Safih in northern Syria.

The suspects in the smuggling operation were employed at a Russian nuclear lab. The smugglers confirmed under questioning that other shipments of centrifuges and low-enriched uranium had already been delivered to the Al Qaeda base, where the centrifuges are being used to make fuel for a nuclear bomb. The smugglers stated that there will be enough bomb grade material produced for at least one weapon within two weeks. Syria has refused to allow international inspectors access to the facility.

"Conventional and nuclear options would be equally effective against the buried Al Qaeda nuclear weapons base."

The Joint Chiefs' report to the President does not recommend a specific course of action. However, it concludes that "because the Al Qaeda facility is comprised of a series of deeply buried bunkers, a strike would require either large numbers of conventional missiles, or two nuclear weapons, to

destroy the facility." Either option would have roughly a ninety percent chance of success, according to the report.

The report was leaked to the Associated Press by a high-ranking administration official involved in planning the strike. According to the official, the centrifuges and nuclear materials are too large to be moved without detection. A US intelligence official stated that he has high confidence that al Qaeda is within two weeks of producing an operational bomb. After that, the official said, "all bets are off."

According to Dr. David Wright, a nuclear weapons expert at the Union of Concerned Scientists, an independent think-tank based in Washington, D.C., "If a bomb of

this size exploded in New York City, it could easily kill 50,000 to 70,000 people."

The report states that the remote location of the Al Qaeda facility should limit Syrian civilian fatalities for either option. Because many conventional weapons would be required to destroy the Al Qaeda base, the report estimates that "the two options would kill approximately the same number of Syrian civilians" – about 1,000, including immediate deaths and long term consequences of the conventional or nuclear strike. As both options will rely on cruise missiles launched from U.S. naval vessels, the report concludes that "no U.S. military personnel are at risk in either operation."

TARGET: AL QAEDA NUCLEAR WEAPONS LAB		
	U.S. NUCLEAR STRIKE	U.S. CONVENTIONAL STRIKE
PROBABILITY OF SUCCESS	90%	90%
ESTIMATED SYRIAN CIVILIAN DEATHS	1,000	1,000

IF U.S. STRIKE FAILS: 50,000 - 70,000 U.S. CIVILIAN FATALITIES

Chart from Joint Chiefs' report describing nuclear and conventional options for strike on Al Qaeda nuclear lab.

Figure B.8: PSV, Nuclear Higher Probability of Success

Al Qaeda Building Atomic Bombs in Syria: Joint Chiefs Say U.S. Nuclear Options Only Provide Small Increase in Chances Of Destroying Nuke Lab

Chiefs Conclude Nuclear Option Has 90% Chance of Success, Conventional 70%

The Associated Press

A report from Admiral Mike Mullen, Chairman of the Joint Chiefs of Staff, to the President concludes that nuclear weapons would be “moderately more effective” than conventional strikes in destroying an Al Qaeda nuclear weapons facility in Syria.

The report compares two American military options, a conventional strike using nearly one hundred conventionally-armed cruise missiles, and an attack using two small nuclear-armed cruise missiles. The report estimates that the conventional strike has a 70 percent chance of successfully destroying the atomic bomb lab while nuclear weapons increase the chances of success to approximately 90 percent.

The Joint Chiefs’ assessment comes two weeks after Russian intelligence agents intercepted a shipment of centrifuges and low-enriched uranium that could be used to produce nuclear weapons.

The bomb-making equipment was being smuggled out of Russia to an Al Qaeda facility located near the remote town of As-Safih in northern Syria.

The suspects in the smuggling operation were employed at a Russian nuclear lab. The smugglers confirmed under questioning that other shipments of centrifuges and low-enriched uranium had already been delivered to the Al Qaeda base, where the centrifuges are being used to make fuel for a nuclear bomb. The smugglers stated that there will be enough bomb grade material produced for at least one weapon within two weeks. Syria has refused to allow international inspectors access to the facility.

“Nuclear weapons would be moderately more effective against this deeply buried target.”

The Joint Chiefs’ report to the President does not recommend a specific course of action. However, it concludes that “because the Al Qaeda facility is comprised of a series of deeply buried bunkers, nuclear weapons would be more effective for destroying this

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TARGET: AL QAEDA NUCLEAR WEAPONS LAB		
	U.S. NUCLEAR STRIKE	U.S. CONVENTIONAL STRIKE
PROBABILITY OF SUCCESS	90%	70%
ESTIMATED SYRIAN CIVILIAN DEATHS	1,000	1,000

If U.S. STRIKE FAILS: 50,000 - 70,000 U.S. CIVILIAN FATALITIES

Chart from Joint Chiefs’ report describing nuclear and conventional options for strike on Al Qaeda nuclear lab.

B.4 Conjoint Experiment Details

In the choice experiments, each strike had six characteristics:

1. type of strike (conventional or nuclear)
2. chance of success (90 or 70 percent)
3. U.S. military casualties (minimal, low, or high)
4. civilian casualties (about 10, 100, or 1,000)
5. environmental damage (minimal, moderate, or high)
- 6a. approval of U.S. allies (few or most; main study only)
- 6b. chance for a follow-up strike (yes or no; pilot study only)

The pilot’s choice experiment assigned all attribute combinations with equal probability, as did six of the twelve tasks in the main study. We examine the results of these experiments in Appendix D.5.

In the main text, we focus on the six main study choices that restricted the randomization so as not to allow unrealistic combinations of attributes. The restricted randomization was conducted as follows. First, we restricted our attention to combinations of attributes that meet the following rules:

- The nuclear strike always kills at least as many civilians as the conventional strike.
- The nuclear strike always causes at least as much environmental damage.
- The nuclear strike never has greater approval among allies.
- The nuclear strike always has at least as large a chance of success.
- The nuclear strike never results in more U.S. military casualties.
- All strikes are nuclear versus conventional.

We then grouped the remaining possible scenarios into sixteen groups representing all possible combinations of the three variables that enter our pre-registered regression test: M_i (military casualties, values: 0 or 1), S_i (chance of success, values: 0 or 1), and D_i (number of disadvantages, values: 0, 1, 2, or 3). All sixteen combinations are listed in Table D.2. For each respondent, six of these groups were randomly selected with equal probability and without replacement. Within each group, one combination was then selected with equal probability.

B.5 Survey Text

Below we provide, verbatim, the questions that we asked subjects in the pilot and main study. For ease of comparison, the survey experiment questions are near-identical to those used by Press and colleagues.

Pilot, Survey Experiment

1. Demographic questions (pre-vignette)
2. Given the facts described in the article, if the United States decided to conduct a nuclear strike to destroy the Al Qaeda base, how much would you approve or disapprove of the U.S. military action? (Strongly disapprove, disapprove, somewhat disapprove, somewhat approve, approve, strongly approve)
3. Given the facts described in the article, if the United States decided to conduct a conventional strike to destroy the Al Qaeda base, how much would you approve or disapprove of the U.S. military action? (Strongly disapprove, disapprove, somewhat disapprove, somewhat approve, approve, strongly approve)
4. If you had to choose between one of the two U.S. military options described in the article, would you prefer the nuclear strike or the conventional strike? (Strongly prefer the conventional strike, somewhat prefer the conventional strike, somewhat prefer the nuclear strike, strongly prefer the nuclear strike)
5. You said you preferred a conventional (nuclear) strike by the United States. In a sentence or two, please say why you preferred a conventional (nuclear) strike.
6. Regardless of which option you preferred, how ethical or unethical do you think it would be if the United States decided to use nuclear weapons in this situation (Highly ethical, ethical, somewhat ethical, somewhat unethical, unethical, highly unethical)

Pilot, Conjoint

On the transition page between last survey experiment question and the conjoint tasks, respondents saw the following text:

“Now imagine a scenario similar to the one described in the news article. Again, an Al Qaeda cell is operating a nuclear weapons lab in a remote town in Syria, and is developing a weapon that could be used against American civilians. However, the strike options available are different from those indicated in the article.

“Over the next five questions, you will be asked to choose between two strike options. In each case, you will be informed about the characteristics of each strike along several dimensions.”

For each conjoint task, subjects saw the strike comparisons and the following text: “Please carefully review the options detailed below, then indicate which of the two strikes you prefer. Which of these strike options do you prefer?”

Main Study, Survey Experiment

1. Demographic questions (pre-vignette)
2. Given the facts described in the article, if the United States decided to conduct a nuclear strike to destroy the Al Qaeda base, how much would you approve or disapprove of the U.S. military action? (Strongly disapprove, disapprove, somewhat disapprove, somewhat approve, approve, strongly approve)
3. Given the facts described in the article, if the United States decided to conduct a conventional strike to destroy the Al Qaeda base, how much would you approve or disapprove of the U.S. military action? (Strongly disapprove, disapprove, somewhat disapprove, somewhat approve, approve, strongly approve)
4. If you had to choose between one of the two U.S. military options described in the article, would you prefer the nuclear strike or the conventional strike? (Strongly prefer the conventional strike, somewhat prefer the conventional strike, somewhat prefer the nuclear strike, strongly prefer the nuclear strike)
5. You said you preferred a conventional (nuclear) strike by the United States. In a sentence or two, please say why you preferred a conventional (nuclear) strike.
6. Regardless of which strike option you preferred, how realistic did you find the scenario described in the article? (Not very realistic, somewhat realistic, very realistic)

Note: We randomized whether subjects were asked about their approval or their preference first (i.e., whether subjects saw questions 1 and 2 above before question 3 or whether they saw question 3 first followed by questions 1 and 2.)

Main Study, Choice Experiment

On the transition page between last survey experiment question and the conjoint tasks, respondents saw the following text:

“The last set of questions asks you to choose between a series of military strike options.

“Imagine a situation similar to the one you read about before. Al Qaeda is operating a nuclear weapons lab in Syria and is developing a weapon that could eventually be used against U.S. civilians. The President has decided to attack the lab and the Joint Chiefs have presented two possible options. We want to know which option you think would be a better choice

“There will be twelve total choices. On each page, the ‘next’ button will appear after 15 seconds.”

Subjects then saw two strike options, with randomly varied features as described in the main text of the article, and indicated their preferences.

C Supporting Tables

To support the tables and figures in the main text, this section presents the following:

- Table C.1 presents the estimates plotted in Figure 1.
- Table C.2 shows that the regression analysis of the choice experiment, presented in Table 2, is robust to the inclusion of controls for the respondent’s vignette experiment treatment assignment.
- Table C.3 shows that in the same analysis, the respondent’s vignette experiment treatment assignment did not have a statistically significant effect on any of the parameter estimates.

Table C.1: Estimates plotted in Figure 2.

Side effects	Scenario	Estimate	s.e.	95% CI
High Harm	+0% chance	0.168	0.014	(0.141, 0.195)
	+20% chance	0.239	0.016	(0.208, 0.271)
Low Harm	+0% chance	0.186	0.014	(0.158, 0.214)
	+20% chance	0.497	0.018	(0.462, 0.532)
High Harm	Fewer casualties	0.333	0.017	(0.300, 0.365)
	Same casualties	0.168	0.014	(0.141, 0.195)
Low Harm	Fewer casualties	0.591	0.018	(0.557, 0.626)
	Same casualties	0.186	0.014	(0.158, 0.214)

Table C.2: Robustness check on Table 2: controls for vignette experiment treatment status.

	No controls	Controls
α_0 Constant	0.221 (0.023)	0.275 (0.035)
δ_0 Disadvantages (0-3 scale)	-0.021 (0.008)	-0.026 (0.006)
α_M Fewer military casualties	0.284 (0.021)	0.279 (0.014)
α_S Better chance of success	0.184 (0.020)	0.165 (0.013)
δ_M Disadvantages \times fewer mil. casualties	-0.039 (0.010)	-0.039 (0.007)
δ_S Disadvantages \times better chance	-0.044 (0.010)	-0.035 (0.007)
Better chance of success	0.039 (0.029)	0.004 (0.019)
Equal destruction	-0.037 (0.026)	-0.026 (0.017)
Better chance \times equal destruct.	-0.011 (0.040)	0.009 (0.026)
Adj. R ²	0.099	0.124
Num. obs.	12154	12136
N Clusters	2054	2051

Note: Table presents OLS estimates of the parameters in Table 2, with the addition of controls for the respondent's treatment status in the vignette experiment. Standard errors clustered by respondent.

Table C.3: Robustness check on Table 2: test for treatment effects on each parameter.

	No controls	Controls
α_0 Constant	0.194 (0.031)	0.256 (0.039)
. . . $\times (d = 0, s = 1)$	0.124 (0.053)	0.036 (0.032)
. . . $\times (d = 1, s = 0)$	-0.050 (0.039)	-0.030 (0.031)
. . . $\times (d = 1, s = 1)$	0.023 (0.044)	0.029 (0.032)
δ_0 Disadvantages (0-3 scale)	-0.011 (0.014)	-0.019 (0.011)
. . . $\times (d = 0, s = 1)$	-0.030 (0.024)	-0.010 (0.016)
. . . $\times (d = 1, s = 0)$	0.001 (0.019)	-0.004 (0.016)
. . . $\times (d = 1, s = 1)$	-0.007 (0.021)	-0.016 (0.016)
α_M Fewer military casualties	0.308 (0.040)	0.281 (0.028)
. . . $\times (d = 0, s = 1)$	-0.071 (0.061)	-0.011 (0.041)
. . . $\times (d = 1, s = 0)$	0.007 (0.058)	0.031 (0.040)
. . . $\times (d = 1, s = 1)$	-0.025 (0.055)	-0.029 (0.040)
α_S Better chance of success	0.220 (0.044)	0.169 (0.027)
. . . $\times (d = 0, s = 1)$	-0.097 (0.061)	-0.016 (0.038)
. . . $\times (d = 1, s = 0)$	-0.019 (0.058)	0.008 (0.038)
. . . $\times (d = 1, s = 1)$	-0.021 (0.058)	-0.010 (0.038)
δ_M Disadvantages \times fewer mil. casualties	-0.050 (0.020)	-0.034 (0.015)
. . . $\times (d = 0, s = 1)$	0.007 (0.029)	-0.015 (0.020)
. . . $\times (d = 1, s = 0)$	0.024 (0.029)	-0.004 (0.020)
. . . $\times (d = 1, s = 1)$	0.010 (0.028)	0.003 (0.020)
δ_S Disadvantages \times better chance	-0.057 (0.022)	-0.036 (0.014)
. . . $\times (d = 0, s = 1)$	0.052 (0.031)	0.011 (0.019)
. . . $\times (d = 1, s = 0)$	-0.001 (0.029)	-0.008 (0.019)
. . . $\times (d = 1, s = 1)$	-0.007 (0.029)	0.000 (0.019)
Adj. R^2	0.101	0.124
Num. obs.	12154	12136
N Clusters	2054	2051

Note: Table presents OLS estimates of the parameters in Table 2, with the addition of interactions between each parameter and the subject's treatment status in the vignette experiment. Standard errors clustered by respondent.

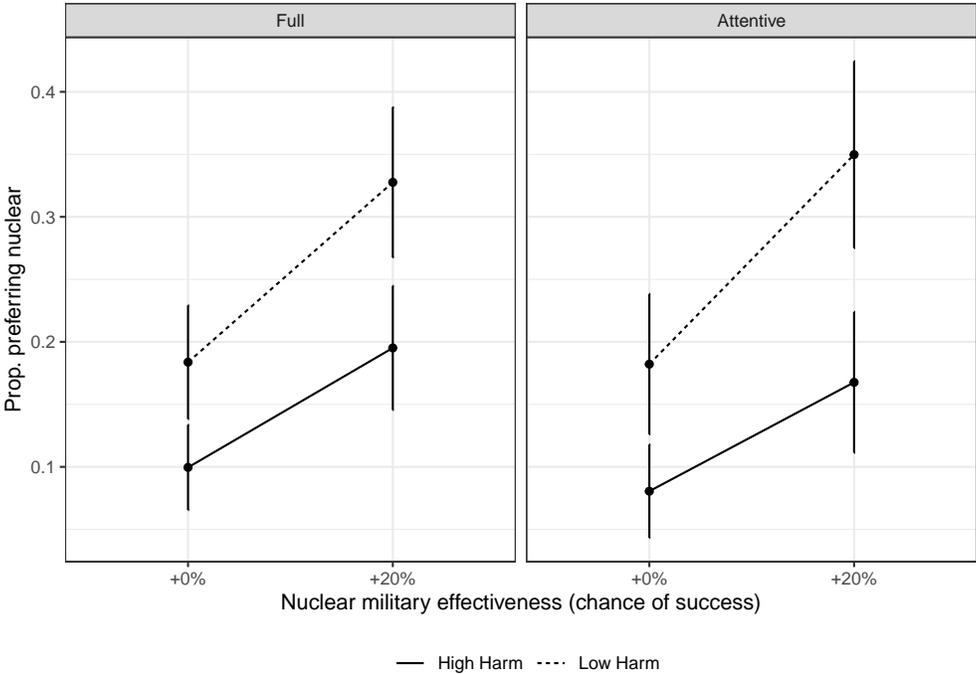
D Supplemental Results

D.1 Attentiveness

As noted in the main text, we used the amount of time respondents spent reading the articles to approximate their attentiveness. Consistent with recent research on inattentiveness, we defined respondents who spent an unusually short *or* unusually long time on the page as being inattentive (Read et al. 2021). This section examines how our treatment of attentiveness affected the results.

We begin by visualizing the difference in our results that emerges due to the exclusion of inattentive respondents. Figure D.1 graphically presents the no-controls results presented in Table 1. The small, negative conditional effect of military utility in the full sample is visible in the slightly flatter slope of the ‘high harm’ line in the left panel. The larger conditional effect obtained in an attentive sample can be seen in the greater divergence in the ‘high harm’ and ‘low harm’ slopes in the attentive sample panel on the right.

Figure D.1: Effect of military advantages when nuclear weapons are low- vs. high-harm.



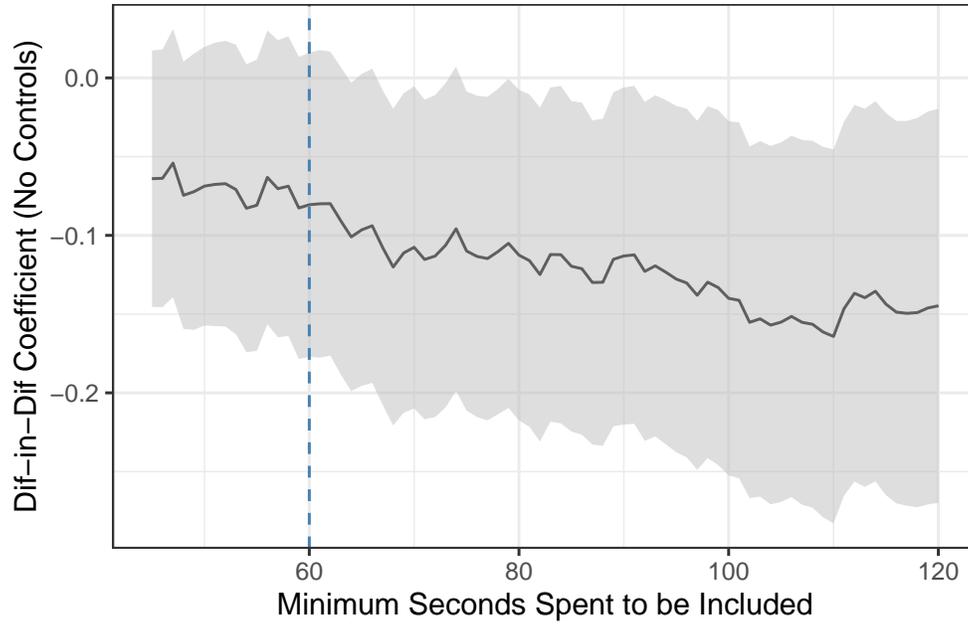
Note: Figure plots the percentage of respondents preferring a nuclear strike over a conventional strike (y-axis) by treatment group (x-axis). Vertical bars represent 95 percent confidence intervals.

Figure D.2 examines the robustness of our results to alternative definitions of attentiveness. Each figure plots the coefficient estimate for our key parameter, $\hat{\beta}_3$ (y-axis), against a possible minimum time spent viewing the treatment to be considered inattentive (x-axis). The top panel uses the actual high-end cutoff time from the paper, while the bottom panel uses an alternative, stricter high-end cutoff time.

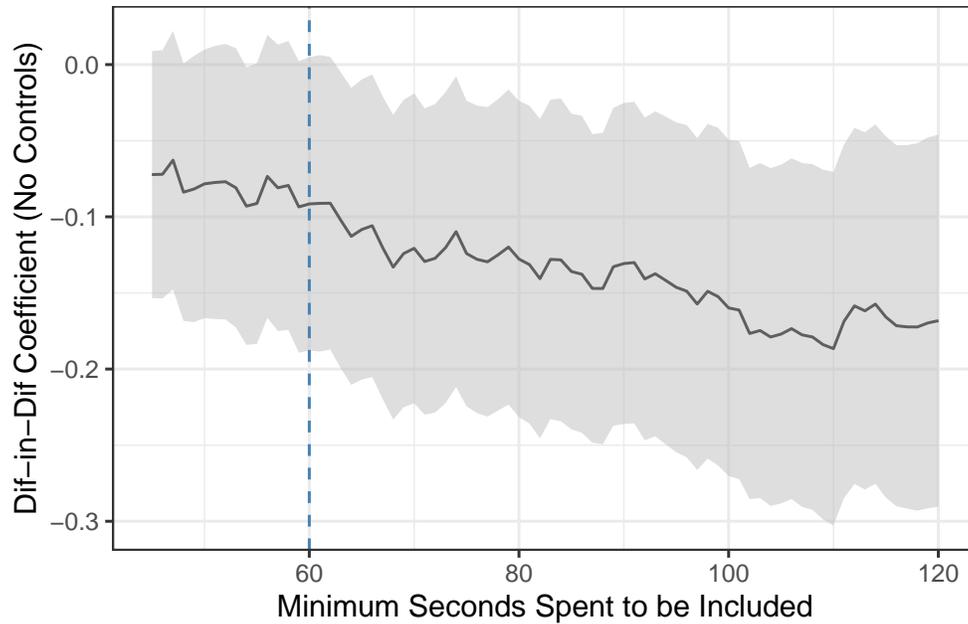
The consistent downward slope of the lines in both panels of Figure D.2 strongly supports our interpretation of the results: as the definition of attentiveness grows stricter, the point estimates become larger (more negative) and become easier to statistically distinguish from zero. The dashed lines indicate the actual cutoff times used in the main text. The larger (more negative) estimates to the right of the dashed lines indicate that our cutoffs are conservative. If we had used a stricter definition of attentiveness in the main text, our results would have appeared stronger.

Figure D.2: Robustness of attentive sample results.

(a) Maximum Seconds to be Included = 600



(b) Maximum Seconds to be Included = 480

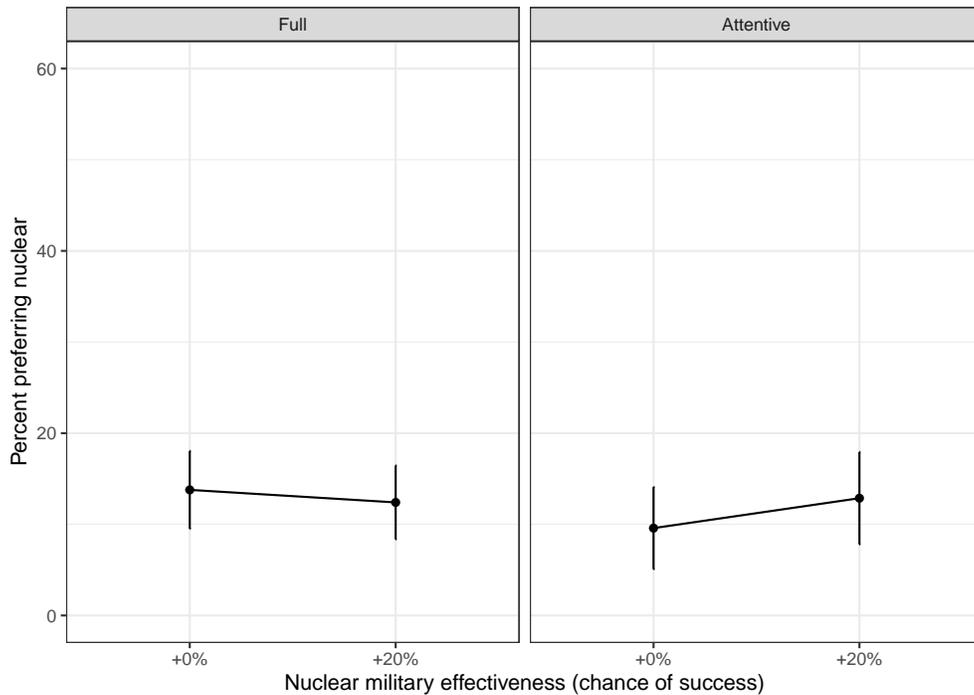


Note: Black lines plot difference-in-differences coefficient ($\hat{\beta}_3$, y-axis) by the minimum time spent with the vignette required to be included in the sample (x-axis). The (a) and (b) panels vary by the maximum amount of time spent with the vignette required to be included in the sample. Grey bands represent 90 percent confidence intervals around the coefficients. The vertical dashed lines marks the actual minimum cutoff used in the analysis presented in the main manuscript.

D.2 Pilot Vignette Experiment

As noted in the main text, we conducted a pilot prior to our main study. This study kept a similar vignette to Press et al. (2013) but informed respondents that nuclear weapons would cause more civilian casualties and environmental damage. Figure D.3 presents the results of the vignette experiment. For the full sample, the estimated treatment effect or increasing military effectiveness is statistically insignificant and slightly negative ($\hat{\beta} = -1.04$, s.e. = 3.0; see Table D.1). For the attentive sample, the estimate is more consistent with prior work and the main study in that it is positive, but it remains statistically insignificant ($\hat{\beta} = 3.3$, s.e. = 3.4). We attribute the remaining difference in results between the main study and the pilot study to sampling error.

Figure D.3: Pilot vignette experiment on nuclear attitudes.



Note: Figure plots the percentage of respondents preferring a nuclear strike over a conventional strike (y-axis) by treatment group (x-axis). Vertical bars represent 95 percent confidence intervals.

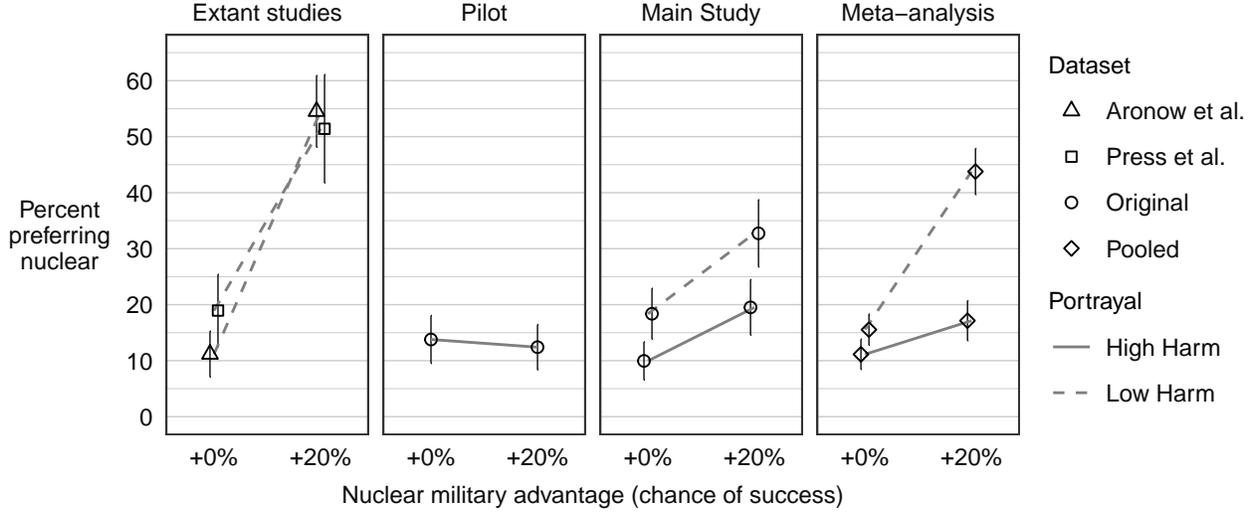
D.3 Meta-Analysis

We examine here in a meta-analysis vignette experiment results from our novel experiments as well as from nearly-identical designs in previously published work. The far left panel of Figure D.4 plots results from Press and colleagues’ original experiment, as well as a replication undertaken by Aronow et al. (2019). Both experiments found low support when nuclear and conventional weapons cause equal levels of civilian casualties. In conditions that kept collateral damage equal and increased nuclear weapons’ advantage in military utility, support exceeded 50 percent.

Our pilot vignette experiment (center-left panel), conducted in August 2018 ($N=512$), reproduced this setup, but informed subjects that the nuclear strike would cause greater harm to civilians and the environment. For a nuclear and conventional strike that are equally effective, we find 13.8 percent support for the nuclear strike, similar to prior studies. Despite similar baseline support, however, our pilot found substantially more resistance to persuasion, with only 12.4 percent of respondents preferring a militarily advantageous nuclear strike. This small negative effect for military effectiveness is not statistically significant. Our main vignette experiment used the above-described 2×2 factorial design, and is discussed in greater detail in the main manuscript and above in the appendix. These results appear in the center-right panel of Figure D.4. To make maximal use of comparable data, we then pooled the results from our original studies with those of Press and colleagues and Aronow, Baron, and Pinson in a meta-analysis.

As expected, the conditional effect of military utility in our main vignette experiment is negative, but it is relatively small ($\hat{\beta}_3 = -6.5$ and s.e. = 4.6 with controls). In the main manuscript and above in the appendix, we show that this effect strengthens substantially when we restrict analysis to attentive subjects. However, even using the results from the less attentive full sample, the pooled estimate of the conditional effect of military advantages for just our pilot and main vignette experiment is -9.1 percentage points (s.e. = 4.4). The meta-analytic estimates incorporating previously published work are even starker: much, but not all, of the effect of military advantages on support for nuclear use ($\hat{\beta}_1 = 23.5$, s.e. = 1.8) is erased by emphasizing the disadvantages of nuclear strikes ($\hat{\beta}_3 = -18.3$, s.e. = 2.5). Table D.1 presents the results in tabular form.

Figure D.4: Vignette experiments on nuclear attitudes.



Note: Figure plots the percentage of respondents preferring a nuclear strike over a conventional strike (y-axis) by treatment group (x-axis). Vertical bars represent 95 percent confidence intervals.

Table D.1: Regression analysis of vignette experiments.

Term	Controls?	Pilot		Main Study		Original Studies		All Studies	
		No	Yes	No	Yes	No	Yes	No	Yes
α	Constant	0.138 (0.022)	0.209 (0.168)	0.184 (0.023)	0.228 (0.079)	0.184 (0.023)	0.204 (0.045)	0.172 (0.011)	0.184 (0.026)
β_1	Better chance of success	-0.014 (0.030)	-0.014 (0.030)	0.144 (0.038)	0.136 (0.037)	0.144 (0.038)	0.148 (0.038)	0.233 (0.018)	0.235 (0.018)
β_2	More destructive			-0.084 (0.029)	-0.064 (0.029)	-0.072 (0.027)	-0.039 (0.028)	-0.049 (0.016)	-0.052 (0.016)
β_3	Better chance \times more destructive			-0.048 (0.049)	-0.065 (0.046)	-0.084 (0.045)	-0.091 (0.044)	-0.180 (0.025)	-0.183 (0.025)
	Adj. R ²	-0.002	0.025	0.043	0.128	0.039	0.057	0.072	0.075
	Num. obs.	512	512	2138	2138	2650	2650	4016	4016

Note: Table presents OLS estimates of the parameters in (1).

D.4 Additional Choice Experiment Results

In the main text, we analyze the choice experiment by visualizing a subset of the results in Figure 2 and with regression analysis in Table 2. Here, we supplement this analysis by visualizing a broader set of the results.

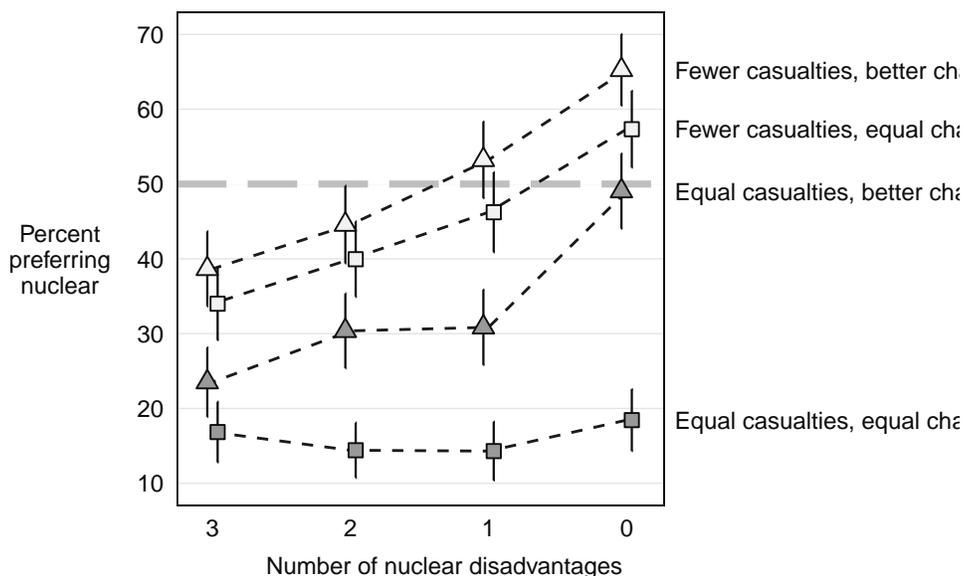
The choice experiment allows a look at sixteen distinct scenarios: between 0 and 3 disadvantages for nuclear weapons, as well as two possible advantages (for a complete description, see Appendix B.4). For each of these sixteen distinct cells, Figure D.5 presents mean support for nuclear strikes over a conventional alternative.

The left side of the figure shows preferences for nuclear use when the disadvantages of nuclear weapons are many. Here, we can test for our expectation of conditional effects: a majority of people should oppose nuclear use, and this resistance will be inflexible to variation that assigns the nuclear option greater military utility, such as a greater chance of success or fewer U.S. military casualties. This prediction is borne out. While preference for nuclear strikes is not completely inflexible, aversion remains strong: in all scenarios on the far left-hand side of the graph, solid majorities oppose the use of nuclear weapons. Even when the nuclear strike offers a 20 percent greater chance of success against a perilous threat and the prospect of reducing the number of U.S. military casualties, it is opposed by more than 60 percent of respondents.

The choice experiment also allows us to examine how the same respondents react in scenarios in which nuclear weapons are not ascribed their usual disadvantages of more civilian casualties, greater physical destruction, and the disapproval of allies. Moving from the lefthand side to the righthand side of Figure D.5, when nuclear strikes are low harm, the military advantages are sufficient to bring about majority support.

Table D.2 displays the estimates that are plotted in Figure D.5. Some of these estimates are reported in the main text as validation of the predicted values from the regression analysis.

Figure D.5: Support for nuclear strikes by advantages and number of disadvantages.



Note: Based on the choice experiment, this figure presents a non-parametric estimate of the relationships implied by Table 2. The y-axis plots the percentage of respondents preferring a nuclear strike and the x-axis plots the disadvantage index. The connected sets of points all have the same military advantages, as indicated by the text to the right.

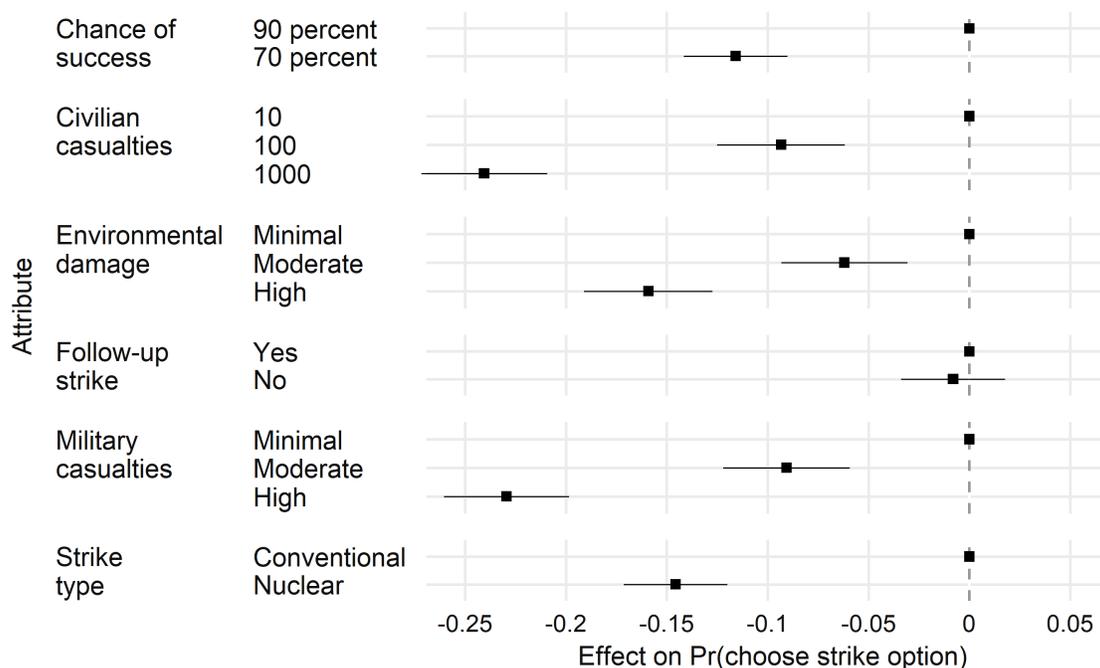
Table D.2: Group means, restricted choice experiment, Study 2

Advantages	Disadvantages	Estimate	S.E.	CI
Equal military casualties, Better chance of success	3	0.24	0.02	(0.19, 0.28)
	2	0.30	0.03	(0.25, 0.35)
	1	0.31	0.03	(0.26, 0.36)
	0	0.49	0.03	(0.44, 0.54)
Equal military casualties, Equal chance of success	3	0.17	0.02	(0.13, 0.21)
	2	0.14	0.02	(0.11, 0.18)
	1	0.14	0.02	(0.1, 0.18)
	0	0.18	0.02	(0.14, 0.23)
Fewer military casualties, Better chance of success	3	0.39	0.03	(0.34, 0.44)
	2	0.45	0.03	(0.39, 0.5)
	1	0.53	0.03	(0.48, 0.58)
	0	0.65	0.02	(0.6, 0.7)
Fewer military casualties, Equal chance of success	3	0.34	0.02	(0.29, 0.39)
	2	0.40	0.03	(0.35, 0.45)
	1	0.46	0.03	(0.41, 0.52)
	0	0.57	0.03	(0.52, 0.62)

D.5 Unrestricted Choice Experiment

We examine here the results of our unrestricted conjoint, in which all strike attributes were randomized independently from one another. We begin by calculating average marginal component effects (AMCE; see Hainmueller et al. 2015). This framework has the advantage of clearly presenting how much each attribute matters on average, at the expense of detecting the conditional effects we spotlighted in the main text. Figure D.6 plots AMCE estimates for our pilot, and Figure D.7 plots them for our main study.

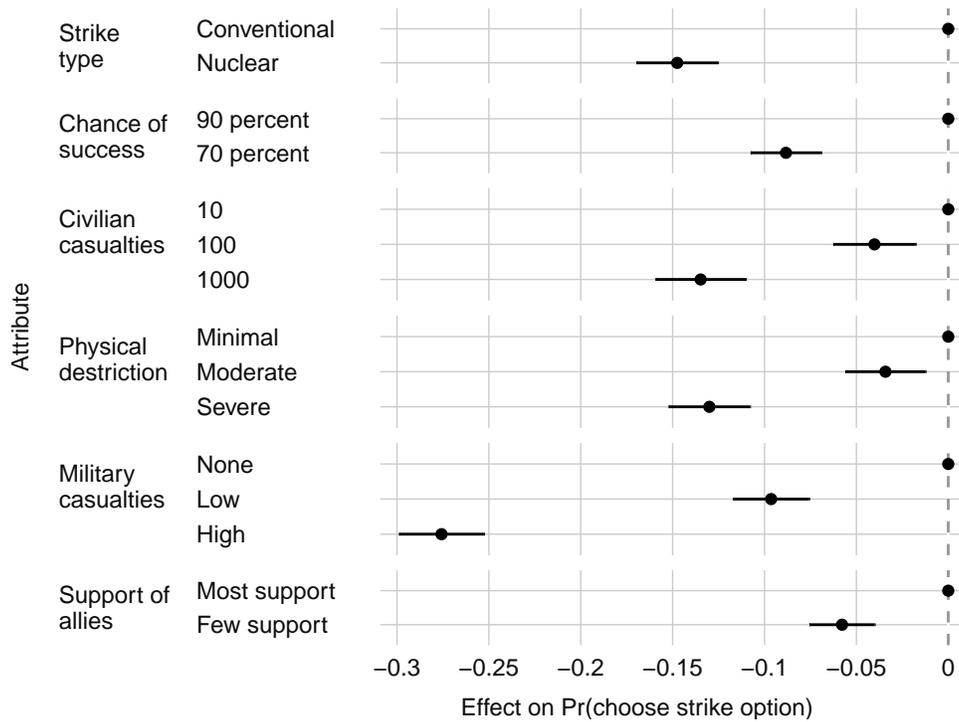
Figure D.6: Average Marginal Component Effect Estimates (Pilot).



Note: This figure plots the average marginal component effect of each attribute in Study 1’s fully randomized choice experiment. Each dot is a coefficient estimate from the model $Y_{ij} = \mathbf{X}\beta + \epsilon_{ij}$, where X is a matrix of indicator variables and β is a vector of regression coefficients. Horizontal bars represent 95 percent confidence intervals calculated using cluster-robust standard errors. Dots without confidence intervals indicate the baseline category.

The unrestricted conjoint also permits a second, independent look at our prediction of conditional effects. We abstract away from specific advantages and disadvantages to construct a summary variable for the net advantages that a strike has over an alternative across all dimensions of the choice. This yields a net advantage index that ranges from -4 to 4 in our pilot and -5 to 5 in our main study for each strike option. For example, in our main study, a nuclear strike that has a higher probability of success than a conventional alternative but would not save more U.S. military lives and would kill more civilians, cause greater environmental harm, and elicit greater disapproval from allies would have a net advantage score of -2 ($1 - 0 - 1 - 1 - 1 = -2$).

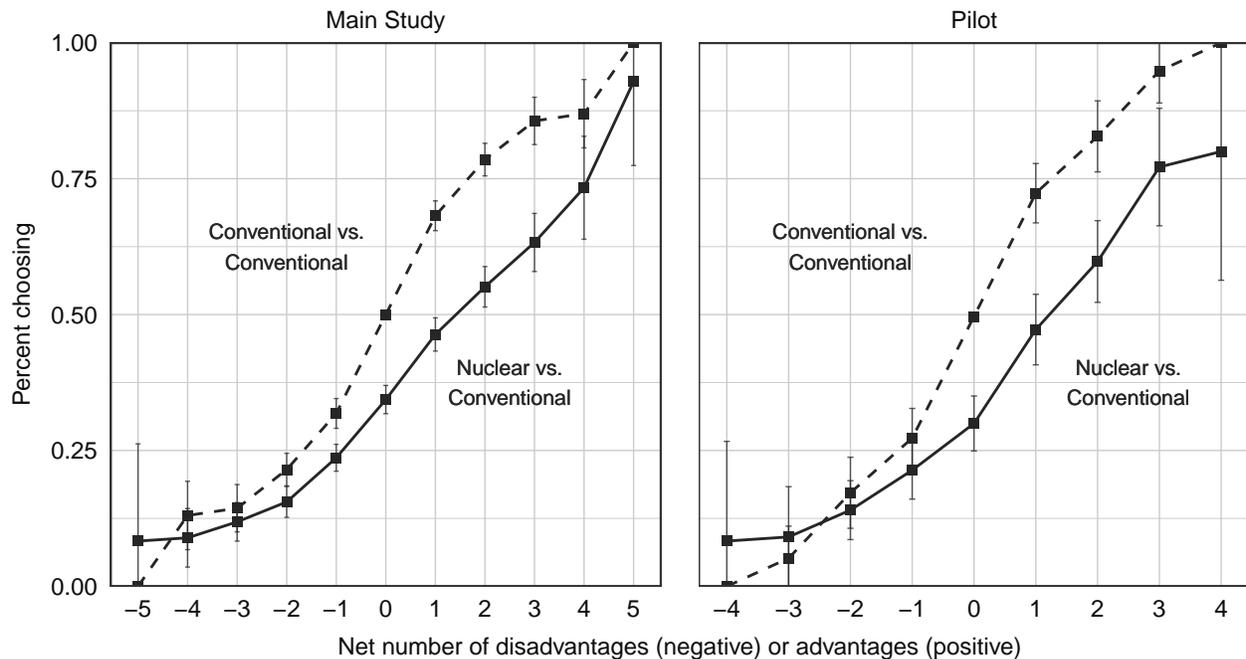
Figure D.7: Average Marginal Component Effect Estimates (Main Study).



Note: This figure plots the average marginal component effect of each attribute in our main study's fully randomized choice experiment. Each dot is a coefficient estimate from the model $Y_{ij} = \mathbf{X}\beta + \epsilon_{ij}$, where X is a matrix of indicator variables and β is a vector of regression coefficients. Horizontal bars represent 95 percent confidence intervals calculated using cluster-robust standard errors. Dots without confidence intervals indicate the baseline category.

Figure D.8 shows preferences as function of a strike’s net advantages. The solid line traces respondents’ preferences for a nuclear strike over a conventional alternative. The dashed line, a comparison of two conventional strikes, allows us to explicitly compare our respondents’ preferences for nuclear strikes to our respondents’ preferences for purely conventional uses of force.

Figure D.8: Net advantage comparison.



Note: Figure plots the percentage of respondents who chose a nuclear strike over a conventional strike (y-axis) as a function of the nuclear strike’s advantage or disadvantage relative to a conventional strike (x-axis). Vertical bars represent 95 percent confidence intervals. The appendix presents all estimates in tabular form.

As expected, the effect of the marginal net advantage is not constant, but rather conditional on surrounding strike choice features and smallest when nuclear strikes carry many net disadvantages. This is visible on the left-hand side of the chart. In this region, the solid line hardly rises at all with the marginal advantage. This result suggests that the public may act as a check: if nuclear weapons almost always carry many disadvantages at baseline, majority support for nuclear use is out of reach, potentially exerting constraining effects on policymakers.

The middle and right-hand side of Figure D.8 better captures survey experiments that find the highest levels public support for nuclear weapons, particularly the prospective conditions presented in the main Press et al. (2013) article. That experiment portrayed nuclear and conventional options as roughly equivalent to a conventional alternative in terms of their side effects (Table A.1). Consistent with these experiments, we find that when the baseline number of net advantages is around zero, the marginal advantage can have a large effect and push preferences near or above 50 percent.

An interesting feature of the unrestricted conjoint is that it can shed light on the degree to which people treat the choice to use nuclear weapons similar to how they would treat the choice between two conventional strikes. As a basis for this comparison, the dashed lines in Figure D.8 display our respondents' average preference between two conventional strikes with the same number of advantages and disadvantages.

Preferences follow a similar pattern, suggesting that subjects assessed nuclear and conventional strikes with a similar decision calculus. At many of the leftmost points in each panel of Figure D.8, preferences for the two strike types are statistically indistinguishable from one another. Solid majorities consistently oppose strikes that carry disadvantages, and at similar rates for both weapon types. This implies that when a strike is defined as having a lot of disadvantages, it will be consistently and rigidly opposed by a majority of the public.

These findings add a new perspective to the debates over the nuclear taboo and the “conventionalization” of nuclear weapons (Tannenwald 2007; Jervis 1989). There is some level of gut aversion to nuclear use, but contrary to the idea of the nuclear taboo, members of the public do not appear to think about nuclear weapons as inherently wrong or verboten to use. Instead, individuals tend to judge the advantages and disadvantages of nuclear use in a similar way to how they think about the conventional use of force. However, this rational calculus has an observational equivalence to taboo-like thinking because nuclear weapons almost always carry notable downsides in terms of civilian casualties and other forms of collateral damage. Therefore, as long as nuclear weapons are defined by their negative disadvantages, strong and inflexible opposition can emerge even without much of the gut aversion vividly described in taboo accounts.

On the right-hand side of Figure D.8, public support for nuclear strikes is alarmingly high, just as Press et al. (2013) found. However, it is also in this region that the gap in public support between nuclear and conventional strikes is largest. Comparing the horizontal distance between the dashed and solid lines in Figure D.8 suggests that in this region, a nuclear strike would need to offer two to three advantages just to break even in terms of public support. This means that for a leader tempted to use nuclear weapons, the marginal cost in public support is highest in precisely the circumstances that offer the best strategic case for, and highest public support for, a nuclear strike. When faced with the choice between a strike that might be supported by a bare majority of the public and one that would be supported by a large majority of the public, we suspect that election-motivated policymakers might take the large majority.

E Discrete Choice Model

The main text notes that the expectation of the conditional effects of nuclear advantages was inspired in part by the implications of a standard model of discrete choice (Train 2003). This appendix describes such a model, explains why it is consistent with the explanation in the main text, and shows that it provides a good fit to our data.

The Model

Choices between military strikes are a function of the strikes' characteristics. Let X_{ijk} be an undifferentiated index of strike characteristics, including the military utility of a strike option (e.g., its chance of success) and its side effects (e.g., civilian casualties); we will distinguish between these characteristics below. To accommodate the idea of gut aversion to nuclear strikes, also let strikes be designated as nuclear ($N_{ij} = 1$) or conventional ($N_{ij} = 0$). Agent i 's utility from strike j is

$$U_{ij} = \eta N_{ij} + \sum_k \beta_k X_{ijk} - \epsilon_{ij}. \quad (1)$$

In (4), η represents the level of inherent or gut aversion to nuclear strikes. By inherent aversion, we mean to capture the opposition to nuclear weapons themselves apart from their instrumental consequences. This could rise to the level of horror and disgust that Tannenwald perceived in people's attitudes toward nuclear weapons. Meanwhile, β is the amount of utility or disutility i receives from strike characteristic k . Finally, ϵ_{ij} represents idiosyncratic differences between agents.

Under this framework, i chooses strike option 1 over strike option 2 if $U_{i1} > U_{i2}$. Given the choice between two strikes, $j = 1$ and $j = 2$, i chooses 2 if:

$$U_{i1} < U_{i2} \\ \sum_k \beta_k (X_{i1k} - X_{i2k}) + \eta(N_{i1} - N_{i2}) < \epsilon_{i1} - \epsilon_{i2}. \quad (2)$$

To simplify the presentation of the results while maintaining the core intuition, we can also constrain all β_k to be equal, giving a restricted version of the model,

$$\beta \sum_k (X_{i1k} - X_{i2k}) + \eta(N_{i1} - N_{i2}) < \epsilon_{i1} - \epsilon_{i2}. \quad (3)$$

To estimate the model and generate observable predictions from it, we follow the literature on discrete choice and assume that ϵ_{ij} follows a Type I extreme value distribution, which allows the model parameters to be estimated using logistic regression (Train 2003). The precise choice of distribution does not matter much; many sigmoid distributions bound choice probabilities between 0 and 1 and take approximately the same shape.

The predictions generated by the discrete choice model reflect a property of human decision-making: choice attributes matter more when they are close-to-pivotal than when most factors

are stacked in favor of one option or another. Consequently, the parametric assumptions that go into discrete choice models tend to provide an excellent fit to the data (for studies of this in the consumer choice literature, see [Andersson and Uboe 2010](#); [Larsen et al. 2012](#)). [Graham and Svolic \(2020\)](#) show a strong correspondence between the model’s predictions and a non-parametric analysis of candidate choice scenarios.

Though researchers sometimes treat parametric assumptions as a matter of convenience, in the case of the discrete choice model, the parametric assumptions are well-founded. The standard assumptions about the distribution of ϵ_{ij} embody intuitive truths about human decision-making that are evident in raw data in a wide range of contexts. In our case, we drew on this model’s success in explaining preferences in other contexts to generate predictions for how people would form their preferences in choices between nuclear and conventional strikes.

In this way, the expectations of conditional effects we referenced in the main text embedded a simple, standard framework for examining an agent’s choice between two alternatives. Just as in choices between consumer products and political candidates, one should expect the marginal effect of the attributes of nuclear and conventional strikes to be conditional on the surrounding aspects of the choice (i.e., their advantages and disadvantages).

Model-Based Estimates

To provide evidence that the discrete choice model offers a good approximation for our respondents’ actual choice behavior, we began by estimating the parameters in (4), and (3). [Table E.1](#) displays the results. In our pilot, respondents placed the highest value on avoiding civilian casualties, followed by avoiding U.S. military casualties and the “inherent” aversion to nuclear weapons that cannot be explained by other factors. In our main study, respondents placed the highest value on preventing U.S. military casualties, followed by avoiding nuclear strikes and then by civilian casualties. In both studies, respondents saw a higher chance of success and lower environmental damage as roughly half to two-thirds as important as these leading concerns. Least important were the chance for a follow-up strike and the disapproval of allies.

We can check the alignment between our model and the respondents’ actual choice behavior by using these parameter estimates to generate predictions for what should have been observed in our non-parametric analysis. The most straightforward opportunity to compare the model’s predictions to our other analysis comes from [Figure D.8](#), which plots the percentage of respondents who prefer each strike option for the unrestricted choice experiments from both studies, separated by whether the choice pits a nuclear strike against a conventional strike or whether it pits two nuclear strikes.

[Figure E.1](#) presents the results of this comparison. It duplicates [Figure D.8](#), with predictions from (3) overlaid as thick, semi-transparent lines. We observe a close match between the model’s predictions and the non-parametric results we presented in the main text, in terms of both the slopes of the lines and the difference between the nuclear/conventional and the conventional/conventional lines.

Table E.1: Model estimates.

(a) Pilot, unrestricted model.

Parameter	Estimate (S.E.)
η Nuclear	-0.78 (0.08)
β_1 Chance of success	0.59 (0.07)
β_2 Prevents casualties	0.81 (0.07)
β_3 Follow-up strike	0.06 (0.07)
β_4 Civilian casualties	-0.87 (0.07)
β_5 Environmental damage	-0.58 (0.06)

(b) Main study, unrestricted model.

Parameter	Estimate (S.E.)
η Nuclear	-0.74 (0.04)
β_1 Chance of success	0.46 (0.03)
β_2 Prevents casualties	0.95 (0.03)
β_3 Allies disapprove	-0.29 (0.03)
β_4 Civilian casualties	-0.50 (0.03)
β_5 Environmental damage	-0.48 (0.03)

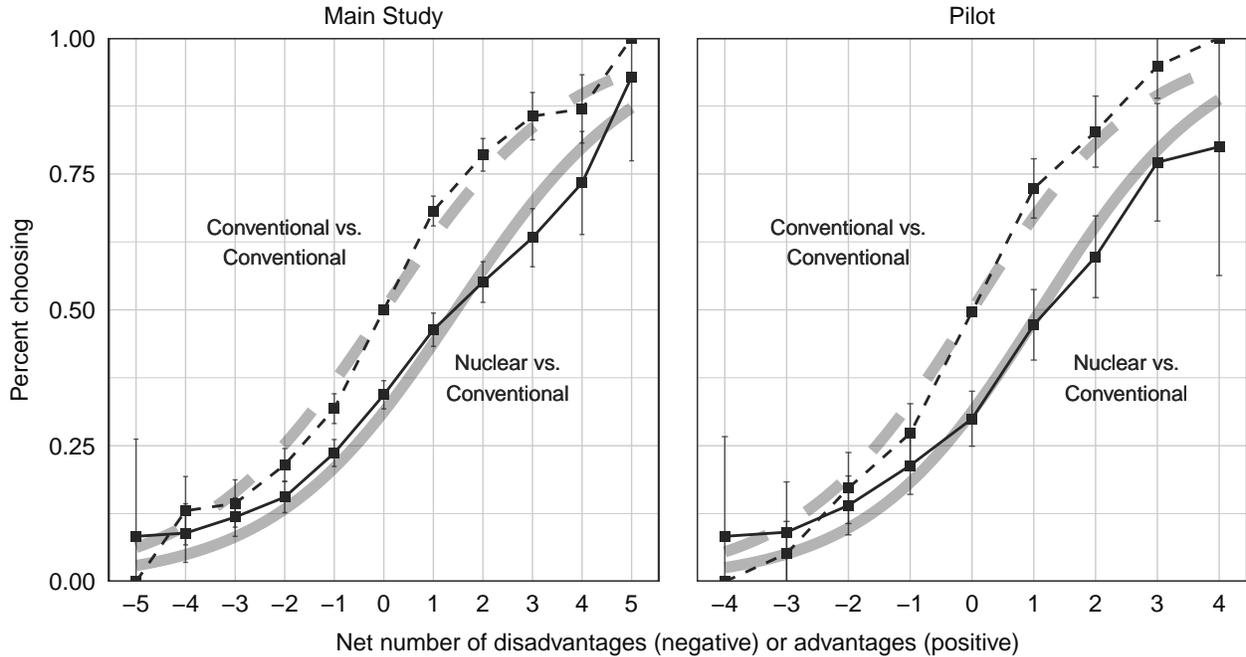
(c) Pilot, restricted model.

Parameter	Estimate (S.E.)
η Nuclear	-0.79 (0.08)
β Net advantages	0.71 (0.04)

(d) Main study, restricted model.

Parameter	Estimate (S.E.)
η Nuclear	-0.71 (0.04)
β Net advantages	0.54 (0.02)

Figure E.1: Figure D.8 with parametric estimates overlaid.



F Pre-Analysis Plan

This section presents the text from our pre-analysis plan. This document can also be found at [LINK TO AUTHOR-IDENTIFYING DOCUMENT REMOVED].

The purpose of this document is to offer a pre-analysis plan describing our theoretical goals, hypotheses, design, and analysis prior to fielding a survey experiment on public attitudes toward the use of nuclear weapons. The basic approach is as follows: We present subjects with a hypothetical scenario that calls for military strikes, and have them choose between two options that randomly vary in their attributes. One of those attributes is whether a strike is nuclear or conventional. But we also vary, in a survey and in two versions of a choice experiment, other attributes so that we can better understand how preferences for nuclear use are conditioned by contextual factors. Using this approach, we hope to map a broader range of preferences than has been considered in existing work.

Below, we describe in further detail the components of our project, our hypotheses, the design of the survey and conjoint, and analysis we plan to conduct. We also note secondary hypotheses at the end. Further details can be found in the paper from our pilot study, which is attached to this document. Our eventual manuscript will adopt a similar theoretical posture to these documents, but we reserve the right to update our thinking.

Theory of Nuclear Non-Use

Nuclear weapons have not been used in conflict since the bombings of Hiroshima and Nagasaki in 1945. One explanation for this apparent nuclear restraint is the “nuclear taboo” theory put forth by Tannenwald (1999, 2005, 2007). This theory says that decision-makers refrain from using nuclear weapons because of strong norms that frame their use as barbaric; using nuclear weapons is not something that a civilized state would do. Over time, nuclear restraint came to be unthinking, exhibiting a taken-for-granted quality. Another explanation for post-1945 nuclear restraint views the norm of non-use as a tradition rather than a taboo. A core difference between the tradition and taboo perspectives is that the former sees nuclear weapons use as subject to a rational and strategic calculation that is less prominent in the taboo story. For proponents of the tradition approach, the material consequences and reputational backlash associated with using nuclear weapons “self-deters” decision-makers from using “the bomb,” but this outcome is reached by the conscious weighing of costs and benefits, not unthinkingly and as a result of constraints imposed by social norms (Paul 2009). Similarly, some researchers argue that non-use is due to a strategic phenomenon in which leaders of nuclear weapons states would rather not let the “nuclear genie” out of the bottle (Sagan 2004). Recently, experimental studies on the U.S. public indicate little resistance to the use of nuclear weapons, especially when they offer advantages over conventional alterna-

tives, suggesting that public attitudes may be quite permissive of nuclear use (Press et al. 2013; Sagan and Valentino 2017).

Each of these arguments puts forth a role for U.S. public opinion and finds empirical support for it. The taboo theory argues that the American public acts a constraint upon decision-makers in times of potential nuclear use. For example, President Dwight Eisenhower and Secretary of State John Foster Dulles thought that backlash from the U.S. public would be an obstacle to using nuclear weapons against China in the Taiwan Strait Crisis (Tannenwald 2007). The tradition theory argues that public opinion is generally opposed to the use of nuclear weapons but that U.S. citizens' attitudes are malleable to the context in which a nuclear strike takes place (Quester 2006). Press, Sagan, and Valentino argue that the public evinces little opposition to nuclear use, and that any aversion is due to strategic considerations rather than moral ones. They point to experimental evidence across two studies to buttress this claim (Press et al. 2013; Sagan and Valentino 2017).

To link the sometimes stark differences between these portrayals of the American public's attitudes toward nuclear weapons, we describe a theory of *conditional aversion* to the use of nuclear weapons. The conditional aversion theory holds that though the American public dislikes nuclear weapons, the apparent strength of this aversion depends heavily on the extent to which nuclear weapons are perceived as bringing about adverse consequences that would be less severe if conventional weapons were used to accomplish the same objective. We contrast conditional aversion with *inherent aversion*, which is a dislike of some action or thing so strong that it remains robust to that action gaining advantages over alternative options. Thus far, the literature on non-use has defined a taboo as a strong inherent aversion. However, our conditional aversion theory and the findings we plan to present questions that definition. A weak affective or gut aversion could sustain a pattern of preferences similar to a taboo if the action is commonly linked to severe disadvantages. We argue that this is the case with nuclear use.

Our central predictions is that when nuclear weapons' disadvantages are large, the public's preferences are *observationally equivalent* to a taboo: weighed down by their perceived disadvantages, nuclear weapons receive little support at baseline and do not receive much additional support as a consequence of their potential advantages on the battlefield. When these disadvantages are framed away, we observe that preferences do not behave like a taboo: the public supports nuclear strikes at higher rates *and* is more easily persuaded to increase its support.

These two regularities—that both the support for nuclear weapons *and* the effect of battlefield advantages on changes in this support vary as a function of nuclear weapons' perceived drawbacks—are both predicted by a simple model of preferences over strike options. Suppose that strike option j may be nuclear ($N_j = 1$) or conventional ($N_j = 0$). Strikes vary according to several other characteristics as well, some of which are typically seen as possible advantages that a nuclear strike could have and others of which are typically seen as possible disadvantages that a nuclear weapon can have. Mathematically, the model is agnostic as to whether respondents will perceive the traits as advantages or disadvantages, but we have strong expectations that are bolstered by the results to our initial study.

For simplicity suppose that all strike characteristics are binary, with X_{jk} taking a value of 1 when it is the better type and 0 when it is the worse type. Let respondent i 's utility from strike j is:

$$U_{ij} = \eta N_{ij} + \sum_k \alpha_k A_{ijk} + \sum_l \beta_l B_{ijl} \quad (4)$$

where U_{ij} stands for total utility, α_k is the utility from advantage A_k , β_l is the utility from disadvantage B_l and η is the utility from a nuclear strike.

Given the choice between two strikes, $j = 1$ and $j = 2$, i chooses 2 if:

$$U_{i1} < U_{i2}$$

$$\eta(N_{i1} - N_{i2}) + \sum_k \alpha_k (A_{i1k} - A_{i2k}) + \sum_l \beta_k (B_{i1l} - B_{i2l}) < 0 \quad (5)$$

For ease of exposition, we will often focus on a restricted version of this model in which we assume that all β_k take on the same value. This allows us to treat the disadvantages that nuclear weapons face as an additive index. In the restricted model, the respondent's choice is determined by the inequality:

$$\eta(N_{i1} - N_{i2}) + \sum_k \alpha_k (A_{i1k} - A_{i2k}) + \beta \sum_l (B_{i1l} - B_{i2l}) < 0 \quad (6)$$

where the only difference is that β is now a constant in the summation over k and can be pulled out, leaving $\sum_l (B_{i1l} - B_{i2l})$ to function as an additive index of disadvantages ranging from 0 to $-K$. In the main text, our figures will focus on the restricted version of the model in equation (8), but the paper and appendix will present estimates based on both versions of the model.

In our empirical estimates of the model, we will add a disturbance term ϵ_{ijk} . Assuming that this error term is distributed Type I extreme value allows us to estimate η , α_k , and β_l using logistic regression. To validate this assumption, our manuscript will compare non-parametric estimates of the probability of preferring a nuclear strike to predicted probabilities generated by the model.

Below, we combine the model with data from Study 1 to generate predictions for our empirical analysis of Study 2. First, we will briefly describe our research design.

Research Design

Our project will test this theory using a survey experimental design with the following components:

- A 2×2 survey experiment, using a mock news article vignette based on that used by Press et al. (2013).¹ Our 2×2 design varies the relative probabilities of success of the

¹Our vignette is based on that used in the prospective conditions of Press et al. (2013).

strike options (like Press and colleagues), as well as additional consequences of nuclear use, such as civilian casualties, environmental destruction, and possible international disapproval (unlike Press and colleagues).

- A choice experiment that asks subjects to consider a situation similar to that presented in our traditional survey experiment, with variation along five features of nuclear strikes.

In the survey flow, we will show the vignette first and the conjoint second. However, for the sake of clarity in explaining our theory, we may present the results of the conjoint first.

Survey Experiment

Our traditional survey experiment is a 2×2 extension of the prospective experiment presented in [Press et al. \(2013\)](#). In all conditions, respondents read a faux-news article describing a national security crisis involving the threat of nuclear terrorism. The article describes an al-Qaeda weapons lab near a remote town in Syria. The terrorist cell operating there is believed to be just months away from developing a nuclear weapon that could be used against the U.S. homeland. The Joint Chiefs of Staff has prepared for the president a report that describes two military options for destroying the al-Qaeda facility, one using conventional weapons and one using nuclear weapons. We manipulate the features of these strikes in two ways: (1) the relative effectiveness of the strike options and (2) their material consequences in terms of civilian casualties, environmental destruction, and international backlash. Variation along these two dimensions produces our 2×2 structure, and yields the following treatment conditions:

1. Equal Effectiveness, Equal Destruction

- Nuclear strike has a 90% chance of success, kills an estimated 1,000 civilians, with limited physical damage and no mention of international backlash
- Conventional strike has a 90% chance of success, kills an estimated 1,000 civilians, with limited physical damage and no mention of international backlash

2. Equal Effectiveness, Nuclear More Destructive

- Nuclear strike has a 90% chance of success, kills an estimated 1,000 civilians, with considerable physical and environmental damage, and mention of possible international backlash
- Conventional strike has a 70% chance of success, kills an estimated 100 civilians, with limited physical damage and no mention of international backlash

3. Nuclear Advantage, Equal Destruction

- Nuclear strike has a 90% chance of success, kills an estimated 1,000 civilians, with limited physical damage and no mention of international backlash

- Conventional strike has a 70% chance of success, kills an estimated 1,000 civilians, with limited physical damage and no mention of international backlash.

4. Nuclear Advantage, Nuclear More Destruction:

- Nuclear strike has a 90% chance of success, kills an estimated 1,000 civilians, with considerable physical and environmental damage, and mention of possible international backlash
- Conventional strike has a 70% chance of success, kills an estimated 1,000 civilians, with limited physical damage and no mention of international backlash

The vignettes for each of these conditions are submitted with this pre-registration document. There is also a fifth document that highlights the precise places of variation within our vignette.

After reading the vignette, each subject will be asked four structured response questions: how much they would approve of the conventional strike option, how much they would approve of the nuclear strike option, and which strike they would prefer. Finally, we will ask subjects to explain their strike preference in a sentence or two.

Conjoint/Choice Task

For our conjoint/choice task component, we prompt the subjects to imagine a scenario similar to the one that was described in the survey vignette that they have just read (described above). We then present them with two randomly-generated strike options and ask them to indicate which they prefer. Each respondent goes through 12 tasks, making 12 choices in total. Each strike has six characteristics:

1. type of strike (nuclear or conventional)
2. probability of destroying target (90 or 70 percent)
3. U.S. military casualties (high, low, or minimal)
4. civilian casualties (about 10, 100, or 1,000 civilian casualties)
5. environmental damage (minimal, moderate, or high)
6. views of U.S. allies (few approve or most approve of strike)

A conjoint/choice task is a valuable tool for analyzing the nature of opposition to nuclear use, since it allows us to completely de-bundle nuclear technology from other features of a military strike with which nuclear weapons might typically be associated. In half of the 12 tasks, we use unrestricted randomization to generate the strike characteristics, as would occur in a conjoint experiment. In this area, it is possible for nuclear weapons to cause less civilian casualties and environmental damage than conventional weapons. In the other half

of the tasks, we restrict randomization to generate more ‘realistic’ nuclear strikes. These scenarios have the following restrictions:

- All strikes are nuclear versus conventional.
- The nuclear strike always has at least as large a probability of destroying the target.
- The nuclear strike never results in more military casualties.
- The nuclear strike kills at least as many civilians as the conventional strike.
- The nuclear strike always causes at least as much environmental damage.
- The nuclear strike never has greater approval among allies.

These restrictions accord with the typical advantages and disadvantages of nuclear strikes. Two of nuclear weapons’ key potential advantages are that they may be more effective on the battlefield and save U.S. military lives. Three of their key disadvantages are that they are likely to kill more civilians, cause more environmental destruction, and have lower approval among allies. In the language of the model (as expressed in equation (5)), these realistic scenarios amount to forcing $\sum_l (B_{i1l} - B_{i2l})$ to range between -3 and 0 , and $(A_{i1k} - A_{i2k})$ to equal 0 or 1 for both k .

In total, this creates sixteen cells for the restricted randomization experiment, each one representing a combination of the four possible numbers of nuclear disadvantages $\{3, 2, 1, 0\}$ and the four possible combinations of advantages $\{(0, 0), (0, 1), (1, 0), (1, 1)\}$. Each respondent will make choices from six of these scenarios, drawn with equal probability and without replacement.

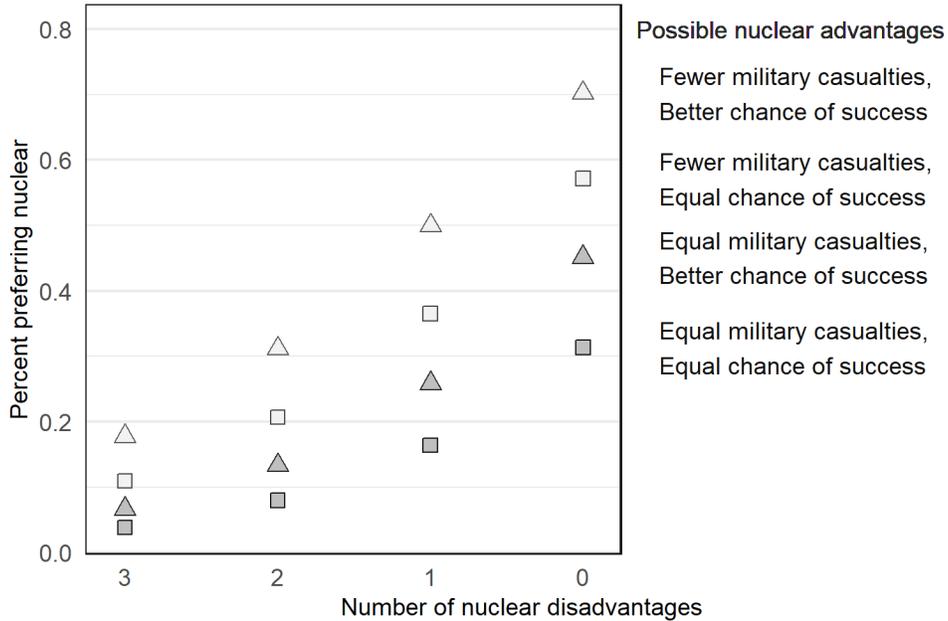
Hypotheses

Our primary interest is in testing the model’s predictions in realistic scenarios. To make the predictions more concrete, we used data from Study 1’s conjoint experiment to fit the unrestricted version of the model (from equation (5)), then generated predicted probabilities for each of the sixteen cells in the restricted randomization choice experiment. Figure F.1 displays these predictions. Our analysis of the choice experiment will feature a figure that looks something like this.

The data visualization captures the core predictions we wish to test: when nuclear weapons are coupled with their typical disadvantages, we will observe lower baseline support for their use and smaller treatment effects for increases in battlefield effectiveness. We will articulate these predictions as some version of the following hypotheses:

Hypothesis 1. Conditional aversion. More disadvantages for nuclear weapons will lead to lower levels of baseline (control group) support and less increases in support due to nuclear weapons’ possible advantages in the treatment group.

Figure F.1: Predicted Results of Choice Task, Restricted Randomization



Hypothesis 2. Effective taboo. At the greatest levels of net disadvantage for nuclear weapons, attitudes against their use will look like a taboo: support for nuclear strikes will be low and relatively resistant to change.

Analytic Plan

We test our conditional aversion theory using evidence from our survey experiment and our conjoint/choice task. We will judge our theory by the total weight of this evidence. Our plan for analyzing the data from the two components of our study is outlined below.

Survey Experiment

Our analysis of the survey experiment will focus on subjects' preference between the nuclear and conventional strike options. Let μ represent the proportion of subjects in each treatment condition that preferred the nuclear strike option. We subscript μ with $C = c, E = e$, where $C = 0$ means the nuclear option has worse material consequences, and $C = 1$ means the strike options have the same material consequences. When $E = 0$ the strike options have the same change of success, and $E = 1$ means that the nuclear option has a higher chance of success. Thus, for example, $\mu_{C=0, E=1}$ is the proportion of subjects preferring the nuclear option within the treatment condition in which nuclear weapons cause more collateral damage and have a higher probability of destroying the terrorist nuclear weapons lab.²

Based on our theoretical discussion so far, we expect:

²We reserve the right to change the coding of C and E if we decide a different coding will lead to a more intuitive presentation of the results. They will always be binary but we might change what 0 and 1 mean.

1. **Increasing the nuclear option’s material consequences decreases preferences for nuclear use.** Formally, $\mu_{C=1,E=0} > \mu_{C=0,E=0}$ and $\mu_{C=1,E=1} > \mu_{C=0,E=1}$.
2. **Increasing nuclear effectiveness increases preferences for nuclear use.** Formally, $\mu_{C=0,E=1} > \mu_{C=0,E=0}$ and $\mu_{C=1,E=1} > \mu_{C=1,E=0}$.
3. **Increasing nuclear effectiveness increases preferences for nuclear use by a smaller amount when the nuclear option’s material consequences are high.** Formally, $\mu_{C=1,E=1} - \mu_{C=1,E=0} > \mu_{C=0,E=1} - \mu_{C=0,E=0}$.

Given our conditional aversion theory, we are most interested in the relative treatment effect of increasing the nuclear strike’s effectiveness, *conditional* on the the material consequences of nuclear use (i.e., the third hypothesis above). We are confident that the treatment effect of increasing the nuclear option’s relative effectiveness will be statistically detectable when the consequences are the same ($\mu_{C=1,E=1} - \mu_{C=1,E=0} > 0$). We also expect increasing the nuclear option’s relative effectiveness to have a positive treatment effect when the consequences of nuclear are greater, but we will not be surprised if we cannot distinguish it from 0 ($\mu_{C=0,E=1} - \mu_{C=0,E=0} \geq 0$).

A formal test of our survey experimental hypotheses will use OLS to estimate the β in:

$$Y_i = \beta_0 + \beta_1 C_i + \beta_2 E_i + \beta_3 C_i E_i + \epsilon_i \quad (7)$$

where C_i and E_i are the same indicators defined above. Respectively, β_1 through β_3 test empirical hypotheses 1 through 3 in the list above. Our preferred specification is Lin estimation. We will also present estimates that do not make use of covariates.

Will 2,000 subjects provide sufficient statistical power to detect the interaction effect between collateral damage and tactical effectiveness? To answer this, we conducted power analysis that is informed by the results of prior studies. Our expectations for these group means are informed by three prior studies: Press et al. (2013); an experimental methods-focused replication of Press and colleagues by Aronow et al. (2019); and our own pilot study. Based on this past work, we assumed a set of group means that we think constitutes a conservative, still reasonable test of our theory. In particular, we wanted to assume a smaller β_3 than previous work would predict.

- **Nuclear More Destructive, Same Effectiveness** ($\mu_{C=0,E=0}$):
 - (AUTHORS’ NAMES REMOVED): 13.8 percent
 - Power analysis: 12.0 percent
- **Same Material Consequences, Same Effectiveness** ($\mu_{C=1,E=0}$):
 - Press, Sagan, and Valentino: 18.9 percent
 - Aronow, Baron, and Pinson: ~ 10 percent (weighted to match covariate distribution of PSV); ~ 15 percent (unweighted)

- Power analysis: 18.8 percent
- **Nuclear More Destructive, Nuclear More Effective** ($\mu_{C=0,E=1}$):
 - (AUTHORS’ NAMES REMOVED): 12.4 percent
 - Power analysis: 14.7 percent
- **Same Material Consequences, Nuclear More Effective** ($\mu_{C=1,E=1}$):
 - Press, Sagan, and Valentino: 51.4 percent
 - Aronow, Baron, and Pinson: ~ 60 percent (weighted); ~ 50 percent (unweighted)
 - Power analysis: 31.5 percent

Using these estimates as a guide, we conducted a power analysis using the `Declare_Design` package in R. As we have clear directional expectations, we will conduct one-tailed tests. The following summarizes the results:

- **Power for β_1 :** We assumed an effect of $\mu_{C=1,E=0} - \mu_{C=0,E=0} = 0.069$. In our simulations, we rejected the null hypothesis that $\beta_1 = 0$ in 92 percent of simulations. However, our theory is consistent with a relatively small effect for β_1 , and thus we will not be surprised if we are unable to statistically distinguish our estimate of β_1 from 0.
- **Power for β_2 :** We assumed an effect of $\mu_{C=0,E=1} - \mu_{C=0,E=0} = 0.126$. We rejected the null hypothesis that $\beta_2 = 0$ in 99 percent of simulations.
- **Power for β_3 :** We assumed an effect of $[\mu_{C=1,E=1} - \mu_{C=0,E=1}] - [\mu_{C=1,E=0} - \mu_{C=0,E=0}] = 0.099$. We rejected the null hypothesis that $\beta_3 = 0$ in 87.5 percent of simulations.

Our other main analysis will be of the open-ended justifications of strike choice. We will hire research assistants to code the responses according to a protocol reported in the appendix of this pre-analysis plan. This analysis will focus on the reasons that subjects provide for choosing the conventional strike option over the nuclear strike option, and whether those reasons reflect material consequentialist, strategic, or taboo-related logics. We analyze the overall proportions and make a Venn diagram to examine overlap between them. We expect the results of this analysis to reflect treatment status. In treatment conditions that present the nuclear option as more harmful to civilians and the environment, we expect at least strong plurality of respondents will justify their choice with reference to the greater material consequences produced by nuclear weapons. In treatment conditions that present the nuclear option as equally harmful to civilians and the environment as the conventional alternative, we expect that there will be more strategically-grounded justifications, and, perhaps counterintuitively, more taboo-like aversion.

Our remaining outcome variables are included mainly for the sake of replicating PSV. They were not essential to our draft manuscript based on study 1, and we will likely report them in the appendix. However, we do have a hypothesis that question order affects the approval

questions: subjects may say they "approve" nuclear strikes because they want to strike the facility, not because they prefer to do it with a nuclear weapon. If given the chance to say that they approve of a strike, perhaps they will express lower support for nuclear strikes. To learn about this, we will randomize the order of the nuclear and conventional approval variables.

Choice Experiment

Our expectations for the choice experiment are similar to the hypotheses for the survey experiment. In the choice experiment, we will have more granular data on support for nuclear strikes given different levels of net disadvantages and tactical success. We expect the following trends to emerge:

- Adding more net disadvantages reduce support for nuclear strikes
- Increasing tactical effectiveness of nuclear strikes increases support
- The treatment effects of greater tactical effectiveness and fewer military casualties decrease as number of net disadvantages increases.

For a statistical test of these hypotheses, we will take advantage of the fact that for the set of advantages and disadvantages we have stipulated, preference for nuclear strikes appears roughly linear in the number of disadvantages it faces. Assuming that the relationship is linear and testing for a difference in slopes provides an easy-to-reach-for statistical test of the hypotheses just listed. We will use OLS to estimate

$$Y_{ij} = \alpha_0 + \alpha_C C_{ij} + \alpha_E E_{ij} + \beta B_{ij} + \delta_C C_{ij} B_{ij} + \delta_E E_{ij} B_{ij} + \epsilon_i \quad (8)$$

where Y indicates preferring a nuclear to a conventional strike, i indexes respondents, and j indexes matchups. E_{ij} indicates whether indicators are equally (0) or more (1) effective than conventional weapons. C_{ij} indicates whether the nuclear option would involve the same number of U.S. military casualties as the conventional option (0) or fewer casualties (1). B_{ij} is the number of nuclear disadvantages.

Our main interest is in the two interaction coefficients, δ_C and δ_E . We expect these to be negative,³ implying that the effect of each nuclear advantage is decreasing in the number of nuclear disadvantages.

To be clear, we think that relative to OLS, the logistic function is a much better parametric model for preferences over nuclear weapons. This is because unlike OLS, it accounts for the idea that the marginal effect of any particular advantage or disadvantages depends on how many other advantages and disadvantages are present at baseline. We have selected OLS to test the theory because we have strong theoretical expectations and a good reason to think that OLS provides a straightforward, if approximate, test of those expectations.

³Depending on what we decide is most intuitive, we reserve the right to decide to code B_{ij} on $\{-3, -2, -1, 0\}$ instead of $\{0, 1, 2, 3\}$. In this case, the coefficients would be positive instead of negative.

The key threat to this test's ability to detect the expected effect is that our assumptions about the relative influence of the advantages and disadvantages end up being very wrong. Once the logistic function passes 0.5 on the Y -axis, its slope starts decreasing. If the equivalent of Figure F.1's upper rightmost triangle is substantially larger than its predicted value, the test we have specified here will not be as appropriate as we expect it to be.

We will also conduct the following analyses:

- Fit the an unrestricted version of model, using both the restricted randomization and the pure conjoint.
- Report the AMCE's from the conjoint. We expect to use this as a first look at the relative importance of each attribute in affecting respondents' choices. However, the AMCE's will not be the main focus of our analysis of the conjoint.
- Run simulations in which we vary η to explore how strong the gut aversion would have to be to make nuclear support extremely low when nukes' typical disadvantages are framed away. This will show the level of inherent aversion towards the use of nuclear weapons necessary for the strong definition of the taboo to be operative.
- Use the unrestricted choice task to look at the full preference profile. For that, we will assume that $\alpha_k = \beta$ and throw all factors onto a single axis. Then we will plot model estimates against the observed data. This figure is just like the main figure in Study 1 (Figure 4), and it shows how support for nuclear use moves in relation to the net advantages of a nuclear strike.

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