



# Will the Treaty on the Prohibition of Nuclear Weapons affect nuclear deproliferation through legal channels?

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## Summary

Frustrated by the lack of progress on nuclear disarmament, a growing movement of government and civil society actors has emerged hoping to reignite efforts to move toward de-proliferation and disarmament. Out of this movement came the [Treaty on the Prohibition of Nuclear Weapons](#) (TPNW), a legally-binding treaty that would prohibit party countries from possessing, using, threatening to use, hosting, testing, or developing nuclear weapons. The treaty would also forbid parties from contributing to or encouraging those activities, for example by aligning themselves with nuclear weapons states with the explicit aim of being shielded by a nuclear umbrella.

In this post, I investigate whether the TPNW is likely to have an impact on nuclear deproliferation through formal legal channels — for example, by keeping countries that might have considered building nuclear weapons programs from doing so.<sup>1</sup> To do this, I first looked into whether any of the countries that are currently doing things that would be banned by the TPNW might ratify the treaty in the next 20 years (and stop doing those things). Next, I looked into whether the TPNW will keep any countries that ratify the treaty from becoming non-compliant — for example, [by trying to get a sense of whether the treaty could counterfactually cause them not to pursue nuclear weapons](#).

I came out feeling very pessimistic about the likelihood that countries that are non-compliant with the TPNW will ratify it, largely because none of the 40 non-compliant countries have signed or ratified the TPNW, and several have spoken out against it. Additionally, I'm somewhat pessimistic about the potential for the TPNW to causally influence the decision of TPNW supporters to pursue, host, or manufacture nuclear

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<sup>1</sup> Note that I'm considering the impact on deproliferation and adjacent policies, not necessarily on nuclear risks. While these are related, I don't currently have a good enough understanding of how certain nuclear policies affect nuclear risks to make claims about the effect on TPNW on nuclear risks.

weapons, or to join a nuclear weapons alliance, though I have more uncertainty about this.

This leads me to think that the TPNW is unlikely to have much of an impact on nuclear deproliferation through legal channels overall. That said, it's quite possible that the TPNW will have an impact on nuclear weapons policies through informal channels. I'll explore this possibility extensively in a future post.

## Project Overview

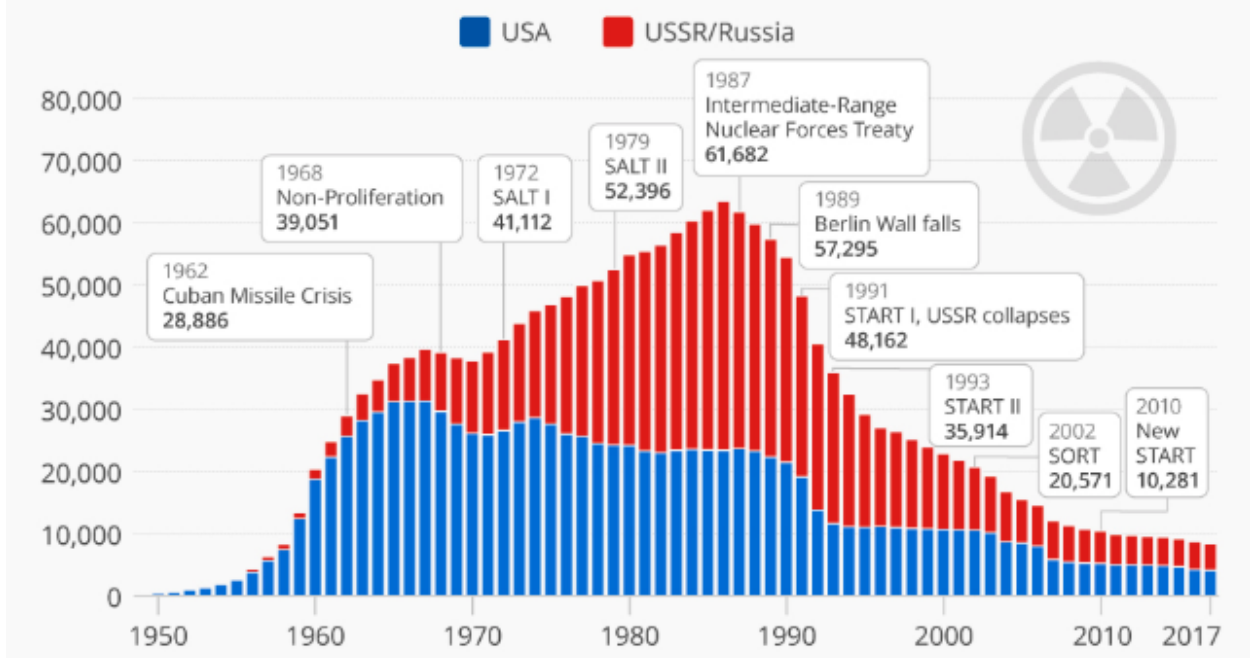
This is the sixth post in [Rethink Priorities'](#) series on nuclear risks. In the [first post](#), I look into which plausible nuclear exchange scenarios should worry us most, ranking them based on their potential to cause harm. In the [second post](#), I explore the make-up and survivability of the US and Russian nuclear arsenals. In the [third post](#), I estimate the number of people that would die as a direct result of a nuclear exchange between NATO states and Russia. In the [fourth post](#), I estimate the severity of the nuclear famine we might expect to result from a NATO-Russia nuclear war. In the [fifth post](#), I get a rough sense of the probability of nuclear war by looking at historical evidence, the views of experts, and predictions made by forecasters. In this post, explore the potential for the Treaty on the Prohibition of Nuclear Weapons (TPNW) to affect nuclear deproliferation through legal channels. Future work will explore the possible impacts of the TPNW on nuclear deproliferation through informal channels — things like norm-shifting — as well as the direct and indirect effects of nuclear exchanges between (1) India and Pakistan and (2) China and its adversaries, the contradictory research around nuclear winter.

## The Rationale for the Treaty on the Prohibition of Nuclear Weapons

Nuclear de-proliferation was enormously successful from the late 80s to the early 2000s. Following the Cold War, a series of bilateral treaties between the United States and Russia brought the number of nuclear weapons down from just under 65,000 nuclear weapons in 1986 to under 10,000 in 2017.

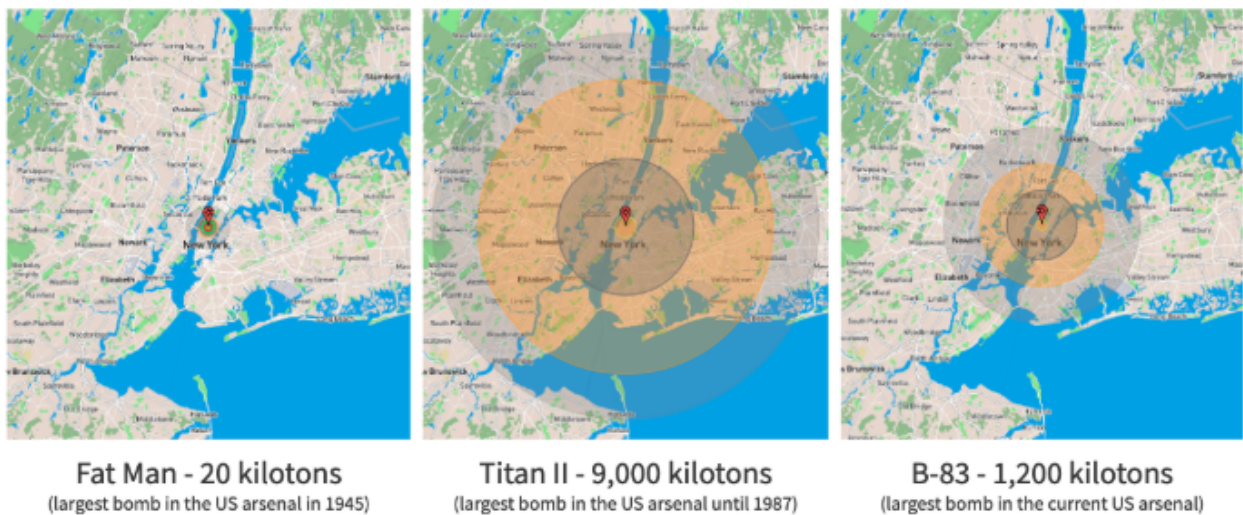
# How U.S. And Russian Nuclear Arsenals Evolved

Stockpiled nuclear warhead count by year



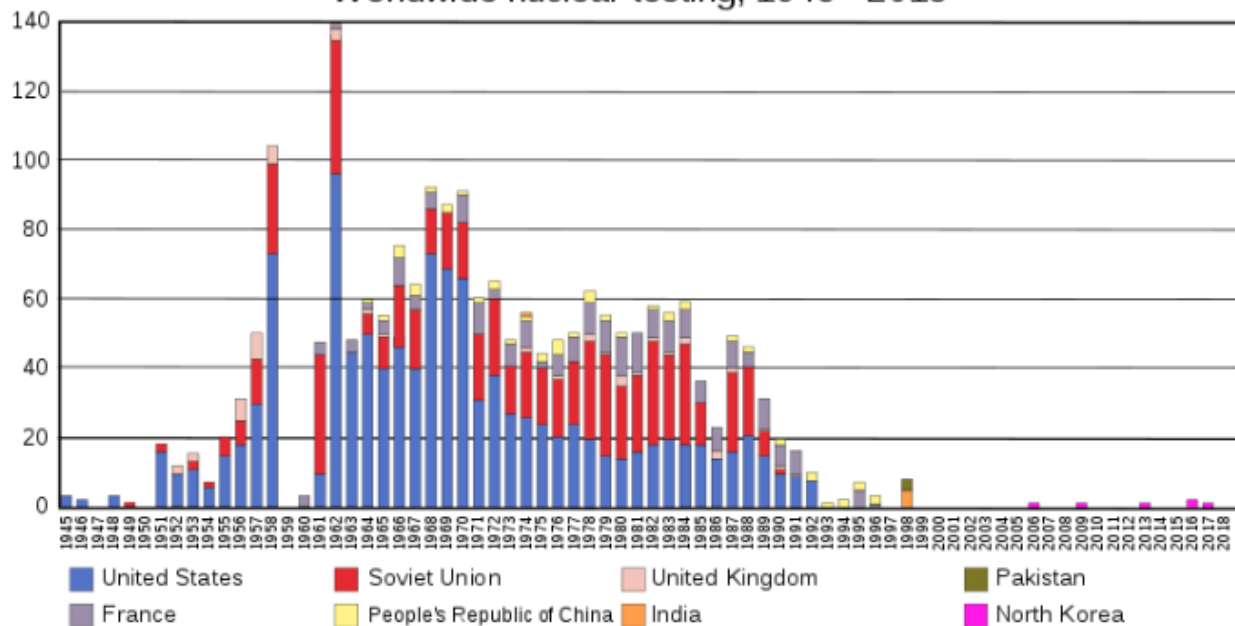
Source: [Data from the Federation of American Scientists](#); [Graphic from Statista](#)

Simultaneously, the explosive yield of the typical nuclear weapon in both the US and Russian arsenals fell drastically, as did the number of nuclear weapons tests being conducted globally.



Source: Generated using [NUKEMAP](#)

Worldwide nuclear testing, 1945 - 2018



Source: [Wikipedia](#)

That process seems to be stalling — you can see in the graph above that the number of nuclear weapons started to plateau in the late 2000s, and most of the countries with nuclear weapons are currently investing heavily in expanding or modernizing their nuclear forces ([Kristensen & Norris, 2017](#)).

Frustrated by the lack of progress, a growing movement of government and civil society actors has emerged hoping to reignite efforts to move toward de-proliferation and disarmament. Out of this movement came the [Treaty on the Prohibition of Nuclear Weapons](#) (TPNW), a legally-binding treaty that would prohibit party countries from possessing, using, threatening to use, hosting, testing, or developing nuclear weapons. The treaty would also forbid parties from contributing to or encouraging those activities, for example by aligning themselves with nuclear weapons states with the explicit aim of being shielded by a nuclear umbrella.

On July 7th, 2017, 122 of the 195 United Nations members voted to adopt the TPNW, which becomes legally binding 90 days after 50 countries become state parties, by either [ratifying](#) or [acceding](#) to the treaty. If and when that happens, any country that has ratified the TPNW must comply with it or would be considered to be violating international law.

Since the treaty’s adoption, there have been mixed opinions about whether the TPNW will boost deproliferation efforts, have no effect, or make things worse. In this post, I try to understand which of those outcomes is most likely. To do this, I consider all of the plausible ways the treaty might have an impact, and then draw from expert opinions and evidence from historical analogs and current events to judge whether those impacts are likely to be realized.

In the rest of this document, I’ll first outline what the treaty does and doesn’t do, going

through the main articles one at a time. Then, I'll try to understand whether the treaty will have any impact on nuclear deproliferation through formal/legal channels once it goes into force. In other words, I'll try to understand whether any currently non-compliant countries — countries that possess, (threaten to) use, host, test, or develop nuclear weapons, etc. — will stop doing so after ratifying the TPNW, or whether the TPNW will keep member countries from becoming non-compliant.

In a set of future posts, I'll try to figure out whether the treaty is likely to have any impacts through more informal channels — for example by shifting norms around nuclear weapons in a way that pushes countries engaging in the activities forbidden in the treaty to stop pursuing those activities. I'll also try to draw some conclusions about the net impact of the treaty, as well as the impact of the group who conceived of and pushed for the treaty: the International Campaign to Abolish Nuclear Weapons (ICAN).

## What the treaty does



Here, I'll spell out the requirements and restrictions laid out in the most important of the 20 articles in the TPNW. (I won't summarize the articles that just talk about logistical details.)

The first article in the TPNW describes exactly what is prohibited by the treaty. State parties are forbidden from:

- developing, testing, manufacturing, acquiring, possessing, or stockpiling nuclear explosive devices
- giving nuclear explosive devices to other countries

- giving and/or receiving control over nuclear explosive devices in any country
- hosting (stationing, storing, deploying) nuclear explosive devices on a party's own territory, or foreign territories under the party's control
- supporting, encouraging, or coercing other countries into pursuing any of the activities that treaty disallows
- seeking support from other countries to pursue any of the prohibited activities

Article 2 requires that countries declare whether they currently have, possess, control, or are hosting on their territory nuclear weapons, and if not, whether they've ever done so. All of those declarations then get shared with all of the state parties.

The third article explains that parties that are International Atomic Energy Agency (IAEA) member states — IAEA is basically the international authority on nuclear materials — that don't possess/control nuclear weapons have to maintain their [IAEA safeguard obligations](#), and that non-members must adopt safeguards that meet the standards outlined in the [Non-Proliferation Treaty](#) (NPT).

Article 4 talks about the actions state parties that possess/control/host nuclear weapons have to take in order to be compliant with the treaty. Specifically, article lays out:

- State parties that possessed nuclear weapons after July 7, 2017, the date that the TPNW opened for signature, are required to negotiate an agreement specifying how a designated international authority will verify that the party has eliminated all nuclear weapons and irreversibly converted all nuclear weapons-related facilities.
- A state party that possesses nuclear weapons as of the date that the treaty has entered into force for that state party has 60 days to create a plan for the elimination of all nuclear weapons and conversion of nuclear weapons-related facilities, and verification of those efforts by a competent international authority.
- State parties that are hosting nuclear weapons on their territory have to remove those weapons as soon as possible (by the first TPNW member meeting at the latest) and then let the UN Secretary General know that it's done.

Article 4 also notes that state parties that were non-compliant with the TPNW before it was adopted (i.e., the countries possessed or hosted nuclear weapons) have to submit reports on their progress at each TPNW member meeting.

Finally, Article 4 states that the state parties have to designate a competent international authority to verify compliance among state parties (analogous to IAEA for the NPT). If this hasn't happened by the time treaty goes into force, a special meeting has to be convened to designate the competent international authority.

Article 5 says that state parties have to take the legal steps necessary to complete their obligations under the treaty, and that it has to take appropriate legal action against individuals or groups in its territory or under its control that violate the terms of the treaty.

Article 6 requires that parties engage in environmental remediation and that they offer

assistance to the victims of the use and testing<sup>2</sup> of nuclear weapons.

Articles 7 and 12 note that state parties are required to encourage non-state parties to ratify the treaty, and to support other state parties in the treaty's implementation.<sup>3</sup>

Articles 8 and 9 talk about the logistics of the treaty, including when the state parties will meet and who will bear the costs of the meetings.

Articles 13 through 15 note that the treaty is open for signature, ratification, and accession in New York, starting September 20, 2017, and that the treaty will enter into force 90 days after the 50th state ratifies it.

To read the full text of the treaty, click [here](#).

## What kinds of impacts might this treaty have?

The most straightforward way the TPNW could impact states' behavior would be through formal legal channels. In effect, countries that are currently doing things that are made illegal by the treaty could ratify the treaty, leading them to stop doing those newly-illegal things. It's also possible that countries that are currently compliant with the TPNW and choose to ratify it may have eventually wanted to behave in ways that are now prohibited by the treaty. In such cases, the TPNW may be causally responsible for preventing that behavior.

Additionally, some have argued that the TPNW will change international norms around nuclear weapons, shaming states that are non-compliant with the treaty into changing their behavior in some way.

In this post, I'm going to focus on the pathways to impact that go through formal channels either now or at some point in the future. In a future post, I'll consider the potential for the TPNW to influence non-compliant states' behaviors through informal channels like norm-shifting.

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<sup>2</sup> To better understand the costs of nuclear weapons testing, see [Meyers \(2017\)](#), or [this Quartz article](#) summarizing Meyers's work.

<sup>3</sup> Currently, the state parties include: Antigua and Barbuda, Austria, Bangladesh, Bolivia, Cook Islands, Costa Rica, Cuba, Dominica, Ecuador, El Salvador, The Gambia, Guyana, Holy See, Kazakhstan, Kiribati, Laos, Maldives, Mexico, New Zealand, Nicaragua, Palau, Palestine, Panama, Samoa, San Marino, South Africa, St Lucia, St Vincent & Grenadines, Thailand, Trinidad & Tobago, Uruguay, Vanuatu, Venezuela, Vietnam



# Will the treaty have an impact through formal legal channels?

There are two main ways the treaty could end up having an impact on states' behavior through formal legal channels:

1. Non-compliant countries might ratify the TPNW.
2. The TPNW prevents countries that ratify the treaty from becoming non-compliant.

I'll discuss both of these mechanisms in turn.

## Will non-compliant countries ratify the TPNW?

To start, I looked into whether any countries who currently have non-compliant nuclear weapons policies — mainly, possession of nuclear weapons, hosting of nuclear weapons, and/or being protected by a nuclear umbrella — have ratified or will ratify the TPNW in the short-term (within 5 years) or longer-term (20 years). The following countries are currently non-compliant:

<i>Non-compliance with the treaty</i>	<i>Countries</i>
Countries with nuclear weapons (9 countries)	China, France, Russia, United Kingdom, United States, North Korea, India, Israel, Pakistan
Countries under the protection of a nuclear umbrella <sup>4</sup> (35 countries)	Albania, Armenia, Australia, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, Germany, Greece, Hungary, Iceland, Italy, Japan, Latvia, Lithuania, Luxembourg, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, South Korea, Spain, Turkey, France, Russia, United Kingdom, United States
Hosts nuclear weapons on its territory (5 countries)	Belgium, Germany, Italy, Netherlands, Turkey

See footnote 4 here.<sup>4</sup>

Source: Adapted from the [Nuclear Weapons Ban Monitor \(2019\)](#)<sup>5</sup>

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<sup>4</sup> Countries under the so-called [nuclear umbrella](#) of their allied countries with nuclear weapons consent to and/or expect that those allies will use their nuclear weapons to defend them.

<sup>5</sup> Up-to-date as of December 5th, 2019.

To date, none of these 40 countries have signed or ratified the TPNW, and several have spoken out against it. For example, the five countries that are legally allowed to have nuclear weapons, known as the nuclear weapons states (NWSs) — the United States, the United Kingdom, France, China, and Russia — made a joint public statement opposing the TPNW and vowing not to become members:<sup>6</sup>

“...we reiterate our opposition to the Treaty on the Prohibition of Nuclear Weapons. We firmly believe that the best way to achieve a world without nuclear weapons is through a gradual process that takes into account the international security environment. This proven approach to nuclear disarmament has produced tangible results, including deep reductions in the global stockpiles of nuclear weapons.”

“The TPNW fails to address the key issues that must be overcome to achieve lasting global nuclear disarmament. It contradicts, and risks undermining the [Non-Proliferation Treaty]. It ignores the international security context and regional challenges, and does nothing to increase trust and transparency between States. It will not result in the elimination of a single weapon. It fails to meet the highest standards of non-proliferation. It is creating divisions across the international non-proliferation and disarmament machinery, which could make further progress on disarmament even more difficult.”

“We will not support, sign or ratify this Treaty. The TPNW will not be binding on our countries, and we do not accept any claim that it contributes to the development of customary international law; nor does it set any new standards or norms. We call on all countries that are considering supporting the TPNW to reflect seriously on its implications for international peace and security.”

Other countries have made similar statements, including countries that aren't even violating the conditions of the treaty (for example, a Swiss working group released [this report on why it won't be ratifying the treaty](#)).

In fact, of the 40 non-compliant countries, 39 boycotted the TPNW negotiations entirely. The only non-compliant country to participate, the Netherlands, seemed to do so only because it was [required to participate by its Parliament](#) (Shirobokova, 2018).

Failure to participate in the negotiation of a given treaty shouldn't necessarily be taken as a condemnation of that treaty's aims or the treaty itself. Countries might also choose not to participate because they are under-resourced or unaffected and indifferent to the treaty's content and goals. In the case of the TPNW, though, the non-compliant countries have the resources to engage (their median GDP is \$294 billion USD annually), and each has a clear and vested interest in the treaty's aims. I therefore interpret their decisions to boycott of the treaty negotiations as evidence that they condemn the treaty, or are at least actively disinterested in ratifying it themselves.

Taken together, I think it's quite unlikely (best guess: 5%; 90% subjective confidence interval: 0–25%) that any countries that are currently failing to comply with the TPNW's stipulations will ratify the treaty in the near-term (within the next 5 years) and fairly unlikely (best

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<sup>6</sup> The quoted text is an excerpt — for the full text, see [here](#).

guess: 15%; subjective confidence interval: 0–33%) they'll do so in the longer term (within the next twenty years).<sup>7,8</sup>

## Will the TPNW keep TPNW supporters from becoming non-compliant?

Next, I'll consider whether some of the countries that have signed/ratified the TPNW — I'll call these countries the TPNW supporters — might eventually decide not to pursue non-compliant policies because of their TPNW membership when they otherwise would have.

To start, I tried to get a sense of this by looking at the academic literature on arms control treaties to see whether there's any evidence that these treaties generally make member states more likely to be compliant.

## Do treaty commitments reduce the probability that states will engage in non-compliant activities?

I found that it's pretty widely accepted that the members of arms control treaties almost always adhere to the conditions of those treaties ([Chayes & Chayes, 2014](#); [Downs, Rocke, & Barsoom, 1996](#); [Mitchell & Hensel, 2007](#); [von Stein, 2005](#)). However, countries that sign treaties banning or limiting certain weapons likely do so in part because they independently support that policy and wouldn't have used that weapon anyway. Any differences in the behavior of the countries that do/don't sign a particular treaty can't really

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<sup>7</sup> A subjective confidence interval (SCI) expresses one's subjective view of the probability of an event along with the degree of uncertainty around that probability. Like a 90% confidence interval, we should have 90% confidence that the true value of the parameter being estimated falls within the SCI. My favorite explainer on SCIs is [here](#).

<sup>8</sup> A quick note on the subjective confidence intervals (SCIs) in this post: I make several predictions about events over a 20 year time span. I want to be transparent about my process for making those predictions. What I've basically done is estimated an SCI that the event would happen tomorrow ( in effect, the probability that it would happen given the current state of the world)I then widen that SCI to account for the fact that my confidence decreases as the time horizon of the prediction gets bigger — and as the information I have about the conditions of the world decreases. The degree to which I widen the SCI depends on how mutable the important considerations seem to be. For example, if a key consideration is a country's GDP, I wouldn't widen the 20-year SCI very much, because the GDP is unlikely to change radically in the next 20 years. If however the key consideration is something like the political party in power — something which is much more likely to change in unpredictable ways — I would widen the SCI a fair bit.

be disentangled from the fact that they likely had different views on the given policy in the first place.

The case of the nuclear [Non-Proliferation Treaty](#) (NPT) is illustrative in this respect.

Adopted in 1968, the NPT made it so that the only countries that were legally allowed to possess nuclear weapons were those that had “manufactured and exploded” a nuclear weapon by 1967 — the US, the UK, France, China, and Russia. The NPT also required that those five countries agree to disarm at some (unspecified) point in the future, and banned nuclear weapons for the other 186 countries that signed on.

Considered the pillar of the nuclear arms control regime, the NPT is widely viewed as a key reason the vast majority of countries don't have nuclear weapons. Only four countries aren't state parties to the treaty: India, Pakistan, Israel, and South Sudan (North Korea is technically a state party but is in violation and has previously announced its intention to formally withdraw from the treaty).

On the other hand, NPT-pessimists argue that the NPT was the product of a near-universal preference for nonproliferation rather than causally responsible for it ([Fuhrmann & Lupu, 2015](#)). Of the 16 empirical studies that quantify the impact of the NPT on nonproliferation, seven find a negative correlation between the NPT and proliferation, another seven found mixed effects, and two found no relationship ([Fuhrmann & Lupu, 2015](#)).

Only one of these studies tried to estimate the impacts of arms control treaties after taking account of the selection effects that concern NPT-pessimists. That study, done by Fuhrmann and Lupu ([2015](#)), used a quasi-experimental study design called [propensity-score matching](#) (PSM) to compare the behavior of NPT members to non-members who seemed equally likely to have ratified the NPT.

Specifically, Fuhrmann and Lupu ([2015](#)) estimated the probability that a given country would enter the NPT based on factors like a country's relationship with the US/USSR, whether they typically participate in international treaties, whether they'd entered into other nuclear cooperation agreements, and their GDP, among others. The authors then matched each country that entered the NPT with a country that didn't enter the NPT, but that had a similar probability of entering the treaty ex ante. They then compared the behaviors of each of the paired countries to see if countries that entered the NPT were systematically less likely to pursue a nuclear weapons program, while (theoretically) holding constant the factors that would make a country more or less likely to select into the treaty.

The authors found that the NPT did have a meaningful impact on member states' likelihood of pursuing nuclear weapons programs:

“Statistical significance aside, NPT ratification is substantively important in shaping the probability of nuclear proliferation. Based on the estimates from Model 1, the size of the effect of NPT ratification on the probability of nuclear weapons pursuit is about 3 times the size of the effect of belonging to an enduring rivalry and about 7 times the size of the effect of belonging to an alliance with the U.S. or Soviet Union.”

But despite probably being the best study out there, I think Fuhrmann and Lupu (2015) has several weaknesses. For example, there aren't that many countries that pursued nuclear weapons programs. This makes it difficult to distinguish between noisy data and actual meaningful differences among countries that didn't end up pursuing nuclear weapons programs.

So there's evidence that maybe the NPT had some counterfactual impact on the behavior of state parties. But I think the evidence base is somewhat weak — especially considering the mixed results of the full body of literature.

Compounding my skepticism is the fact that there are differences between the NPT and the TPNW that make me think that the case that the TPNW will counterfactually impact its supporters behavior is even weaker than the case that the NPT has. This is because, unlike the NPT, which ended up being signed by almost every country, the TPNW seems to only have support from countries that are unlikely to have pursued policies banned by the TPNW.

If I'm right about this, it seems like the TPNW would be unlikely to counterfactually constrain behavior. I explore each of these hypotheses in a bit more depth next, starting with whether the TPNW supporters would pursue nuclear weapons in the foreseeable future.

## **Will the TPNW prevent TPNW supporters from pursuing nuclear weapons?**

All but three of the 79 TPNW supporters are also members of the Non-Proliferation Treaty (NPT),<sup>9</sup> and 70% of them are already members of regional nuclear weapons free-zone treaty.<sup>10</sup> I'm somewhat skeptical that the TPNW reduces the likelihood that the state parties would be any more disincentivized from pursuing nuclear weapons programs than they are by the NPT and regional nuclear weapons free zone treaties, which already ban nuclear weapons programs for all but the five nuclear weapons states (NWSs) permitted to have nuclear weapons under the NPT.

On the other hand, it could be the case that the TPNW compounds the impact of the other treaties in the nuclear arms control regime. I'm fairly skeptical of this line of reasoning, mainly because I think the TPNW supporters seem particularly unlikely to want and/or be able to develop nuclear weapons — at least in the foreseeable future (next 20 years). To decide to actively pursue a nuclear weapons program, I would guess that a country would

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<sup>9</sup> The exceptions being Cook Islands, Trinidad & Tobago, and St. Kitts and Nevis, three tiny countries populations of [-18,000](#), [-1.4 million](#), and [-55,000](#), respectively.

<sup>10</sup> These include the [Treaty of Tlatelolco](#) in Latin America, the [Treaty of Pelindaba](#) in Africa, the [Bangkok Treaty](#) in Southeast Asia, the [Treaty of Rarotonga](#) in the South Pacific, and [Treaty of Semipalatinsk](#)

have to:

1. **Be relatively wealthy.** Developing or acquiring nuclear weapons is expensive. A very limited nuclear weapons program like North Korea's [probably costs at least one billion USD to build from scratch](#) — and this doesn't include the [at least \\$700 million annually USD it takes to maintain that program](#). Countries with smaller economies would likely find nuclear weapons prohibitively expensive.
2. **Have the technical capabilities and materials to develop nuclear weapons.** Building a nuclear weapons program requires specialized technical expertise as well as fissile material (plutonium and highly enriched uranium), which most countries don't have access to (and is heavily regulated).
3. **Be at least somewhat conflict-prone.** As I noted above, nuclear weapons are incredibly expensive, and not all countries face security threats serious enough that nuclear weapons (as a deterrent or otherwise) would be worth the investment.
4. **Be politically open to nuclear weapons.** Many governments and/or civil societies consider nuclear weapons an illegitimate element of military doctrine. It may be the case that the political environment in some countries would make the development of nuclear weapons in those countries infeasible.

I've tried to understand to what extent the current TPNW supporters have these characteristics. To do this, I compiled a set of proxies that I expect tell us something about whether these countries are wealthy enough, capable enough, and motivated enough to develop nuclear weapons. I'll discuss the [resulting dataset](#) more below.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
			Are they in compliance with the treaty?			Could the effort to build a nuclear weapons program from scratch?			Do they have a track record of supporting nuclear proliferation/disarmament?			Are they peaceful or conflict-prone?					
			Has nuclear war Part of a nuclear Non-nuclear war? (billions)			Would a nuclear weapons materials to build			Has fissile material Party to the Non-Proliferation Treaty ratified the Comprehensive Member of a regional Peace Index International Confirization, GPI Rating Involved in angic conflict, total disputes since								
3	Ratifiers and acceders																
4	Antigua and Barbuda	No	No	No	\$1.5	68.49%	No	Yes	Yes	Yes	Yes				No		
5	Austria	No	No	No	\$390.8	0.26%	No	Yes	Yes	No	Yes	4	10	13	No	0	1
6	Bangladesh	No	No	No	\$220.8	0.45%	No	Yes	Yes	No	Yes	101	56	118	No	0	2
7	Bolivia	No	No	No	\$33.8	2.90%	No	Yes	Yes	No	Yes	85	131	39	No	0	0
8	Cook Islands	No	No	No	\$0.3	344.83%	No	No	Yes	Yes	Yes				No	0	0
9	Costa Rica	No	No	No	\$57.4	1.74%	No	Yes	Yes	Yes	Yes	33	52	24	No	0	0
10	Cuba	No	No	No	\$89.7	1.11%	No	Yes	No	Yes	Yes	91	41	104	No	0	1
11	Dominica	No	No	No	\$0.6	172.12%	No	Yes	No	Yes	Yes				No	0	0
12	Ecuador	No	No	No	\$98.0	1.02%	No	Yes	Yes	Yes	Yes	71	79	41	Yes	1	1
13	El Salvador	No	No	No	\$26.8	3.73%	No	Yes	Yes	Yes	Yes	113	63	70	No	1	1
14	The Gambia	No	No	No	\$1.0	101.42%	No	Yes	Yes	No	Yes	62	66	66	No		
15	Guyana	No	No	No	\$3.4	29.10%	No	Yes	Yes	Yes	Yes	92	38	43	No	0	0
16	Holy See	No	No	No			No	Yes	Yes	Yes	Yes				No	0	0
17	Kazakhstan	No	No	No	\$135.0	0.74%	Yes	Yes	Yes	Yes	Yes	64	77	83	No	0	0
18	Kiribati	No	No	No	\$0.2	574.71%	No	Yes	Yes	Yes	Yes				No	0	0
19	Laos	No	No	No	\$15.8	6.33%	No	Yes	Yes	Yes	Yes	45	60	46	No	1	1
20	Maldives	No	No	No	\$4.2	23.67%	No	Yes	Yes	Yes	Yes				No	0	0
21	Mexico	No	No	No	\$1,076.9	0.09%	No	Yes	Yes	Yes	Yes	140	62	145	No	0	1
22	New Zealand	No	No	No	\$187.5	0.53%	No	Yes	Yes	Yes	Yes	2	4	8	No	0	2
23	Nicaragua	No	No	No	\$13.2	7.56%	No	Yes	Yes	Yes	Yes	120	55	121	No	1	0
24	Palau	No	No	No	\$0.3	322.58%	No	Yes	Yes	Yes	Yes				No	0	0
25	Palestine	No	No	No	\$13.4	7.46%	No	Yes	No	No	Yes	142	110	144	Yes	0	2
26	Panama	No	No	No	\$55.2	1.81%	No	Yes	Yes	Yes	Yes	47	23	27	No	1	0
27	Samoa	No	No	No	\$0.8	121.65%	No	Yes	Yes	Yes	Yes				No	0	0
28	San Marino	No	No	No	\$1.6	62.85%	No	Yes	Yes	No	Yes				No	0	0
29	South Africa	No	No	No	\$295.4	0.34%	Yes	Yes	Yes	Yes	Yes	127	92	93	No	0	2
30	St Lucia	No	No	No	\$1.4	71.58%	No	Yes	Yes	No	Yes				No	0	0
31	St Vincent & Grenadines	No	No	No	\$0.8	130.72%	No	Yes	Yes	Yes	Yes				No	0	0
32	Thailand	No	No	No	\$407.0	0.25%	No	Yes	Yes	Yes	Yes	117	28	126	No	1	2
33	Trinidad & Tobago	No	No	No	\$24.1	4.15%	No	No	Yes	No	Yes				No	0	0
34	Uruguay	No	No	No	\$52.4	1.91%	No	Yes	Yes	Yes	Yes	34	51	4	No	0	0
35	Vanuatu	No	No	No	\$0.8	119.33%	No	Yes	Yes	Yes	Yes				No	0	0
36	Venezuela	No	No	No	\$291.4	0.34%	No	Yes	Yes	No	Yes	144	85	122	Yes	0	0
37	Vietnam	No	No	No	\$205.3	0.49%	No	Yes	Yes	Yes	Yes	57	130	53	No	2	2
38	Ratifier median	0%	0%	0%	\$25.4	4%	0%	94%	91%	61%	61%	85	60	66	9%	0.3	0.6

Broadly speaking, I found that TPNW supporters seem to be 1) mostly low and middle-income countries, 2) less likely to have access to [fissile material](#) necessary to develop nuclear weapons, 3) less prone to inter-state conflict and territorial disputes, and 4) historically very committed to nuclear deproliferation and disarmament. This makes me think that most of the TPNW supporters wouldn't want to pursue a nuclear weapons

program in the foreseeable future regardless of their membership in the TPNW.

Some more details on the proxies I used, and how TPNW supporters compare to other countries:

## TPNW supporters are mostly low and middle-income countries

Most of the TPNW supporters have very small economies and limited economic growth — likely too small to finance a nuclear weapons program. The median GDP of the TPNW supporters is about \$21 billion USD, which is a bit lower than the median of all the countries who haven't supported the treaty (\$37 billion USD), and much, much lower than that of the nine countries with nuclear weapons arsenals (\$2.3 trillion USD).

<i>Could they afford to build a nuclear weapons program from scratch?</i>		
<i>Countries</i>	<i>GDP (billions), USD</i>	<i>What percent of their GDP would a nuclear weapons development program be?</i>
Ratifiers and acceders	\$25.4	4%
Signatories	\$20.5	4.89%
All supporters (ratifiers, acceders, and signatories)	\$21.0	4.76%
Compliant, have neither signed or ratified the TPNW	\$14.2	7.06%
Non-compliant, have neither signed or ratified the TPNW	\$294.7	0.34%
All countries that have neither signed or ratified the TPNW	\$37.0	2.70%
Just countries with nuclear weapons	\$2,259.6	0.04%

But some TPNW supporters would be able to finance a nuclear weapons program. Austria, Mexico, New Zealand, South Africa, Thailand, Venezuela, Vietnam, Algeria, Angola, Bangladesh, Brazil, Chile, Colombia, Indonesia, Ireland, Kazakhstan, Malaysia, Nigeria, Peru, and the Philippines all have a pretty high GDP, and could probably spend one billion dollars on a nuclear weapons program reasonably easily if they wanted to.

In the remaining countries, a nuclear weapons program would cost about 12% of their GDP (median) to build from scratch (excluding the cost to maintain the program) — an amount that I expect makes nuclear weapons prohibitively expensive. For those countries that can't afford nuclear weapons, I expect the TPNW won't have any effect on their behavior. They probably aren't going to build nuclear weapons either way.

## Almost none of the TPNW supporters have access to fissile material

To build a nuclear bomb, you either need plutonium-239 (henceforth, plutonium) or uranium-238 (henceforth, highly enriched uranium or HEU) — ideally both — but both are pretty hard to get for most countries ([Institute for Energy and Environment Research, 2012](#)). Plutonium doesn't occur naturally in the environment — you have to produce it in a nuclear reactor. And even then, the plutonium you get isn't in a form that can be used in a nuclear bomb. It has to be reprocessed in special reprocessing plant. The only countries to ever have had this type of reprocessing plant are the US, the UK, France, Russia, India, Japan, Israel, China, and North Korea.

Uranium does occur naturally, but it has to be enriched to be usable. Low-enriched uranium (LEU) — usually enriched up to 3-5% — is regularly used in nuclear reactors, so it's permissible (and common) to enrich uranium to up to 20% in enrichment plants. Argentina, Brazil, China, France, Germany, India, Iran, Japan, North Korea, the Netherlands, Pakistan, Russia, the UK, and the US all have enrichment plants that could theoretically be used to produce HEU. However, the [International Atomic Energy Agency \(IAEA\)](#), a regulatory agency set up by the Non-Proliferation Treaty (NPT), exists in part to ensure that uranium enrichment plants meant for industrial use are not diverted to make HEU for nuclear weapons.<sup>11</sup>

I expect that this would pose a considerable barrier for any country that did want to pursue a nuclear weapons program in the next 20 years. My impression is that, historically, acquiring the necessary fissile materials covertly has seemed exceedingly difficult (I'm thinking of Libya and other countries, which have tried to acquire fissile material covertly but failed). That said, I haven't looked into this in depth.

This all makes me think that most countries wouldn't have access to the materials required to build nuclear weapons from scratch. Only three of the TPNW supporters currently have access to fissile material: Kazakhstan, South Africa, and Brazil, and I believe that none of them are likely to pursue a nuclear weapons program.

Kazakhstan inherited about -1,400 nuclear weapons after the dissolution of the Soviet Union, but [gave them up in 1995, and has since become party to at least seven deproliferation-oriented groups and treaties](#). Similarly, South Africa [built up a nuclear weapons program in the 1960s, but voluntarily disarmed in 1990](#), and is now “one of the most vocal state advocates of nuclear disarmament,” according to the Nuclear Threat Initiative. Likewise, the Nuclear Weapons Ban monitor notes that Brazil “was at the forefront of the diplomatic process towards a treaty prohibiting nuclear weapons, including during the negotiation of the TPNW in 2017” ([2019, p. 77](#)). Brazil was also the first country to sign the TPNW, and is a member of six other deproliferation-oriented groups and

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<sup>11</sup> Except for in the five countries that are allowed to have nuclear weapons under the Non Proliferation Treaty (NPT).



treaties.

Together, this makes me think that it's pretty unlikely that these countries would reverse their strongly anti-nuclear weapons positions on this in the next 20 years.

<i>Do they have the materials to build nuclear weapons?</i>	
<i>Countries</i>	<i>Has fissile material?</i>
Ratifiers and acceders	6%
Signatories	2%
All supporters (ratifiers, acceders, and signatories)	4%
Compliant, have neither signed or ratified the TPNW	3%
Non-compliant, have neither signed or ratified the TPNW	43%
All countries that have neither signed or ratified the TPNW	16%
Just countries with nuclear weapons	100%

## **TPNW supporters are more likely to be engaged in civil war, but are less prone to inter-state conflict and territorial disputes**

Compared with the countries that haven't engaged with the treaty, TPNW supporters seem to be less likely to be involved in interstate conflict and war.<sup>12</sup> This is based on an exploration of six different proxies for conflict and militarization:

1. **Global Peace Index (GPI), overall ranking:** GPI ranks 163 countries and territories according to their level of Societal Safety and Security, the extent of Ongoing Domestic and International Conflict, and the degree of Militarization. I then lumped countries into three cruder buckets, based on whether they were in the top third, middle third, or bottom third of countries.
2. **Global Peace Index (GPI), Ongoing Domestic and International Conflict ranking:** this is the GPI ranking that is specific to domestic and international conflict. It ranks 163 countries and territories on the basis of the number and duration of internal conflicts, the number of deaths from internal organised conflict, the number, duration and role in external conflicts, the intensity of organised internal conflict, and relations with neighbouring countries. I again lumped countries into three buckets based on whether they were in the top third, middle third, or bottom third

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<sup>12</sup> I include both minor conflicts and wars, where minor conflict is defined as causing 25-999 deaths in a given year, and war is defined as a conflict causing >1,000 deaths in a given year.

- of countries.
3. **Global Peace Index (GPI), Militarization ranking:** this is the GPI ranking that is specific to a country's level of militarization. It ranks 163 countries and territories on the basis of the military expenditure as a percentage of GDP, the number of armed services personnel per 100,000 people, the volume of transfers of major conventional weapons as recipient (imports) and supplier (exports) per 100,000 people, the financial contribution to UN peacekeeping missions, the country's nuclear and heavy weapons capabilities, and the ease of access to small arms and light weapons. Again, I grouped countries into three buckets (top, middle, and bottom thirds).
  4. **Whether a country has been involved in any ongoing armed conflict in the last year:** Here, I just entered "yes" or "no" based on whether a country had been involved in an inter-state conflict (involving > 100 deaths) in the last year according to [Wikipedia](#).
  5. **Involvement in interstate conflict since 1946:** Here, I put countries into three buckets using [data from the Uppsala Conflict Data Program \(UCDP\)](#): I entered "0" for countries that hadn't been involved in any inter-state conflicts since 1946, "1" for countries that had been involved in "some" conflict (defined as up to 10 years of conflict), and "2" for countries that had been involved in "a lot" of conflict (defined as more than 10 years of conflict).<sup>13</sup>
  6. **Involvement in territorial disputes since 1946:** Again, I put countries into three buckets using [data from the UCDP](#): I entered "0" for countries that hadn't been involved in any territorial disputes since 1946, "1" for countries that had been involved in "some" territorial disputes (up to 15 years), and "2" for countries that had been involved in "a lot" of territorial disputes (more than 15 years).

According to these proxies, TPNW supporters look much more peaceful than countries with nuclear weapons. They also look more peaceful relative to countries that are compliant with the TPNW, but that haven't signed or ratified it. The median GPI rank among TPNW supporters is 66, while the median rank of countries with nuclear weapons is 141 (a lower rank indicates less conflict). The pattern holds for the Ongoing Domestic and International Conflict and Militarization rankings as well. Similarly, only 9% of TPNW supporters are involved in an ongoing armed conflict, compared to a third of countries with nuclear weapons. Finally, TPNW supporters have been involved in very few interstate conflicts and territorial disputes since 1946, while countries with nuclear weapons have been involved in many.

As far as I can tell, TPNW supporters are just unusually peaceful countries. Though I suspect they may be involved in disproportionately more civil war, their lack of history of interstate violence and territorial disputes makes me think that are less likely to be involved

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<sup>13</sup> Note that some countries were involved in multiple conflicts in one year. I count each conflict-year independent. So a country that was involved in independent conflicts with 2 other countries during the year 2000 would be counted as having been involved in 2 years of conflict. This means some countries could have more years of conflict that have elapsed since 1946 (for example, Myanmar has been engaged in 227 years of conflict, according to my system). I use the broad buckets (scores of 0, 1, and 2) to avoid giving too much weight to countries that have been in multiple conflicts simultaneously.

in the kind of conflict where nuclear weapons are particularly valuable. I interpret this as some evidence that the countries that have signed onto the TPNW have historically been less interested in nuclear weapons in part because they've been less potentially valuable to them.

<i>Are they peaceful or conflict-prone?</i>						
<i>Countries</i>	<i>Global Peace Index Ranking</i>	<i>Domestic and International Conflict, GPI Ranking</i>	<i>Militarization, GPI Ranking</i>	<i>Involved in ongoing armed conflict</i>	<i>Interstate conflict, since 1946</i>	<i>Territorial disputes since 1946</i>
Ratifiers and acceders	85	60	66	9%	~None (0.3)	~None (0.6)
Signatories	84	71	68	9%	~None (0.27)	~Some (0.71)
All supporters (ratifiers, acceders, and signatories)	85	66	67	9%	~None (0.26)	~None (0.64)
Compliant, have neither signed or ratified the TPNW	100	98	102	21%	~None (0.36)	~Some (0.80)
Non-compliant, have neither signed or ratified the TPNW	35	78	57	13%	~None (0.48)	~Some (1.20)
All countries that have neither signed or ratified the TPNW	79	96	90	17%	~None (0.40)	~Some (0.94)
Just countries with nuclear weapons	141	159	131	33%	A lot (1.44)	A lot (2.00)

Again, there are exceptions to this general trend. Algeria, Colombia, Ecuador, Libya, Nigeria, Palestine, and Venezuela have all been part of an interstate war within the last year. And Algeria, Angola, Bangladesh, Cambodia, Congo, Cuba, Indonesia, Ireland, Laos, Myanmar, Namibia, New Zealand, Nigeria, Palestine, the Philippines, South Africa, Thailand, and Vietnam have all been involved in territorial disputes for over 15 years since 1946. These countries would arguably have more use for nuclear weapons now and going forward.

And of those countries that are more likely to see military value in nuclear weapons, Algeria, Angola, Bangladesh, Colombia, Indonesia, Ireland, New Zealand, Nigeria, the Philippines, South Africa, Thailand, Venezuela, Vietnam, and possibly Cambodia, Cuba, Ecuador, Libya, and Myanmar also have the financial means to pursue a nuclear arsenal.

But of the countries with possible motivation and means, only South Africa currently has the fissile material necessary to develop a nuclear weapons program in the near-term. South Africa already had and gave up a nuclear weapons program, and has since been an outspoken advocate of disarmament.

## TPNW supporters are, historically, very committed to nuclear disarmament

Finally, besides feasibility and motivation, the TPNW signatories have a pretty unambiguous track record of meaningfully supporting nuclear arms control treaties and nuclear disarmament more broadly. Again, except for Cook Islands, Trinidad and Tobago, and St. Kitts and Nevis, every TPNW signatory is a member of the NPT. Similarly, all but two countries, Cuba and Palestine, have signed the [Comprehensive Test Ban Treaty](#), another significant treaty within the nuclear nonproliferation regime. I see membership in both of these treaties as a demonstration of commitment to nuclear nonproliferation policies more broadly.

Additionally, 70% of the TPNW supporters are members of a regional [nuclear weapons free-zone treaties](#), while only 30% of non-supporters are part of such treaties, and none of the countries with nuclear weapons are. Countries that are members of the NPT and/or of these regional nuclear weapons ban treaties have formally agreed not to pursue nuclear weapons. This makes me think that it would be difficult for these countries — especially members of the regional treaties — to generate the political will to publicly withdraw from them to pursue a nuclear weapons program.

<i>Do they have a track record of supporting nuclear deproliferation/disarmament?</i>			
<i>Countries</i>	<i>Party to the Non-Proliferation Treaty (NPT)</i>	<i>Ratified the Comprehensive Test-Ban Treaty (CTBT)</i>	<i>Member of a regional nuclear prohibition treaty</i>
Ratifiers and acceders	94%	91%	61%
Signatories	98%	100%	76%
All supporters (ratifiers, acceders, and signatories)	96%	96%	70%
Compliant, have neither signed or ratified the TPNW	97%	91%	45%
Non-compliant, have neither signed or ratified the TPNW	90%	93%	3%
All countries that have neither signed or ratified the TPNW	95%	91%	30%
Just countries with nuclear weapons	56%	67%	0%

Furthermore, as I argued above, I would also expect that, if nuclear weapons bans do meaningfully deter countries from pursuing nuclear weapons programs, most of the effect would be achieved by the NPT and regional treaties rather than the TPNW, as the latter is essentially redundant from a legal perspective.

## An attempt at a Nuclear Weapons Potential Index

I tried to [combine all of these factors](#) into a single score that roughly indicates whether a country seems like it might consider pursuing a nuclear weapons program in the future. The scores range from 0 to 1, where a low number suggests that it would be surprising if that country pursued nuclear weapons, and a high number suggests it wouldn't be at all surprising. The index seems to perform reasonably well. For example, all of the countries with nuclear weapons score fairly high (see the [Summary sheet](#)):

<i>Nuclear Propensity Index</i>	
China	0.8
France	0.7
India	1.0
Israel	1.0
North Korea	0.6
Pakistan	1.0
Russia	0.7
United Kingdom	0.7
United States	0.7

Other countries that score fairly high are Iran, Iraq, Italy, Germany, Hungary, and the Netherlands. Iran and Iraq kind of make sense — there's some reason to think they might want nuclear weapons. Italy and Germany don't have nuclear weapons, nor do they want them, but both had nuclear weapons programs in the 60s and 70s, so it's not shocking that they would score relatively high as well. Hungary and the Netherlands have never had or wanted nuclear weapons, but both have fissile material (the Netherlands has a small amount of highly enriched uranium and Hungary has civilian plutonium stocks) and the Netherlands is actively involved in manufacturing nuclear weapons for France, so it's not shocking that my index points at them as possible candidates for future nuclear weapons programs.

North Korea scores a bit lower than one might expect, probably because my index doesn't account for the fact that some countries have particularly tense relationships with adversaries that could credibly threaten the country's sovereignty. There's no obvious proxy for this, so for now, I've just accepted that the index gets kind of close to reality, but definitely misses things.

When I look at the average nuclear propensity scores for TPNW supporters relative to other groups, it continues to look like TPNW supporters look meaningfully less likely to be interested in developing nuclear weapons programs than the countries that chose to in the past.

<i>Nuclear Propensity Index</i>	
<i>Countries</i>	<i>Nuclear Potential Index</i>
Ratifiers and acceders	0.2
Signatories	0.2
All supporters (ratifiers, acceders, and signatories)	0.2
Compliant, have neither signed or ratified the TPNW	0.2
Non-compliant, have neither signed or ratified the TPNW	0.5
All countries that have neither signed or ratified the TPNW	0.3
Just countries under a nuclear umbrella	0.4
Just countries with nuclear weapons	0.8

Taken together, I take the profile of the member states I’ve described — countries with small economies, mostly without easy access to fissile material, with relatively little interstate conflict, and with a track record of supporting nuclear nonproliferation — as evidence that most of the member states wouldn’t have pursued nuclear weapons programs in a world without the TPNW. It’s certainly not strong evidence — in particular because none of these factors are fixed over time, and they’re likely to be more unstable in some countries than others — but it’s enough to make me somewhat pessimistic. I put the probability that the TPNW will be causally responsible for TPNW supporters choosing not to pursue a nuclear weapons program around 20% (subjective confidence interval: 0–45%).

As discussed above, beyond banning nuclear weapons, the TPNW also adds new restrictions to those outlined in the NPT and more recent nuclear arms control treaties. In particular, the TPNW also prohibits hosting and manufacturing nuclear weapons. So, the TPNW could plausibly play some causal role in reducing the likelihood that the member states pursue those activities. I consider this next.

## **Will the TPNW prevent TPNW supporters from hosting nuclear weapons?**

I expect that whether a country hosts nuclear weapons on its territory could plausibly affect nuclear risks. Recall that the Cuban Missile Crisis — arguably one of the instances in which the world came closest to nuclear war — arose because the Soviet Union wanted to host medium- and intermediate-range missiles in Cuba.

On the other hand, I expect the importance of hosting nuclear weapons has shrunk somewhat. My understanding is that the main benefit of having one’s nuclear weapons on foreign territories is so shorter range missiles can be used to reach otherwise geographically distant adversaries (for example, the value of hosting nuclear weapons on Cuba came largely from Cuba’s proximity to the US). As technology has improved, most

nuclear weapons possessing countries with geographically distant adversaries have missiles that can reliably reach their adversaries' territory with high accuracy<sup>14</sup> — which was not the case for the USSR at the time of the Cuban Missile Crisis. This makes me think that conflict over nuclear weapons-hosting wouldn't be as high-stakes as it was in the case of the Cuban Missile Crisis (but this is a pretty weak belief).

Regardless, I'm again fairly pessimistic about the potential for the TPNW to influence whether member states host nuclear weapons as 70% of them are already members of regional nuclear weapons free-zones, treaties that ban hosting nuclear weapons.

I would imagine that any additional impact the TPNW might have on whether these countries would host nuclear weapons — when they have already formally committed not to — would be pretty small, if not completely negligible. I would put the probability that the TPNW reduces the likelihood that any of the 70% of TPNW supporters that are already part of a nuclear weapons free-zone decide to host nuclear weapons in the next 20 years at around 10% (subjective confidence interval: 0–33%).

I think it's possible that some of the TPNW supporters that aren't already bound by these treaties would eventually want to host nuclear weapons. The following TPNW supporters are not part of a nuclear weapons free-zone: Austria, Bangladesh, Bolivia, The Gambia, Holy See, Maldives, Palao, Palestine, San Marino, St Lucia, St Vincent & Grenadines, Trinidad & Tobago, Venezuela, Cabo Verde, Central African Republic, Congo, Cote d'Ivoire, Democratic Republic of the Congo, Ireland, Liechtenstein, Nepal, Sao Tome & Principe, St Kitts & Nevis, and Timor-Leste.

But currently, only five non-nuclear weapons possessors host nuclear weapons on their territory (Belgium, Germany, Italy, the Netherlands, and Turkey). Given that so few countries host nuclear weapons even without institutionalized obligations not to, I'm inclined to think that the probability that (m)any others would join after formally committing not to is fairly low. But the evidence to draw from here is pretty weak. I would put the probability that the TPNW is causally responsible for TPNW supporters who are not already members of the nuclear weapons free zone choosing not to host nuclear weapons in the next 20 years at around 15% (subjective confidence interval: 0–60%).

## **Will the TPNW prevent TPNW supporters from manufacturing nuclear weapons?**

I expect that whether non-nuclear weapons states are involved in manufacturing nuclear weapons is less important to avoid from a nuclear risks perspective. Conversations with experts make me think that the nuclear weapons manufacturing space is actually both crowded and profitable, such that if some actors left the space, others would quickly take their place. There might be some impact that would come from stigmatizing the

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<sup>14</sup> The main exception today is North Korea.

production of nuclear weapons, but effects on norms and stigma are outside the scope of this post.

For the same reasons I expect TPNW supporters would be unlikely to host nuclear weapons on their territory irrespective of their TPNW membership, I expect TPNW supporters would also be unlikely to manufacture them. Like hosting nuclear weapons, manufacturing them is banned under the nuclear weapons free zone treaties. This again makes me think that the 70% of TPNW supporters that are already part of a nuclear weapons free zone would be unlikely to start manufacturing nuclear weapons in the next 20 years. I put the likelihood that the TPNW reduces the probability that these countries decide to manufacture nuclear weapons at around 10% (subjective confidence interval: 0–33%).

Further, only two countries without nuclear weapons programs of their own are substantially involved in the production of nuclear weapons (Italy and the Netherlands) ([Nuclear Weapons Ban Monitor, 2019](#); [Synder, 2019](#)). This makes me think that even countries that are not part of a nuclear weapons free zone would be pretty unlikely to start manufacturing nuclear weapons, but I'm uncertain about this. I put the probability that the TPNW is causally responsible for TPNW supporters choosing not to manufacture nuclear weapons at around 15% (subjective confidence interval: 0–60%).

The final key restriction put in place by the TPNW would be making it unacceptable to be under the protection of a nuclear umbrella. I consider the potential pathway to impact next.

## **Will the TPNW prevent TPNW supporters from seeking the protection of a nuclear umbrella?**

Unlike with the development, hosting, and manufacturing of nuclear weapons, the TPNW would be the only nuclear arms control treaty to explicitly ban being protected under a nuclear umbrella, also known as extended deterrence:

“The treaty makes it unlawful for a state party to rely on an ally’s nuclear weapons for defense; as a result, a state must withdraw from the protection of a nuclear umbrella if it chooses to sign and ratify the TPNW. A state party may, however, maintain relationships with nuclear armed states” ([International Human Rights Clinic, 2018](#)).

This means that there's more room for the TPNW to counterfactually affect member states' behavior, as the conditions aren't redundant with the other treaties that most of the state members are already party to. This could be significant as, if countries with adversarial relationships with nuclear weapons-possessor states seek out protection under a nuclear umbrella, their allies might be obligated to protect them by deploying their nuclear arsenal, increasing the probability of nuclear war. For example, NATO is currently considering the accession of Ukraine, which has ongoing conflict with Russia. If this goes through, the US, the UK, and France might have to consider using their nuclear weapons to defend Ukraine against Russia. It's unclear if they would actually do so — but it probably increases the risk



that they would.

On the other hand, aside from bilateral security agreements between the US and South Korea and the US and Japan, there are really only two existing nuclear weapons alliances that offer protection in this way: the North Atlantic Treaty Organization (NATO) and the Collective Security Treaty Organization (CSTO), which consists of Russia and 5 other former Soviet republics.

Of the TPNW supporters, only two countries are eligible to join NATO (only European countries are eligible to join NATO these days): Austria and Ireland. Austria seems extremely unlikely to join NATO, as it made a [Declaration of Neutrality](#) in 1955, and neutrality has been a feature of its constitution ever since. Ireland has an 80-year-long history of neutrality, but recently rejected a bill that would have codified its neutrality in its constitution. Additionally, one of its political parties is strongly in favor of joining NATO. On the other hand, there seem to be many important factors influencing whether Ireland joins NATO, and I would be surprised if the TPNW was much of a factor in that decision. Given all of this, I expect that the probability that the TPNW causes Austria not to join NATO in the next 20 years is around 10% (subjective confidence interval: 0–25%), and the probability that the TPNW counterfactually causes Ireland not to join NATO in the next 20 years is around 20% (subjective confidence interval: 0–33%).

Assuming that the CSTO is only open to former Soviet republics (which I haven't been able to confirm, but seems true to me), there are no TPNW supporters that are obvious candidates to join (Kazakhstan, which has already ratified the TPNW, is already a member of CSTO). But I have a lot of uncertainty about how the CSTO works and which countries would consider becoming and be accepted as members. Given this, I think the probability that the TPNW causes any TPNW supporters not to join the CSTO in the next 20 years is somewhere around 20% (subjective confidence interval: 0–60%).

For other TPNW supporters to seek out protection under a nuclear umbrella, the US, UK, France, or Russia — which are already part of a nuclear alliance — would have to form new nuclear alliances, NATO would have to change its eligibility requirements, or there would basically have to be a formation of a new security alliance between non-nuclear weapons state(s) and China, India, Pakistan, North Korea, or Israel (countries that are not currently part of a nuclear alliance). I deprioritized spending much time looking into these scenarios for now. I currently believe that they are plausible, but I didn't find any evidence that any such alliances are currently being discussed. I therefore put the probability that the TPNW is causally responsible for preventing such an alliance from forming somewhere around 20% (subjective confidence interval: 0–80%).

## Conclusion

Based on these considerations, I'm very pessimistic about the likelihood that countries that are non-compliant with the TPNW will ratify it, and somewhat pessimistic about the potential for the TPNW to causally influence the decision of TPNW supporters to pursue,

host, or manufacture nuclear weapons, or to join a nuclear weapons alliance (my credences are summarized in the table below).

Importantly, I would expect these outcomes are not independent. In other words, I expect that a country's interest in and willingness to withdraw from the TPNW to pursue nuclear weapons would be highly correlated with its interest in and willingness to withdraw from the TPNW to join a nuclear weapons alliance. Given that I put relatively low probabilities on the TPNW having an impact on various TPNW supporters' actions, and given that I believe the outcomes are all quite correlated, I expect that the TPNW is unlikely to have much of an impact on nuclear deproliferation through legal channels overall.

That said, it's quite possible that the TPNW will have an impact on deproliferation and adjacent policies through informal channels. I'll explore this possibility extensively in a future post.

Event	Best Guess	Subjective Confidence Interval <sup>15</sup>	Main drivers
<i>Will non-compliant countries ratify the TPNW?</i>			
Any countries that are currently failing to comply with the TPNW's stipulations will ratify the treaty within the next 5 years	5%	0–25%	Public denunciation of TPNW and failure to negotiate
Any countries that are currently failing to comply with the TPNW's stipulations will ratify the treaty within the next 20 years	15%	0–33%	Public denunciation of TPNW and failure to negotiate
<i>Will the TPNW be [causally] responsible TPNW ratifiers choosing not to pursue nuclear weapons?</i>			
The TPNW will be [causally] responsible if TPNW ratifiers choose not to pursue a nuclear weapons program within the next 20 years	20%	0–45%	Low GDP, lack of access to fissile material, little conflict, strong commitment to deproliferation policies, historically
<i>Will the TPNW be [causally] responsible TPNW ratifiers choosing not to host nuclear weapons on their territory?</i>			
The TPNW will be [causally] responsible if TPNW ratifiers that are already part of nuclear weapons free zones choose to host nuclear weapons in the next 20 years in a world without the TPNW	10%	0–33%	Strong commitment to deproliferation policies, historically
TPNW supporters that are <b>not</b> already part of nuclear weapons free zones decide to host nuclear weapons in the next 20 years in a world without the TPNW	15%	0–60%	Base rate of hosting and/or manufacturing nuclear weapons is low, but quite uncertain
<i>Will the TPNW be [causally] responsible TPNW ratifiers choosing not to manufacture nuclear weapons?</i>			
The TPNW will be [causally] responsible if TPNW ratifiers that are already part of nuclear weapons free zones choose to manufacture nuclear weapons in the next 20 years in a world without the TPNW	10%	0–33%	Strong commitment to deproliferation policies, historically
The TPNW will be [causally] responsible if TPNW supporters that are <b>not</b> already part of nuclear weapons free zones decide not to manufacture nuclear weapons in the next 20 years in a world without the TPNW	15%	0–60%	Base rate of hosting and/or manufacturing nuclear weapons is low, but quite uncertain

Will the TPNW be [causally] responsible if TPNW ratifiers choose not to seek protection under a nuclear umbrella?			
The TPNW will be [causally] responsible if Austria chooses not to join NATO in the next 20 years, putting in under the protection of NATO's nuclear umbrella	10%	0–25%	Austria's declaration of neutrality
The TPNW will be [causally] responsible if Ireland chooses not to join NATO in the next 20 years, putting in under the protection of NATO's nuclear umbrella	20%	0–33%	Ireland's history of neutrality, and conservative party support for joining NATO
The TPNW will be [causally] responsible for state parties that aren't already part of the CSTO choosing to join in the next 20 years	20%	0–60%	CSTO seems to be former Soviet republics only, and the only former Soviet republic to support the TPNW is already a member
The TPNW will be [causally] responsible if there's no new nuclear alliance formed that extends a nuclear umbrella to any of the TPNW supporters in the next 20 years	33%	0–80%	Didn't find evidence that an alliance like this is being discussed, but very uncertain

See footnote 15 here.<sup>15</sup>

Questions I didn't look at much, but could be interesting to explore in the future

- How big would a shift in domestic or international politics need to be for a country's stance on nuclear weapons (broadly, whether they're pro-deproliferation or not) to change, and how often have such shifts occurred? For example, could these stances be changed as a result of a different political party winning an election? Or would it take more drastic shifts, like the collapse of the Soviet Union? It could be interesting to look at countries that have had shifts in their stance on nuclear weapons (e.g., Libya, South Africa, Cuba, among others) to understand what kinds of domestic and international changes precipitated the policy change. It would also be good to look at countries that had major shifts that might have made countries more likely to change their stance on nuclear weapons, but that didn't do so. Other case studies that could help understand how durable foreign policies include: law of the sea, international air travel, space exploration, etc.
- Similarly, I'd be interested to look into whether country's policies become more durable over time. In effect, does the duration of a country's adherence to a given policy tell us much about the likelihood that they'll continue to have that policy? If so, how strong of an indicator is this? Does this vary by types of policies?
- I'd be interested in doing a deeper dive into the literature into the effectiveness of international treaties and arms control regimes. I looked at this pretty shallowly

<sup>15</sup> The color-coding in this column reflects the uncertainty of the parameter (essentially, a visual representation of the wideness of the SCI).

here.

- Relatedly, what can game theory tell us about the effectiveness of international arms control treaties from a theoretical perspective? Max Daniel pointed out that there are game theoretic reasons that arms control treaties are desirable and likely to influence states' behaviors. I didn't look into this much, but would be excited to in the future.

## Credits

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