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Demilitarization and economic growth: Empirical evidence in support of a peace dividend☆

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ABSTRACT

This paper analyzes the implications of demilitarization on economic growth. I create a new data set of military transitions since 1960 and measure the effect of demilitarization in countries that reduced their military capabilities and subsided aggressive or violent behavior. Semiparametric difference-in-difference estimates predict that on average, demilitarization is associated with a 1% higher annual GDP per capita than if the country had remained militarized. Dynamic analysis shows that on average, GDP per capita is 15%–20% higher 20 years after transition. These findings provide empirical evidence in support of a Peace Dividend.

1. Introduction

Demilitarization is a movement away from a society organized for violent conflict. There are relatively few historical examples of demilitarization as governments throughout the world have assumed that peace and economic prosperity would be the product of more weapons, not fewer (Rubenstein, 2010).[1]

However, in recent decades, there is evidence to suggest that countries may be beginning to move away from this belief (Stearns, 2013). A popular theory held by academics and policymakers to explain this movement is a realization of economic gains as a result of demilitarization. Otherwise known as the Peace Dividend.[2] Despite the importance of the decision to unwind conflict-oriented institutions, little is known about repercussions on the macroeconomy.[3]

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[1] There has been an historical skepticism among academics and politicians who believe that militarization promotes economic growth through positive security related effects, research and development (R&D) breakthroughs, and fiscal stimulus (Hamilton et al., 2009; Alptekin and Levine, 2012).

[2] The *Peace Dividend* was part of a campaign slogan for President George H.W. Bush during the 1992 election against future President Bill Clinton. The idea is that a reduction in military spending, forces, and posturing would bring economic prosperity to not only the U.S., but to all countries that took part. Empirically tested by Knight et al. (1996), Mintz and Stevenson (1995), Mintz and Huang (1990), and Gleditsch et al. (1996).

[3] Studies focused on other institutional transitions that have garnered more academic attention. For democratization, see: Barro (1991); Papaioannou and Siourounis (2008); Acemoglu et al. (2019). For economic liberalization, see: Sachs et al. (1995); Wacziarg and Welch (2008); Grier and Grier (2021).

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In this paper, I estimate the effect of demilitarization on economic growth with a novel data set of military transitions since 1960. Difference-in-difference estimates predict that on average, demilitarizations are associated with a 1% higher annual GDP per capita than if the country had remained militarized. Dynamic analysis shows that on average, GDP per capita is 15%–20% higher 20 years after transition. My findings give empirical credibility to the theory of a Peace Dividend.

1.1. Background and motivation

Wielding the power of an organized military is among the most consequential decisions for a state. However, this can come with substantial economic trade-offs. Choosing to militarize and flexing that power can lead to a state becoming an economic pariah, as is the case with Russia since the 2022 invasion of Ukraine (Liadze et al., 2022). When a country chooses to demilitarize, it has been hypothesized that there will be substantial economic benefits, in the form of a Peace Dividend.

Existing economic research has no shortage of literature covering various aspects of military policy and the relation to economic outcomes. However, there does not appear to be a definitive answer on the empirical effect of demilitarization. This is due in part to a lack of a statistically measurable definition for what it means to be demilitarized. Smith (1983) summarizes this in defining militarism as "not a unitary phenomenon, but a portmanteau description covering a number of distinct aspects".[4] Smith theorized that these aspects included military expenditure, the relationship between the military and citizens, the use of the military in the context of international relations, and the nuclear arms race. The fragmentation in the study of militarism and demilitarization prevents researchers from capturing the economic effect of the broader concept. Instead, more recent work continues to analyze individual aspects of militarism and their impact on economic outcomes, just as Smith explained in 1983.

With this study, I am the first to take on the more holistic concept of demilitarization. The contributions of this paper include: (a) bringing together the fragmented strands of research to estimate the Peace Dividend with a broader framework; (b) developing the first data set dedicated to the study of military transitions; (c) using new econometric methodologies in the study of militarism; and (d) exploring causal mechanisms to economic growth in the context of demilitarization.

1.2. Existing literature

How does the demilitarization of institutions impact economic growth? Most of the existing empirical work comes from cross-country regression analyses of military expenditure. Alptekin and Levine (2012) summarize the literature on military expenditure and growth in a meta-analysis. Their results state that military expenditure has a non-linear relationship with growth. This translates to an economic benefit for larger, developed countries when they spend more on the military (militarization) and inconclusive results for smaller, less developed countries. Dunne and Tian (2020) argue that greater data availability since the end of the Cold War actually shows that a reduction in military expenditure (demilitarization) has created net economic gains for countries around the world. Studies specifically discussing a Peace Dividend have also focused on the relationship between military expenditure and growth (Knight et al. (1996), Mintz and Stevenson (1995), Mintz and Huang (1990), and Gleditsch et al. (1996)).

There are no studies to my knowledge that look at the broader behavior of institutions with respect to their level of militarization. To find similar literature, I need to look at research regarding other political institutions. Here, democracy has a particularly rich catalog of papers. Determining if a country is a democracy or not is about more than if the country has elections. Democracy is instead a broad collection of institutions working in unison to create a fair and equitable society. Recent work by Papaioannou and Siourounis (2008), Giavazzi and Tabellini (2005), Persson and Tabellini (2006), and Acemoglu et al. (2019) have moved economic literature away from the continuous specifications of democracy and have instead focused on transitions. In this study, I take the existing literature of institutions and military factors, such as spending and conscription, and create a dichotomous definition for the broader state of a country's military capacity.

Military institutions began to transition globally, for nearly all countries, with the end of the Cold War. Since the mid- to late-1980s, the world has seen a dramatic decline in military spending, a reduction in the pervasiveness of conscription, the ousting of several military dictators, and the dismantling of more than 80% of the global nuclear stockpile (Cheibub et al. (2010), Roser and Nagdy (2013), Toronto (2007)). At the same time, significant economic development has taken place. Academics and politicians alike have attributed changes in military capacity to a corresponding growth of global economies and the potential for lasting peace.[5]

The belief in a Peace Dividend is not universally held. There has been skepticism on the part of those who believe that militarization promotes economic growth through positive security related effects and supply-side spillovers.[6] In Federalist #11, Alexander Hamilton espoused his view on the economic benefits of a strong and robust Navy to project military might (Hamilton et al., 2009). Hamilton believed that naval power would allow the burgeoning nation to establish itself as a major player in international trade. Hamilton also discussed his belief that a united Navy would bring states together through the joint construction

[4] A reminder, militarism (or militarization), is the opposite of the process for demilitarization.

[5] Dunne and Tian (2020) state that: "…a long-standing, impressively large, and growing literature appeared to have failed to result in a scholarly consensus on the effects of military expenditure on economic growth. But the availability of 20 more years of data since the end of the Cold War has helped researchers …the findings reported here suggest that reducing military expenditure need not be costly and may contribute to improved economic performance, especially in developing countries".

[6] Alptekin and Levine (2012) conduct a meta-analysis of existing military expenditure studies and find "that the hypothesis of a negative military expenditure–growth relationship is not supported for both LDCs and in general, while a positive effect of military expenditure on economic growth is supported for developed countries".

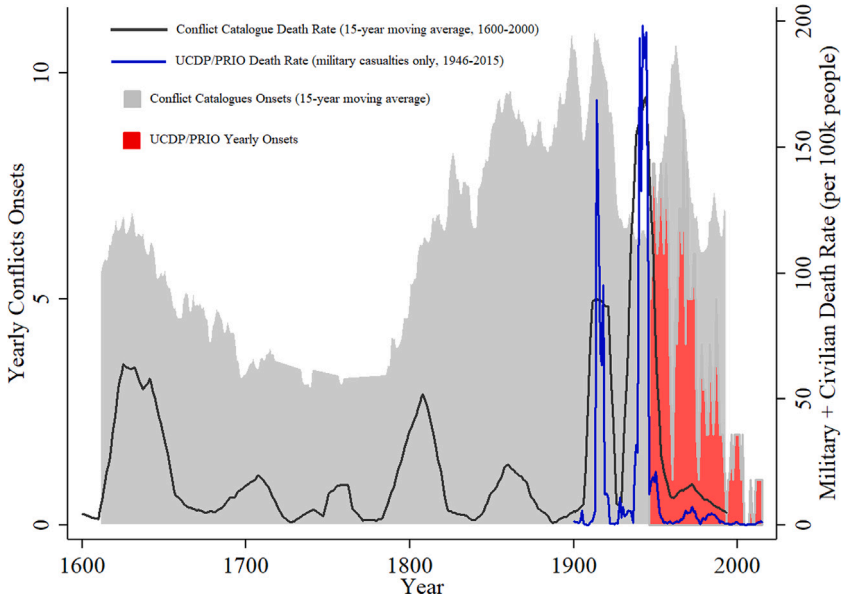


Fig. 1. Long-run trends of violent conflict.
Notes: Fig. 1 depicts the evolving nature of violent conflict since 1600. The Light gray area graph is the 15-year moving average of yearly conflict onsets from the Conflict Catalogue and is available up to 2000. The red area graph is yearly conflict onsets from the UCDP/PRIO data set meeting the same qualifications as the Conflict Catalogue and is available from 1946 to present. The dark gray line graph is the 15-year moving average of civilian and military casualties per 100,000 people and comes from the Conflict Catalogue. The blue line graph is the yearly military casualties per 100,000 from the UCDP/PRIO data set from conflicts meeting the same qualifications as the Conflict Catalogue. Together, these 4 combined graphs show a consistent level of violent conflict up until recent decades. Deaths have been declining significantly since World War 2. Similarly, conflict onsets have been in decline aside from a spike in the late-1970s and early-1980s. Since the Cold War, the world has been in perhaps the most peaceful time in modern history. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

of ships. He said "When the staple of one fails from a bad harvest or unproductive crop, it can call to its aid the staple of another. The variety, not less than the value, of products for exportation contributes to the activity of foreign commerce" (Hamilton et al., 2009). With southern and middle states providing the raw materials and the sailors of the North captaining the vessels, Hamilton saw the militarization of the seas for the United States as a potential economic windfall.

1.3. Paper organization

I begin this study by documenting the institutional factors that determine if a country is in a militarized or demilitarized state. Previous work has focused almost solely on the military capabilities of a country as reference for which state the country is in. Here, the literature on democratization provides some guidance. It would be too narrow to define democracy as just having elections (Papaioannou and Siourounis, 2008). Instead, democracy is the combination of several institutions working in a representative and equitable manner for the people of a state. Much in the same way, demilitarization is a broader concept that includes multiple institutions being redirected from violent conflict to a greater concentration on a peaceful society (Naidu, 1985).

To identify military transitions, I look at military structure and behavior in addition to capabilities for a broader interpretation. Section 2 presents seven key indicators used to determine the state of these institutions. Coverage includes 147 countries from 1960–2019, a significant increase over similar data sets like the Global Militarization Index. Using variation in the persistence of these indicators, I am able to find points of transition across countries. I combine this quantitative measure with qualitative findings to properly identify the point in time when a country transitions from militarized to demilitarized, as well as the intensity of that transition.[7] In total, I identify 53 cases of permanent demilitarization. 32 of these cases are categorized as 'strong' while a 19 are considered 'weak'. I also find 12 cases of permanent militarization and 5 cases of reversal.

Determining which estimation technique to apply to this question and new data set requires thought given the challenges of identification on cross-country data. A commonly used approach is Difference-in-Differences (DiD). There are several econometric circumstances that prevent this approach from returning a reliable estimation. For example, demilitarized countries differ from militarized countries along many unobserved dimensions including institutional, historical, and cultural factors, all of which could impact income. In Fig. 2, I show the difference in GDP between countries that demilitarize and countries remaining militarized. Demilitarizing countries experience a dip in output prior to transition which is a violation of the critical parallel trends assumption

[7] Known as demilitarization.

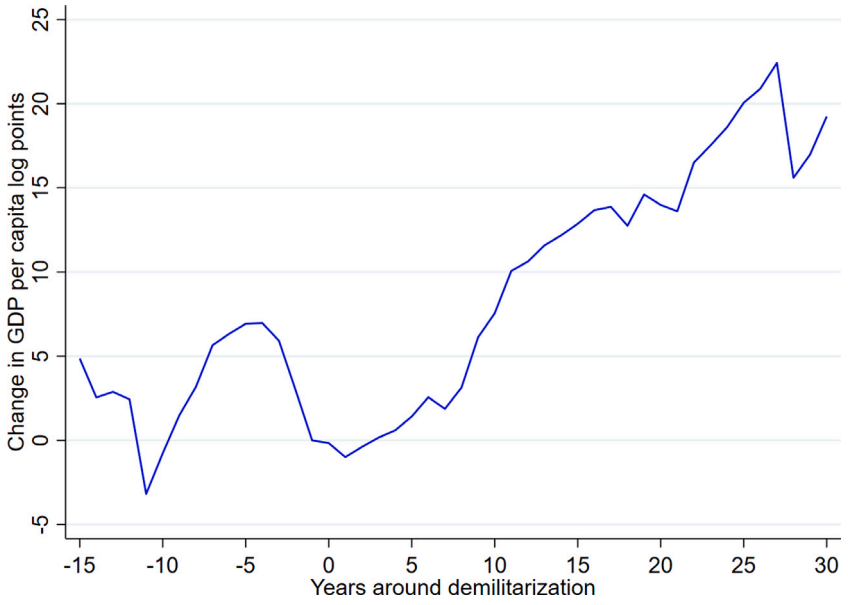


Fig. 2. Demilitarized vs. militarized GDP performance.
Notes: GDP per capita before and after a permanent (strong) demilitarization episode found in Table 1. This figure plots GDP per capita in log points around a military transition relative to countries remaining militarized in the same year. I normalize log GDP per capita to 0 in the year preceding demilitarization. Time (in years) relative to the year of demilitarization runs on the horizontal axis.

(Ashenfelter Dip) in the DiD framework.[8] Furthermore, selection into demilitarization is an endogenous choice. Countries make the decision to reduce their military capacity based on observable factors, not because of randomization.

The semiparametric treatment effects framework pioneered by Abadie (2005) is ideal for these conditions. In this application of DiD, randomization of treatment is not possible. Treatment is instead selective on observable covariates. The semiparametric method models random selection into treatment by re-weighting untreated (militarized) units to have parallel trends to units undergoing treatment (demilitarization). Essentially, this produces a random treatment given that treated and untreated units are nearly identical in the pre-treatment period. I choose the semiparametric estimator proposed by Callaway and Sant'Anna, that I will refer to as CSDiD, because it specifically deals with staggered adoption. Recent work from Goodman-Bacon (2021) has shown that when treatment in a DiD framework is not adopted in the same time period for all treated units (staggered adoption), effects may be biased toward zero.[9] CSDiD groups countries into time-cohorts based on when the treatment was adopted. This method has been shown to account for time heterogeneity bias that could otherwise drive effects toward zero (Baker et al., 2021). Serving as my baseline estimate in Section 3, the CSDiD approach finds that on average, demilitarizations are associated with a 1% higher annual GDP per capita than if the country had remained militarized. Dynamically, GDP per capita is 15%–20% higher 20 years after transition.

A major threat to the causality of my estimation is the idea that a safer global environment drives growth rather than the mechanism of demilitarization. In Fig. 3, I map demilitarization and militarization episodes according to intensity of the transition. Demilitarization appears to be highly spatially correlated given the prevalence of transition in South/Latin America, Sub-Saharan Africa, and Eastern Europe. Collier (1999) finds that countries experience growth following the end of a civil conflict as a result of increased foreign capital flows. Capital is often risk adverse to violence. No one wants to build a factory somewhere it might get blown up. A possibility is that there may be a positive economic effect from being in a 'safer neighborhood,' internationally as it were. To test this proposition, I conduct another CSDiD estimate but use countries choosing to remain militarized even when they have a shock to the violent threats around them as an alternative treatment status. This placebo test in Section 5 finds no statistically significant impact on growth. Meaning, becoming safer is not driving economic growth but rather the mechanism of demilitarization.

There are several potential mechanisms driving this growth, and I address these in Section 6. One such mechanism is increased international economic cooperation as a result of demilitarization. Wisniewski and Pathan (2014) show that reduced military spending leads to increased foreign direct investment inflows (FDI). Similarly, Acemoglu and Yared (2010) find that by reducing the number of troops and money spent on the military, a country becomes a more attractive trade partner. In the 15–30 years following demilitarization, I find that countries have much higher foreign direct investment inflows and international trade volume. I also find

[8] The parallel trends assumption states that, although treatment and comparison groups may have different levels of the outcome prior to the start of treatment, their trends in pre-treatment outcomes should be the same. The Ashenfelter Dip, described in Ashenfelter (1978), is an empirical regularity that the mean outcome of treatment units declines during the period just prior to treatment.

[9] Other papers covering this topic: Athey and Imbens (2021); Ben-Michael et al. (2019); Sun and Abraham (2020).

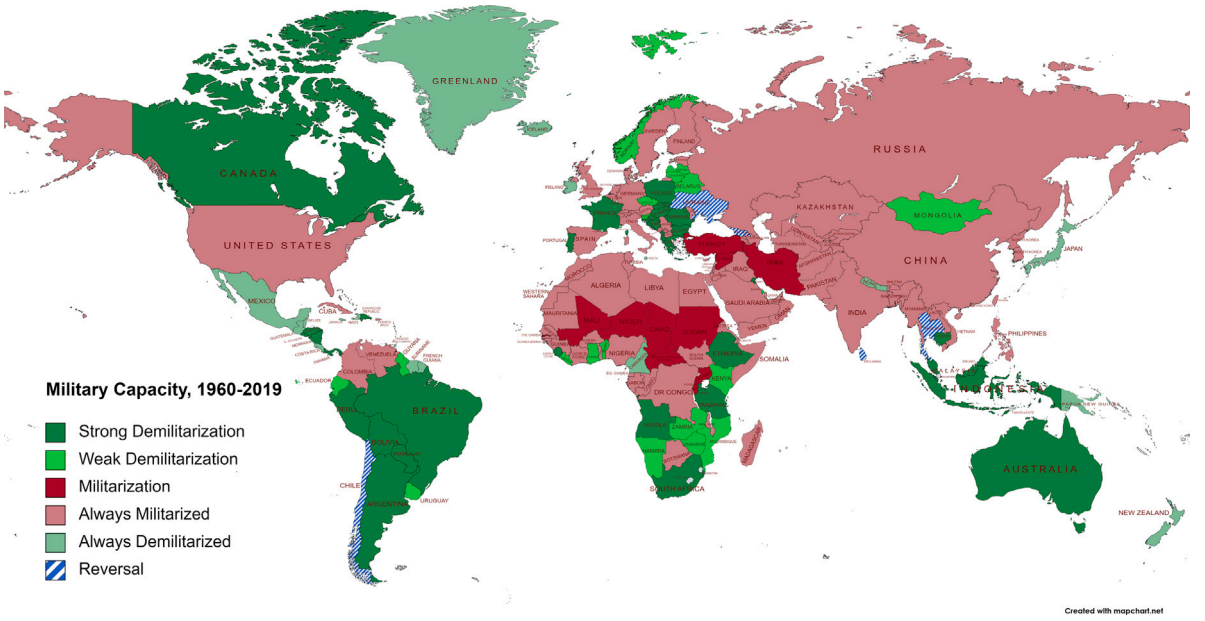


Fig. 3. Military Transition Episodes,1960–2019.
Notes: This map depicts demilitarization and militarization trends around the world. Dark green countries experience a strong, permanent demilitarization episode during between 1960 and 2019. Lighter green experienced a weak transition. Dark red identifies countries undergoing a militarization episode. Neutral red and green are for countries that are always sorted into one of the two categories. The 5 countries with blue stripes undergo a transition only to have it reversed after more than 10 years. Recognize that the demilitarization episodes are highly concentrated by region: Southeast Asia, Latin and South America, Sub-Saharan Africa, as well as Eastern Europe. All episodes are listed and qualitatively defined in Table 1. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

evidence that demilitarization may be positively influencing growth through a reallocation of resources into more economically productive outlets (Loayza et al., 1999). One theory of demilitarization is that it allows a country to increase market-oriented research and development (R&D) and improve total factor productivity (TFP) (Alptekin and Levine, 2012). Similarly, resource reallocation allows a country to build more economically productive capital (tanks vs. tractors) and strengthen the size and capability of the labor force. In my estimation of potential mechanism, I find a large increase in welfare-relevant TFP and capital stock following demilitarization. Countries undergoing militarization see TFP and capital stock levels remain flat or even decline as a result of the transition. Perhaps most interesting, I find a dramatic decline in infant mortality rate, possibly as a result of financial reallocation in labor force health. Militarizing countries see a significant increase in the infant mortality rate following transition. This is likely because of the association with violent conflict of militarization and the movement of resources away from health and labor force related outlets.

2. Data and descriptive statistics

In this section, I explain the challenge of identifying military transitions. I then create an algorithm for identification and describe a newly created data set of demilitarization and militarization episodes. To the best of my knowledge, this is the first attempt at classification for country-level military transitions. Transitions are identified and describe in detail in Table 1. Each variable discussed within this section as part of the algorithm provides not only an explanation of said variable, but also a justification for its inclusion. Each variable relates back to the broader concept of demilitarization established by Smith (1983).

2.1. Identifying demilitarization

The primary challenge in the identification of military capacity is coming up with a statistically measurable definition. It is easy to think of this as the number of weapons or soldiers a country has. However, this view might be too narrow. The economic literature on democracy offers some guidance here. Democracy is about much more than just the right to vote. Democracy is a set of institutions working in coordination to promote a fair and equal society. Similarly, militarization is a collection of institutions that work in unison to organize a society for violent conflict. To capture this definition empirically, I need to take into consideration a broader range of military institutions. I focus on seven military institutions described by Naidu (1985). These are: resources, personnel, politics, heavy weapons, power projection, military industrial complex, and military action. I start by creating a data set that contains each of the seven institutions for 147 countries from 1960–2019, in order to identify military transitions. In total, I identify 53 cases of permanent demilitarization. 32 of these cases are categorized as ‘strong’ while a 19 are considered ‘weak’. I also find 12 cases of permanent militarization and 5 cases of reversal.

Table 1
Recent military transitions chronology (1960–2019).

Strong, Permanent Demilitarization Episodes (32 in total)	
Country and Year	Description
Albania (1992)	End of the Cold War, former Soviet satellite.
Angola (2002)	End of Angolan Civil War.
Argentina (1982)	Conscription ended by law on January 5th, 1995.
Australia (1972)	End of Australian involvement in Vietnam. Re-evaluation of military polities and position in the world.
Bolivia (1983)	End of military dictatorship in 1982. Reforms to military followed.
Bosnia and Herzegovina (2007)	Unification of forces in 2005. End of conscription in 2006. Finalized reforms about a decade after Bosnian War.
Brazil (1985)	End of military regime in 1985. Nuclear program dismantled in 1990.
Bulgaria (1994)	Member of the Warsaw Pact and close ally of the Soviet Union. Political transition after the Cold War leads to military reforms.
Cambodia (1999)	Coup in 1997 leading to the eventual end of civil conflict and the disarmament of the Khmer Rouge.
Canada (1968)	1968 was the year of unification for the Canadian armed forces after a white paper in 64 advocated for it. This lead to a condensing of military structure and influence. Eventually removed U.S. nuclear weapons stationed in Canada.
Croatia (1998)	Formalized independence by 1998 and joined the NATO Partnership for Peace in 2000, leading to post-conflict demilitarization.
Dominican Republic (1966)	Assassination of military-centric dictator Trujillo in 1961 eventually lead to military reforms. Namely, conscription and resource allocation.
El Salvador (1992)	End of Salvadoran Civil War in early 1992.
Ethiopia (1992)	End of Ethiopian Civil War in 1991.
France (1966)	Under de Gaulle, launched the Force de dissuasion in 1961. He signed the Élysée Treaty in 1963, building Franco-German cooperation, a key to European integration. In 1966, he withdrew France from NATO integrated military command and had American military personnel stationed on French soil sent home. All part of broad initiative to demilitarize France.
Greece (1980)	End of military regime in 1974. Rejoins NATO in 1980.
Honduras (1991)	The ending of civil wars in neighboring countries El Salvador and Nicaragua (and also Guatemala in 1996) lead to substantial military budget cuts.
Hungary (1990)	Former Soviet satellite, ceased having military forces supplied by the Soviet Union after the end of the Cold War. Significantly reduced military capacity.
Indonesia (1998)	Ousted military dictator Suharto in 1998. Democratic reforms lead to reduction in military power and capacity.
Kuwait (2001)	After 9/11, Kuwait declared one of 15 strategic non-Nato allies in the war on terror. U.S. military builds 8 bases in the country. Kuwait strategically reduces military capacity.
Malaysia (1986)	The ascension of Mahathir Mohamad to Prime Minister in 1981 saw the implementation of a number of reforms. These included reforms to the military and other institutions in an effort to promote economic growth.
Nicaragua (1990)	Contra War (civil conflict) ended with general election in 1990.
Panama (2000)	Mireya Moscoso, widow of former President Arnulfo Arias Madrid who was removed in a military coup 3 different times, becomes president at the end of 1999. Like her former husband, Moscoso strongly opposed military influence in Panamanian politics.
Paraguay (1989)	Military dictatorship involved in Operation Condor ends in 1989.
Peru (1991)	Strong military infrastructure up to the 1990s. The Peruvian armed forces grew frustrated with the inability of the García administration to handle the nation's crises and drafted Plan Verde — which involved a genocide of indigenous people, government censorship, and the establishment of a military junta to lead the country. Fujimora becomes president in 1990, adopts some of the Plan Verde policies, but takes power away from military and reduces its capacity.
Poland (1989)	Former Soviet satellite state. Tremendous amount of political and military reform following election of partially free parliament in 1989 and eventual collapse of the Soviet Union/end of Cold War.
Portugal (1975)	Carnation Revolution ends dictatorship and reduces military prevalence.
Romania (1993)	End of Cold War, former Soviet satellite state.
Sierra Leone (1998)	End of Sierra Leone Civil War that lasted from 1991–2002. Peace talks seriously begin in 1998.
Slovakia (2000)	Former Soviet Satellite state when part of Czechoslovakia. After the Cold War and break with Czech, military reforms instituted as there was less perceived threat of conflict.
South Africa (1992)	End of the Apartheid. A number of reforms to reduce military capacity and power. Only country in history to successfully develop and nuclear weapon and then completely dismantle stockpile.

(*continued on next page*)

Table 1 (*continued*).

Tanzania (1983)	Following the invasion and occupation of Uganda (Idi Amin) in 1980 after a Uganda invasion in 1978, started to demilitarize.
Weak, Permanent Demilitarization Episodes (19 in total)	
Country and Year	Description
Bahrain (1989)	Large reduction in military capacity at the end of Iran–Iraq war.
Belarus (1998)	At the end of the Cold War, Soviet nuclear weapons were still deployed in Belarus. In 1992, Belarus signed the Lisbon Protocol, agreeing to join the Treaty on the Non-Proliferation of Nuclear Weapons. Weapons were eventually dismantled. Country still maintains a robust military industrial complex.
Benin (1993)	After decades of coups and military dictatorships, the country creates a multi party system in 1991 that ends much of the internal conflict, military reforms.
Czech Republic (2007)	Varied set of reforms, includes ending conscription in 2005.
Ecuador (1979)	End of military lead governments in 1979.
Ghana (1994)	End of Konkomba–Nanumba conflict (also known as the Guinea fowl war).
Guyana (1985)	Massive decline in the Guyana economy throughout the 1980s. Conscription ended and other reforms taken to save money and rebound economy.
Kenya (1983)	Failed military coup in 1982 increases distrust and military, leads to reforms.
Latvia (2006)	Conscription abolished in 2007 as part of a refocusing for the Latvian armed forces after involvement in both Afghanistan and Iraq in the early 2000s.
Liberia (2004)	Second Liberian Civil War ends in 2003.
Lithuania (2008)	Joins NATO in 2004, ends conscription in 2008.
Mongolia (1992)	Close ally of the Soviet Union. Military capacity reduces after Cold War.
Mozambique (1991)	Peace talks for Mozambican Civil War start in 1991, war ends in 1992.
Namibia (1999)	End of Caprivi conflict.
Norway (1981)	Tax cuts and other such measures to improve stagflated economy, military spending cuts were part of this.
Slovenia (2003)	Reorganization of military after the Yugoslav Wars, leading to abolishment of conscription in 2003.
Uruguay (1986)	By 1984, the Civic-Military Dictatorship which had run the country since the U.S. backed coup in 1973 faced a general strike and increased opposition. This lead to elections in late-1984 and the eventual return to democracy by 1985. The subsequent reduction in military power followed.
Zambia (1991)	Many protesters were killed by the Zambian regime in breakthrough June 1990 protests. In 1990 President survived an attempted coup, and in 1991 he agreed to reinstate multiparty democracy, leading to military reforms.
Zimbabwe (1982)	End of Rhodesian Bush War in 1979. Military transition follows,.
Permanent Militarization Episodes (12 in total)	
Country and Year	Description
Burundi (1976)	Military coup in 1976. Violent period follows, civil war and genocide.
Central African Republic (2004)	Central African civil war started in 2004.
Chad (1965)	Civil war begins in 1965. Constant conflict and military dictators have dominated the country since.
Gambia (1994)	Military coup and continued assertion of Gambian military thereafter.
Iran (1980)	Following revolution, becomes increasingly militarized. Establishment of the Iranian Revolutionary Guard Corps, Iran–Iraq war, initiation of nuclear program, and involvement with international terror groups.
Mali (1968)	Mali has military coup in 1968 after breaking away from colonial rule, consistent conflict and militarization follows.
Niger (1974)	First military regime takes control of Niger in 1974, holds until the 1990s. Civil conflict follows.
Rwanda (1990)	Start of Rwandan Civil War and genocide.
Sudan (1969)	Military coup in 1969 followed by a 20 year civil war.
Syria (1969)	Following the Ba'athist coup in 1963, tensions began to arise between party leadership and Hafez al-Assad (leader of the military) in the late 1960s. The Syrian Corrective Revolution (bloodless military coup) took place in 1970 and installed Assad as the military dictator of the country. Assad's family has been in power ever since. A brutal civil war has raged in Syria since 2010.
Turkey (1975)	Highly militarized in the early 20th century. Demilitarized for significant period of time. Turkey invades and occupies Cyprus in 1975 and remains militarized from that point forward. Maintains occupation.
Uganda (1971)	Idi Amin rises to power, destabilization and conflict follows.

(*continued on next page*)

Table 1 (*continued*).

Reversal Episodes, Mil-Demil-Mil (3 in total)	
Country and Year	Description
Thailand (1988)	Country with multiple transitions. Became a constitutional monarchy in 1932. Alternated between democracy and military rule ever since. Most recently, country was ruled by a series of parliamentarians that sought to reduce military influence beginning in 1988. Ended in 2006 with the return of military rule.
Ukraine (1994)	Dismantled all nuclear weapons substantially reduced military capacity after Cold War. Reversal in 2014 with the Russian invasion of Crimea and return to a militarized state.
Georgia (1993)	End of civil conflict following the end of the Cold War and collapse of the Soviet Union. Reversal to a militarized states takes place in 2008 with the invasion of Georgia by Russia.
Reversal Episodes, Demil-Mil-Demil (2 in total)	
Country and Year	Description
Chile (1973)	Pinochet takes power in 1973 as the military and political dictator of the country. Highly militarized and violent period of time for Chile. Pinochet removed from power in 1990 and reforms follow, signaling the reversal of state. Gabriel Boric was recently elected and named Maya Fernandez Allende as the defence minister. Her grandfather was overthrown by Chile's military in 1973. She plans to continue military reforms.
Sri Lanka (1983)	After decolonization of Sri Lanka in 1948, the country remained demilitarized and relatively peaceful. However, in 1983, the country fell into a 26-year long civil war. The state military of Sri Lanka fought with the Liberation Tigers of Tamil Eelam who aimed for an independent nation of their own. The Liberation Tigers were finally defeated in 2009, bringing the civil war to an end. Since 2009, the country has undergone significant demilitarization. Several tribunals have been conducted to hold to account those who committed war crimes on both sides. The country seems determined not to fall back into a state of sustained violence.

2.1.1. Resources: Military spending

Military spending is useful in explaining how a country values its resources. Previous studies have tended to use expenditure data on a yearly basis in a common currency, especially for cross-country analysis (Dunne and Perlo-Freeman, 2003). However, a more relevant measure in terms of opportunity cost is the percentage of GDP (Abu-Qarn and Abu-Bader, 2008). The percentage of GDP offers a clear picture of how a country values its military in comparison to other parts of its society. I use military expenditure as a percentage of GDP data compiled by the Stockholm International Peace Research Institute (SIPRI). The data set has 173 countries from 1949–2019, making it one of the largest in terms of countries and observations available. Upon conducting a Supremum Wald structural break test to detect policy shifts around military spending, I find that countries shift around 3% of GDP.[10] Therefore, all countries spending 3% or greater on the military per year receive a value of 1 (militarized). All others 0 (demilitarized) in that year. The average of negative structural breaks is shown in supplementary figure A1.

2.1.2. Military action: Inter and intra-state conflict

Militarization and demilitarization are ultimately about preparation for conflict. As such, this preparation begets conflict. To determine whether a country is demilitarized, it is important to ask if that country is actively using this preparation to engage in violent conflict. There are several sources of data for state-level conflict. I choose to combine two commonly used data sets to provide more accurate coverage of conflict. First, the Correlates of War (COW) Intra-State War data v5.1 provides a dyadic identification of state vs state conflict from 1816-2007 (Sarkees and Wayman, 2010). The COW Intra-State War data registers all conflicts with greater than or equal to 100 battlefield deaths and that occurs between two or more recognized sovereign states. I start by identifying which states were in conflict during a given year with this data set because it is a leading authority on large conflicts faced throughout history. I match each participant to my constructed data set and record a 1 for each country and year that experiences a significant inter-state conflict. Second, I also want to record intra-state conflicts (civil) as well as bring inter-state conflicts up to 2019. For this, I rely on the UCDP/PRIO UPPSALA conflict data (UCDP Dyadic Data set version 20.1), a combination of Pettersson and Öberg (2020) and Harbom et al. (2008). The UPPSALA data records all inter and intra-state conflicts from 1949–2019 with at least 25 battlefield related deaths. I choose to supplement the UPPSALA data with COW because UPPSALA only codes in conflicts which see a recognized declaration of war. This condition is problematic because it leaves out conflicts that would ostensibly be characterized as a major conflict but were not actually declared state on state wars. Some examples are, the U.S. war in Korea (considered a policing action), the U.S. war in Vietnam (U.S. intervention in a civil conflict), and the Soviet war in Afghanistan (considered an Afghan civil war with Soviet intervention). The COW data does not make this same distinction. By combining the two, I gain a more

[10] Abu-Qarn and Abu-Bader (2008) show that detecting a structural break in the percentage of GDP allocated to military expenditures meets the criteria for identifying the moments of change. Zivot and Andrews (2002) tests for the null hypothesis of existence of a unit root against an alternative of a single structural break. This process is discussed in detail in Appendix Section F.

reliable coverage of all conflicts with at least 25 battlefield related deaths from 1960–2019. As such, the demilitarization indicator is a value of 1 for a year in which a country engaged in conflict and 0 when that country did not.

2.1.3. Personnel: Military conscription

Military conscription is a method of meeting military manpower requirements by mandating service of a citizen by force. Whether a country utilizes conscription, or a volunteer system, can go a long way in explaining a key institution within the context of demilitarization (e.g., personnel). Volunteer armies are typically smaller as there is no requirement to serve in the armed forces and private sector jobs often offer greater utility to those individuals. Countries which use conscription may be doing it because of the threats they face relative the size of their population (i.e., Israel), or because of a need to increase personnel for a coming/ongoing conflict. Either way, conscription is a tool to increase the capacity of the military in terms of personnel and thus signals if the country is militarized or demilitarized. I use the Military Recruitment Data Set from Toronto (2007) which contains information on whether a country used a volunteer or conscription system to meet manpower requirements in their armed forces from 1800–2008. To the best of my knowledge, this is the only globally comprehensive data set concerning military recruitment methods. I manually bring the data set up to date following the existing methodology. I code the data set so that a country takes on a value of 1 each year if it has forced conscription and a value of 0 if it uses a volunteer system.

2.1.4. Politics: Military dictatorships

It is important to consider the political environment surrounding the military as an indicator of militarization. A country's politics can reflect its citizen's feelings about the military, and more generally about what the military should be doing. Recent studies have found that militarized politics may be the result of a non-democratic regime exerting its power to create the political environment it desires (Acemoglu et al., 2010). Either way, the central government of a country has an enormous influence over military functions. As an institution, the thinking of a national government dictates spending, military manpower, nuclear programs, and whether to engage in violent conflict. To calculate the military nature of political institutions, I create a variable that takes on a value of 0 when a country does not have a military dictatorship and a value of 1 when a country's government is led by a military dictator. Data is initially merged in from the data set of Cheibub et al. (2010). However, this data only goes up to 2008. I again bring this data set up to date following the original methodology.

2.1.5. Heavy weapons (R&D): Nuclear capabilities

Since the United States dropped two atomic bombs at the close of World War 2, nuclear weapons and their related technology have been the apex of heavy weapons. A nuclear weapons program is the epitome of militarization in the modern world and requires significant resources be devoted to military research and development. As such, I create a yearly observation for whether a country has a nuclear program. The variable equals 1 if for a given year a country has at least one nuclear weapon, an active nuclear weapons program, or if they are housing nuclear weapons as part of a sharing program, such as NATO. The variable equals 0 if all these conditions are untrue. I construct the data set from 1960–2019 primarily through information coming from the Institute for Science and International Security's historical overview of nuclear weapons and integrating data from a previous study on nuclear programs (Mayberry, 2022).

2.1.6. Power projection: Military occupation of foreign lands

The origins of militarization are based in the conquests of imperialism. That action manifested itself in the occupation of foreign lands to extract the necessary resources to fuel industrialization. In defining demilitarization empirically, it is important to consider whether a country is occupying any land which does not fall under its sovereign jurisdiction. Observing foreign occupation also informs our understanding of how a country behaves with respect to violent conflict. A country being aggressive and projecting power militarily would certainly be considered militarized. I capture this behavior with a variable equal to 1 when a country is occupying a foreign land each year and 0 otherwise. A robust data set was recently created by Vishwasrao et al. (2019).

2.1.7. Military industrial complex: International arms trade

If a country has the capability to produce a vast quantity of advanced weaponry, then presumably countries without such infrastructure would have an incentive to purchase the excess supply. The infrastructure necessary to surge military production is a key element of militarization. I define the military industrial complex by whether a country is a net exporter of arms. I use the arms export/import database from SIPRI to calculate this variable. The military industrial complex variable takes a value of 1 if the total amount (in USD) of arms exports exceeds that of imports. The variable takes a value of 0 if the opposite is true. This provides a reliable indicator for the status of the military industrial complex in each country from 1960–2019.

2.2. Military transition algorithm

The goal of this algorithm is to determine if a state makes a permanent transition from militarized to demilitarized (or vice versa), and with what intensity the transition occurs. Determining permanent transitions creates specific cases that are ideal for analysis. I begin by identifying potential transitions from one state to another based on a negative shock to military spending as a percentage of GDP (military burden). I first identify every country-year pair that experiences a greater than 1%, permanent reduction of military burden in a 5-year period as a potential demilitarization. I then consult the seven institutional indicators previously described. If the negative shock to military burden is associated with two or more permanent transitions of institutional indicators, I consider

that a permanent 'strong' demilitarization. An example of this would be the identification of a negative shock that leads to the permanent end of conscription and a country's nuclear program. Countries only experiencing one permanent institutional transition to a demilitarized state with the identifying negative shock are considered 'weak' permanent demilitarization episodes. I determine militarization episodes by first identifying positive shocks to the military burden of greater than 1% in a 5-year period as a potential militarization. If the country then experiences two permanent institutional transitions to a militarized state associated with the positive shock, I consider that a permanent militarization. Reversals are countries that undergo one of the two transitions, maintain that status for at least 10 years, and then transition back to the previous state. Countries with a lack of transitional behavior fall into one of the two control categories: always militarized or always demilitarized. Finally, I consult various historical and political sources to find qualitative evidence of the reasons for transition. This is to ground my discrete data of transitions in historical fact and reasoning.

2.3. Events driving demilitarization

The final step in identifying demilitarization episodes is to connect them with historical evidence of a policy shift around the military nature of institutions. A catalyst of some sort is needed to determine the discrete timing of initial demilitarization. If there is an event bringing on the demilitarization (i.e., leader death, coup, end of conflict), then the country is likely to be experiencing other changes as well. Knowing what caused each demilitarization episode helps to understand what sources of bias may be impacting my estimations as a result of extenuating circumstances. Therefore, I consult a series of historical and political references to determine the events that precipitate each demilitarization or militarization. The CIA World Factbook, the Freedom House and Polity Project country reports, as well as a variety of academic sources provide the necessary information. If an identification of an event leading to a militarization or demilitarization of a country's institutions cannot be made, then the episode is re-assessed and attributed to one of the two control categories (always militarized or always demilitarized), as there is no definitive transition. The final collection of permanent demilitarization, militarization, and reversal episodes, along with their descriptions, are contained Table 1.[11]

3. Econometric approach and estimation

In this section, I discuss the primary semiparametric DiD estimator. I estimate that on average, demilitarization is associated with a 1% higher annual GDP per capita than if the country had remained militarized. Dynamic analysis shows that on average, GDP per capita is 15%–20% higher 20 years after transition. I also estimate that the process of militarization results in a GDP per capita that is on average 30% lower 20 years after transition, then if the country had remained demilitarized. A more detailed discussion of semiparametric estimators can be found in the Online Appendix, section B.

3.1. Callaway and Sant'Anna (2020) Semiparametric Estimator: CSDiD

The doubly robust semiparametric estimation framework from Abadie (2005) is calibrated for a roll-out of policy implementation. That is, the estimators treat all instances of demilitarization as if they are coming from the same year. However, Goodman-Bacon (2021) finds that the staggered adoption of policy may significantly bias estimates.[12] In a DiD estimation, the control group is made up of units whose treatment status does not change over time. The treatment group is for units that do experience a change in their treatment status. With multiple time periods and variation of treatment timing, some of the control units for the newly treated may be units that have been treated in a previous period. This leads to control units having treatment effect dynamics, making a causal interpretation nearly impossible. When the effect of treatment is positive for all units in all time periods, the previously treated units infecting the control group will cause the estimation of a negative effect (e.g., a positive effect being driven towards zero). A potential solution to this bias is a weighted group-time ATT (CSDiD semiparametric estimator) introduced by Callaway and Sant'Anna (2020) and that builds off the doubly robust estimator from Abadie (2005).

A weighted group-time ATT is an ATT specifically for a cohort of units treated at the same point in time. In this study, an example is Ethiopia and El Salvador both demilitarizing in 1992 after the end of respective civil conflicts. They will be referred to as the 1992 cohort. Another group of countries demilitarize in 1991, so they are the 1991 group. This continues for all countries demilitarizing during the same year. The group-time ATT can also be a dynamic term. In my case, it is necessary to calculate the ATT of the 1992 cohort in 2007, 15 years post-treatment, for long-run analysis. Each cohort has $T - Gt$ ATT parameters. Here, T

[11] I do not distinguish between forced and voluntary episodes of demilitarization due to a lack of variation in my data sample. A prime example of forced demilitarization would be post-WW1 or post-WW2 Germany. Under the signed treaties that ended each of those wars, Germany was forced to demilitarize completely. There were limitations on the number of soldiers there military could have at any one time and the country was not allowed to build new tanks or battleships. In fact a great number of restrictions were placed on Germany in order to demilitarize the country in the sense that Smith (1983) points out (holistic: beliefs, culture, physical, etc.). I was not able to bring my data set back far enough to include transitions like that, and as a result, there was a lack of variation (as you point out). One thing I found is that post-WW2 demilitarization largely occurred internally. Meaning, there were fewer instances of international peacekeepers staying behind to make sure the demilitarization process was actually happening (think post-war U.S., British, French, and Soviet troops in Germany). Instead, the majority of the cases in this study occur as a result of a change in the internal government, a conflict coming to an end and the country no longer needing to be so militarized, or the broad European shift following the end of the Cold War. Therefore, I do not observe enough variation to split the sample of countries based on the criteria of forced vs voluntary demilitarization.

[12] See Athey and Imbens (2021); Ben-Michael et al. (2019); Goodman-Bacon (2021); Sun and Abraham (2020); and De Chaisemartin and d'Haultfoeuille (2020) for reference.

is the last year in the panel and Gt is year of treatment for that group. The total number of weighted group-time ATT's is then the sum of all $T - Gt$ ATTs across all groups. The CSDiD estimator provides a simple way to aggregate all the ATTs into fewer, easy to understand parameters.[13]

CSDiD begins by estimating the propensity score of a treatment (transition to a demilitarized state from a militarized one). Rather than an individual score for each unit, CSDiD estimates a unique propensity score for every group based on treatment date. Treated units are first averaged together based on their time cohort to create multiple treatment groups. Then, pre-treatment data is used to calculate the propensity score of selecting into treatment (demilitarization). The ATT for CSDiD is then the same as the Abadie semiparametric estimator but separated into groups:

$$ATT^{s}_{g,t} = \hat{\mathbb{E}}[\Delta y^{s}_{t}(d)|DEMIL_{g} = 0, DEMIL_{g-1} = 0] - \hat{\mathbb{E}}[X'_{t}|DEMIL_{g} = 0, DEMIL_{g-1} = 0]\hat{\pi^{s}} \tag{4.2.1}$$

The CSDiD estimator is appropriate when: (1) data is panel or repeated cross-sectional; (2) parallel trends are only possible by conditioning on X (conditional parallel trends); (3) treatment must be permanent; (4) treatment and comparison (control) groups must have units with the same approximate propensity score for some range of data (common support assumption).[14]

With these assumptions, Callaway and Sant'Anna (2020) created the CSDiD estimator that is able yield an unbiased and consistent estimate of each group's individual group-time ATT. This is expressed as:

$$ATT^{s}_{g,t} = \mathbb{E}[\Delta y_{gt+n} \cdot w_{gt}|DEMIL_{g-1} = 0] \tag{4.2.2}$$

The estimates for the effect of demilitarization and militarization using the CSDiD approach are listed in Table 2. Panel A of that table shows CSDiD estimates for all permanent demilitarizations. This includes both strong and weak episodes. Panel B and C separate out demilitarizations by intensity with B estimating only strong episodes and C weak episodes. Panel D reports estimates for all episodes of militarization. Columns indicate a range of years around the transition and estimates are averaged together for those years.[15] Standard errors clustered at the country-level are reported in parentheses below each coefficient. Coefficients in bold are statistically significant at least at the 90% confidence interval. Statistical significance is reported with stars and are detailed in the notes below the table. Coefficients are of log GDP per capita multiplied by 100 for interpretation. Therefore, a coefficient of 12.200 (11 to 15 years after demilitarization) signifies that GDP per capita was more than 12 percent higher than if the country had remained militarized in that time period. The first column reports estimates for −20 to −1 years prior to demilitarization, or, pre-treatment period differences between soon to be treated units and comparison units.

In a binary estimation, there are two units used in the estimation: treated and the untreated comparison units. With the Abadie (2005) semiparametric framework, treatment happens only once (at one point in time) so the comparison group should always be large because you have access to all units. The CSDiD estimator does not necessarily have that luxury. As more and more units become treated over time, or if comparison units float between treated and untreated as time passes, the comparison pool shrinks.[16] In each panel of Table 2, I show results for the CSDiD estimation but using 'not-yet' treated units in the control group alongside those 'never' receiving treatment. For robustness, I also include an estimate that models selection into treatment with a propensity score built on alternative, endogenous covariates. These covariates include a measure for democracy (Polity IV), population, capital stock, human capital (Human Capital Index), infant mortality rate, foreign direct investment inflows, and trade share of GDP.

Fig. 4 plots the coefficients from panel A under not-yet treated conditions. The blue connected line plot is the corresponding coefficient for each year around demilitarization. The shaded area is a 95% confidence interval. In column (1) of Table 2, the coefficient for the pre-treatment period is −0.051 percent and statistically insignificant (s.e. 1.377). In order to confirm that the inverse probably weighting has successfully modeled randomization into treatment, there can be no significant difference between treated and untreated units. This is confirmed by the small coefficient (about 1/20th of a percent difference over 20 years) and that the estimate is not statistically different from zero. If this estimate was large and statistically significant, it would be cause for concern and signify that untreated units could not be re-weighted to look like treated units in the pre-treatment period. Following the demilitarization episodes, GDP per capita of those countries receiving treatment slowly begins to outperform the GDP of the weighted comparison units. By column (4), 11 to 15 years after demilitarization, the treated units are on average 12.200 percent larger than untreated (s.e. 5.598). At this point, the difference between treated and untreated units becomes statistically significant. Results peak 26 to 30 years after demilitarization. The coefficient in column (7) is 20.473 (s.e. 11.235). This means that on average, the GDP per capita of countries that underwent demilitarization were roughly 20% larger 30 years after the transition than if they had remained militarized. Column (8) is the last reported coefficient (31 to 35 years after transition) and shows that the difference between treated and untreated units begin to wane and is statistically insignificant.

Fig. 5 plots the coefficients for both strong (subplot a) and weak (subplot b) demilitarization episodes. The blue connected line plot is the estimation for the path of GDP per capita for demilitarizing countries based on the timing of the transition, and the shaded area is a 95% confidence interval. Fig. 5 along with panel B and C of Table 2 show that the positive economic gains coming from demilitarization episodes almost entirely driven by strong transitions. Strong demilitarization episodes are large (13.752%)

[13] Helpful explanation of CSDiD: https://causalinf.substack.com/p/callaway-and-santanna-dd-estimator.

[14] Graphical evidence confirming the common support assumption is found in supplementary figure A2. All other assumptions are consistent with the Abadie doubly robust estimator and are evident upon observing the data.

[15] For example, the estimate for year 1 to 5 post-demilitarization is the average treatment effect for those years.

[16] The 'floating' units are found to be a cardinal sin in Goodman-Bacon (2021). Using a previously treated unit in the comparison group could significantly bias results.

Table 2
CSDiD estimates of the effect of demilitarization and militarization on (Log) GDP per capita.

	Average effects on log GDP per capita from:							
	−20 to −1 Years (1)	1 to 5 Years (2)	6 to 10 Years (3)	11 to 15 Years (4)	16 to 20 Years (5)	21 to 25 Years (6)	26 to 30 Years (7)	31 to 35 Years (8)
	A. Permanent Demilitarizations							
Not yet treated controls	−0.051	1.358	5.353	**12.200****	**14.584****	**18.499****	**20.473***	16.697
(clustered s.e.)	(1.377)	(2.401)	(3.986)	**(5.598)**	**(6.941)**	**(9.275)**	**(11.235)**	(14.295)
Never treated controls	−0.141	1.111	4.867	**11.287****	**13.601***	**17.625***	**20.085***	16.044
	(1.406)	(2.422)	(4.052)	**(5.596)**	**(7.015)**	**(9.331)**	**(11.249)**	(14.268)
Alt. covariates, not yet	0.647	1.513	3.703	10.680	**18.772****	**28.215****	**36.964****	10.159
	(2.697)	(3.876)	(6.118)	(7.632)	**(8.525)**	**(12.115)**	**(14.603)**	(24.728)
	B. Strong, Permanent Demilitarizations							
Not yet treated controls	0.831	2.831	7.451	**13.752****	**17.636****	**24.963*****	**31.623*****	**31.934****
(clustered s.e.)	(1.510)	(3.162)	(5.119)	**(6.771)**	**(7.694)**	**(9.134)**	**(9.777)**	**(12.450)**
Never treated controls	0.928	3.328	7.906	**14.018****	**17.728****	**25.038*****	**31.873*****	**32.030****
	(1.533)	(3.186)	(5.120)	**(6.807)**	**(7.756)**	**(9.195)**	**(9.813)**	**(12.471)**
Alt. covariates, not yet	0.554	1.397	11.297	**23.997****	**30.455****	**45.906****	**47.791****	**57.285*****
	(2.517)	(4.544)	(7.606)	**(10.331)**	**(12.833)**	**(18.580)**	**(20.903)**	**(19.843)**
	C. Weak, Permanent Demilitarizations							
Not yet treated controls	−1.759	−1.828	1.051	8.519	7.267	4.239	−2.597	−16.340
(clustered s.e.)	(2.406)	(2.813)	(4.455)	(6.154)	(8.945)	(15.736)	(21.732)	(27.013)
Never treated controls	−1.902	−2.366	0.489	7.838	6.796	4.055	−2.597	−16.340
	(2.419)	(2.840)	(4.457)	(6.046)	(9.014)	(15.779)	(21.732)	(27.013)
Alt. covariates, not yet	−1.627	−3.467	2.855	6.491	2.036	−11.438	−18.908	−25.885
	(4.363)	(7.988)	(9.611)	(8.323)	(19.843)	(33.122)	(47.840)	(56.258)
	D. Permanent Militarizations							
Not yet treated controls	−0.879	−9.798	**−22.024****	**−27.254*****	**−33.894*****	**−39.823****	**−33.594***	**−34.444***
(clustered s.e.)	(2.347)	(6.772)	**(8.994)**	**(8.396)**	**(12.579)**	**(16.130)**	**(19.195)**	**(20.045)**
Never treated controls	−1.029	−10.059	**−22.252****	**−27.797*****	**−34.741*****	**−40.792****	**−34.525***	**−35.147***
	(2.336)	(6.637)	**(8.920)**	**(8.597)**	**(12.729)**	**(16.275)**	**(19.330)**	**(20.086)**
Alt. covariates, not yet	−1.452	6.316	−4.357	**−30.927****	**−38.758****	**−35.153***	−22.006	−8.556
	(3.376)	(13.206)	(15.085)	**(13.637)**	**(15.908)**	**(18.543)**	(31.789)	(37.869)

Notes: Table shows CSDiD estimates of the effect of a demilitarization and militarization on log GDP per capita over different time horizons. I list estimates of the average effect on the treated. Log GDP per capita is multiplied by 100, estimates are 'percent larger than if country had not transitioned.' All panels feature a doubly robust estimator with three estimation techniques. Alternative covariates reported in text. Below each estimate I report robust standard errors clustered at the country level. Stars reported for significant levels: *, **, ***, for 90, 95, and 95 percent, respectively. Statistically significant results are in bold.

and statistically significant (s.e. 6.771) 11 to 15 years after transition. The difference between strongly demilitarizing countries and untreated units continues to grow and peaks between 25 and 30 years after transition. The average estimated coefficient for strongly demilitarized countries 26 to 30 years after transition is 31.623 percent (s.e. 9.777) and is statistically significant at a 99% confidence interval. Weak demilitarization episodes do not experience this same growth effect. Instead, none of the estimated coefficients for weak episodes are statistically significant. The average post-treatment impact is initially positive, albeit statistically insignificant from zero, but becomes negative around 25 years after weak demilitarization. The results shown in Fig. 5 confirm that it is the combination of multiple institutional transitions driving growth rather than a single instance or simply a negative shift in spending. If countries were experiencing the same growth patterns, regardless of demilitarization intensity, I would be concerned that the effect was coming from more global trends or a single institution (i.e., resources—military spending). Instead, this is confirmation that countries engaging in strong demilitarization across multiple institutions saw GDP per capita outperform the counterfactual, rather than those instituting a weaker set of reforms.

Fig. 6 plots the coefficients for militarization episodes. The blue connected line plot is the estimation for the path of GDP per capita for militarizing countries based on the timing of the transition, and the shaded area is a 95% confidence interval. Fig. 6 and panel D of Table 2 show that countries undergoing militarization experience a severely negative trend in GDP per capita. Looking at column (1) in panel D, not-yet treated controls specification, the inverse probability weighting provided a convincing counterfactual from the set of control countries (those always demilitarized). The coefficient in column (1) is −0.879, less than a one percent difference in the pre-treatment period. After transition, the negative effect of militarization on GDP per capita is felt almost immediately. The first 5 years after transition, column (2), shows a negative difference between the treated and untreated units of −9.798%. While column (2) is statistically insignificant, the estimate becomes statistically significant at a 95% confidence interval in column (3). The coefficient in column (3) is −22.024 percent (s.e. 8.994). The estimates reach the lowest around 25 years after militarization. Column (6), 21 to 25 years after transition, has a coefficient of −39.823 percent (s.e. 16.130). The estimates slightly rise in the 10 years after that. The interpretation of these results is that on average, countries that chose to militarize experienced a more than 30% lower GDP per capita than if they had remained demilitarized.

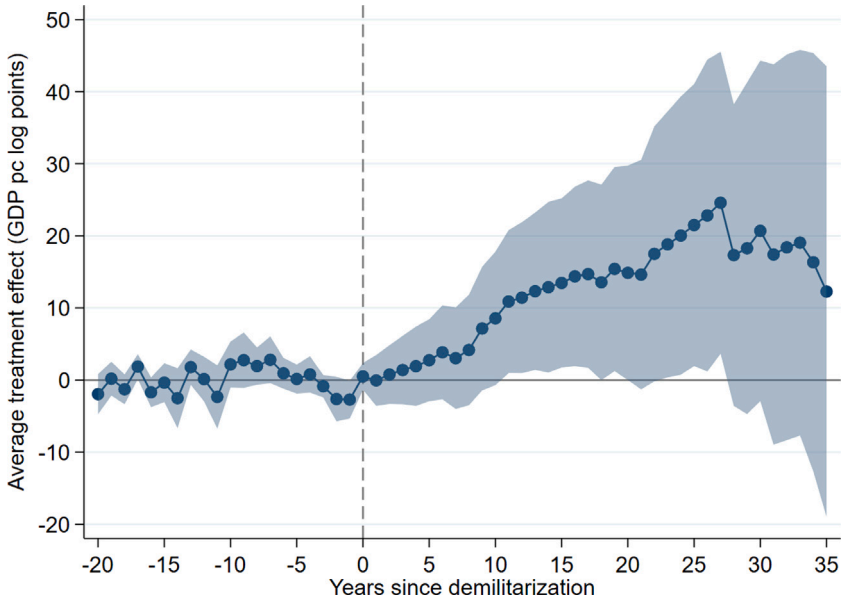


Fig. 4. CSDiD Estimate: Effect of (all) demilitarization episodes on GDP per capita.
Notes: CSDiD group-time estimates of the over-time effects of all demilitarization episodes on log of GDP; doubly robust estimate with not-yet treated comparison units. This figure plots CSDID estimates of the effect of demilitarization on GDP per capita in log points. The blue, connected line plot estimates average effect on GDP per capita on countries that demilitarized (in log points), with a 95 percent confidence interval shown by the gray, shaded area plot. Time (in years) relative to the year of demilitarization runs on the horizontal axis. The estimates are obtained by assuming and estimating a probit model for demilitarizations based on GDP lags of the time-cohorts, which I use to estimate the propensity score and re-weight the data. In addition, I partial out lags of GDP linearly, making this approach doubly robust. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

4. Semiparametric instrumental variable

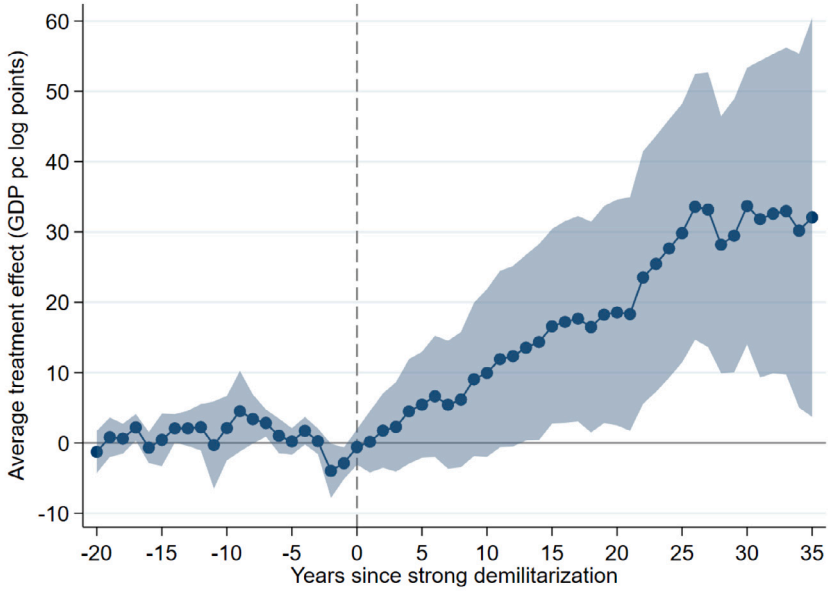
The semiparametric DiD estimator successfully models pre-treatment behavior of treated and untreated units after conditioning on a vector of covariates. The CSDiD estimator also accounts for the staggered adoption of treatment by placing treated units into time cohorts. However, this technique is only able to model randomization based on weighting. It is possible that differences in the distribution of GDP between treated and untreated units may be reflecting differences generated by the treatment selection process, not just the effect of treatment. I institute a semiparametric instrumental-variables (IV) strategy to introduce plausibly exogenous variation for the selection into treatment. Exploiting variation in external threats faced by a country to instrument for selection into demilitarization, I find statistically significant evidence that demilitarization leads to on average, 20% higher GDP per capita (20 years after transition) than if the country had remained militarized.

4.1. Instrument

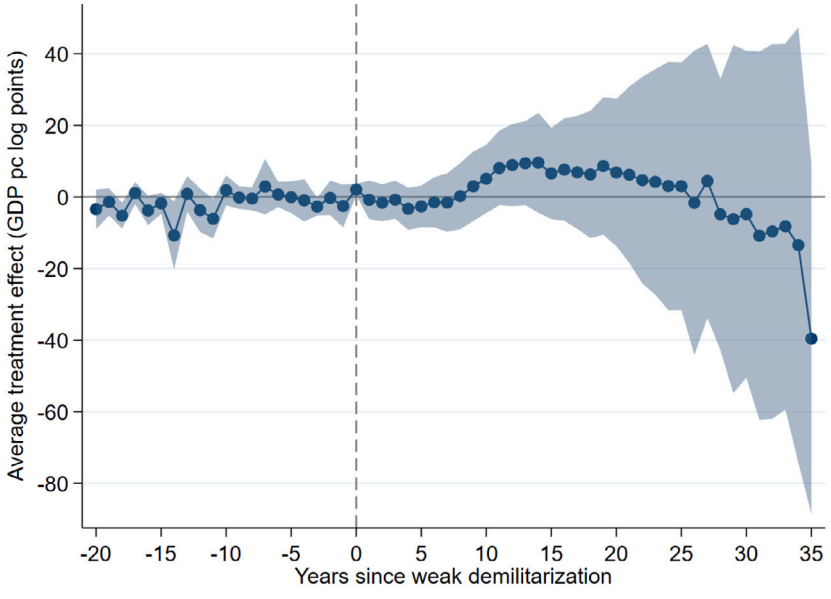
The end of the Cold War brought with it the dismantling of the Soviet Union. Former members and satellite states suddenly had no quarrel with the West as the threat of a U.S. invasion or a nuclear war dissipated. With this end, Eastern European countries began the process of demilitarization with the help of the U.S. government through the Nunn–Lugar Act (Shields and Potter, 1997). Latin and South American countries, which had been heavily militarized throughout the 60 s and 70 s, changed their military institutions with a wave of new political leadership (Stearns, 2013). Similar trends have occurred in sub-Saharan Africa and Southeast Asia. What these anecdotal events reveal, and as depicted by the map in Fig. 3, is that shifts in military capacity may evolving spatially. This theory, which I will discuss in the following paragraphs, is that when countries see a reduction in violent threats they face, especially close to home, there is incentive to demilitarize.

A significant finding in the study of demilitarization is that behavior towards another country may be a function of military power and proximity (Acemoglu and Yared, 2010). Logically, this makes sense. Prior to World War 1, European countries entered armament agreements with weapons manufacturers to stockpile for future conflict (Stearns, 2013). Germany had the latest long-range canons so France, being a bordering nation, felt they would be at a disadvantage in the event of a war without an upgrade to their weaponry. Having a neighbor with more and better guns means that they could potentially invade and conquer. When this is not occurring, countries have less incentive to stockpile weapons themselves because there is a reduced likelihood of that attack.

Incorporating the theory of national security and the understanding that military capacity evolves spatially, I exploit changes in the distribution of military capabilities in contiguous counties as a source of exogenous variation for military institutions. A recent database created by J Andrés Gannon tracks the distribution of military equipment for 173 countries from 1970–2014 (Gannon, 2021). For this study, I separate those units of equipment into two categories: offensive and defensive. Offensive refers to any piece



(a) Strong demilitarization episodes



(b) Weak demilitarization episodes

Fig. 5. CSDiD Estimate: Effect of strong/weak demilitarization episodes on GDP per capita.
Notes: CSDiD group-time estimates of the over-time effects of strong and weak demilitarization episodes on log of GDP; doubly robust estimate with not-yet treated comparison units. This figure plots CSDID estimates of the effect of demilitarization on GDP per capita in log points. The blue, connected line plot estimates average effect on GDP per capita on countries that demilitarized (in log points), with a 95 percent confidence interval shown by the gray, shaded area plot. Time (in years) relative to the year of demilitarization runs on the horizontal axis. The estimates are obtained by assuming and estimating a probit model for demilitarizations based on GDP lags of the time-cohorts, which I use to estimate the propensity score and re-weight the data. In addition, I partial out lags of GDP linearly, making this approach doubly robust. Subplot (a) shows all cases of strong demilitarization. Subplot (b) shows all cases of weak demilitarization. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

of equipment which could be used to attack another country, such as an intercontinental ballistic missile or military attack vehicle. Defensive is for units specifically designed for defense, such as an anti-missile defense system or ground-based air radar. I then

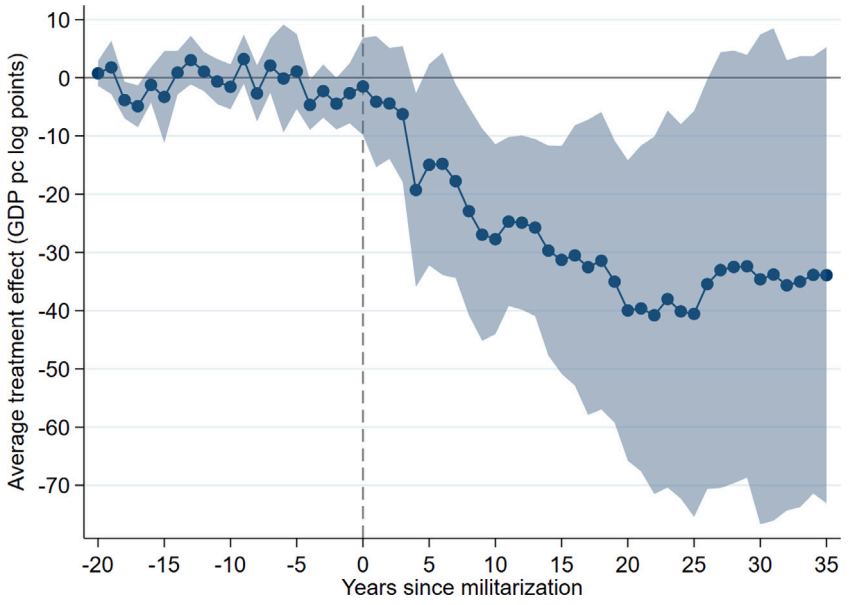


Fig. 6. CSDiD Estimate: Effect of militarization episodes on GDP per capita.
Notes: CSDiD group-time estimates of the over-time effects of militarization episodes on log of GDP; doubly robust estimate with not-yet treated comparison units. This figure plots CSDID estimates of the effect of demilitarization on GDP per capita in log points. The blue, connected line plot estimates average effect on GDP per capita on countries that militarized (in log points), with a 95 percent confidence interval shown by the gray, shaded area plot. Time (in years) relative to the year of militarization runs on the horizontal axis. The estimates are obtained by assuming and estimating a probit model for militarizations based on GDP lags of the time-cohorts, which I use to estimate the propensity score and re-weight the data. In addition, I partial out lags of GDP linearly, making this approach doubly robust. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

matched this data to each country's set of contiguous countries and collapsed the data. For the United States, this means that the total offensive units would be the summation of offensive military capabilities of Cuba, the Bahamas, Mexico, Canada, and Russia.[17] Offensive units in contiguous countries are the specific external threats that may influence the likelihood of demilitarization and are what I will use as the instrumental variable.

I define a set of countries that may influence the demand for demilitarization in any given country. For each country c, I let $WEAPONS_{ct}$ denote the number of offensive weapon units (in thousands) a country has at any given time. I also let $CONT_c$ equal 1 or 0 depending on if a country is contiguous to another. Therefore, I am believing that the military institutions of country c are influenced by the set of countries closest to them. I then define the instrument of evolving external threat levels as:

$$Z_{ct} = \sum WEAPONS_{ct} \times CONT_c \tag{5.1.1}$$

For this equation, Z_{ct} is the sum of all offensive weapon units (in thousands) of contiguous countries. As that numbers decreases, the likelihood of demilitarization for the country of interest should increase.

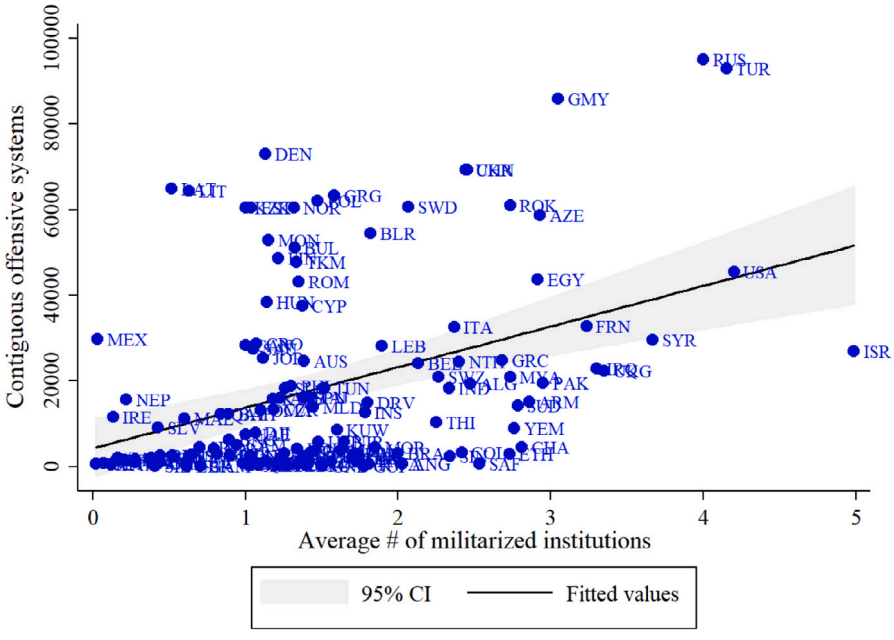
For the exclusion restriction:

$$\mathbb{E}[\epsilon_{ct} | y_{ct-1}, \dots, y_{ct_0}, Z_{ct-1}, \dots, Z_{ct_0}, \alpha_c, \delta_t] = 0 \tag{5.1.2}$$

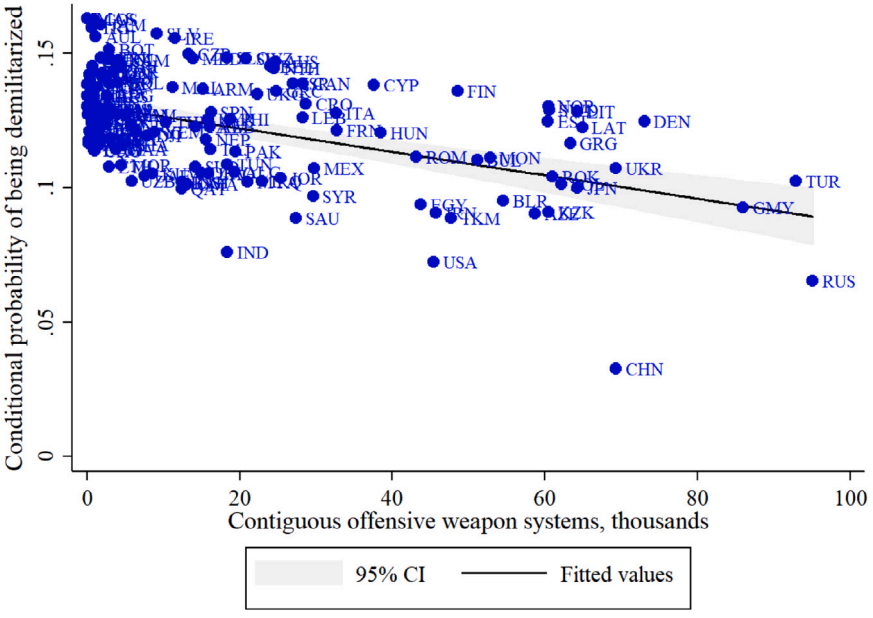
for all $y_{ct-1}, \dots, y_{ct_0}, Z_{ct-1}, \dots, Z_{ct_0}, \alpha_c$, and δ_t and for all c and $t \geq t_0$. Here, the exclusion restriction requires that the contiguous offensive weapons variable, Z_{ct-n}, only impacts GDP of country c at time t through demilitarization, conditional on the lags of GDP and fixed effects. To be an appropriate IV, I need to meet the exclusion restriction. This should hold because if a contiguous countries' weapons were impacting the GDP of a given country, that would likely mean they are in conflict and thus not demilitarizing.

The relevance condition for the IV is clear when looking at Fig. 7. Subplot (a) depicts the positive relationship of contiguous offensive weapons on the militarization of institutions. The x-axis is the average number of militarized institutions (of the 7 introduced in Section 2) from 1960–2019, plotted against a y-axis of average contiguous offensive weapons. Subplot (b) shows

[17] The COW contiguous database accounts for water contiguity. From COW: "Water contiguity is based on whether a straight line of no more than a certain distance can be drawn between a point on the border of one state, across open water (uninterrupted by the territory of a third state), to the closest point on the homeland territory of another state. Four different levels of water contiguity are recorded, based on the distance between the two states' territories: up to 12 miles (reflecting the widely recognized 12-mile limit for territorial waters), 24 miles (reflecting the maximum distance at which two states' 12-mile territorial limits can intersect), 150 miles (from the original 1816–1965 version of the data set, reflecting what was considered the average distance that a sailing ship could travel in one day), and 400 miles (the maximum distance at which two 200-mile exclusive economic zones can intersect)". This condition brings Russia, the Bahamas, and Cuba into the sphere of contiguous countries for the United States.



(a) Military institutions



(b) Conditional probability of being demilitarized

Fig. 7. Instrumental Variable—relevance assumption: Contiguous offensive weapons.
Notes: This figure plots the relevance assumption of the instrumental variable (i.e. association between IV and independent variable), contiguous offensive weapon systems. Subplot (a) shows the relationship between contiguous offensive weapons and the number of militarized institutions (of the seven listed in Section 2). As institutions make up an important component of deciding what state a country is in with respect to its military, I thought it necessary to show this relationship. Subplot (b) shows the relationship between the IV and the conditional probability of being demilitarized. I use a propensity score measure to estimate the conditional probability of being treated (demilitarized) to assess the relationship to the IV. Both subplots show individual countries (by mean) in a scatter plot with a linear regression fit with a 95% confidence interval.

the negative relationship between the conditional probability of demilitarization and the IV. The x-axis is the average number of contiguous offensive weapons from the study timeframe, plotted against a y-axis of the conditional probability of being demilitarized (derived using same propensity score methodology from Section 3). Contiguous offensive weapons have a statistically significant impact on demilitarization. I am assuming this causal relationship between the IV and treatment because of previous research on external threats and state responses discussed at the beginning of this subsection.

Finally, the exogeneity assumption requires that contiguous offensive weapon units are determinants of military institutional change but are not actually caused by the demilitarizing state. This would mean that the demilitarizing state, country A, is not causing the offensive armament of contiguous states, country B. If country A were building up its military to attack, then country B would be focused on defensive measures. Offensive measures would not necessarily be affected. And if country A were to demilitarize, this would have no direct influence over country B's decision to shift its distribution of military capabilities. Therefore, the buildup of offensive capabilities is not correlated with country A's decision to change its military institutions.

As I show in Fig. 8 subplot (a), the offensive weapons surrounding a country begin reducing dramatically prior to a demilitarization episode. This is in accordance with the relevance condition. Fewer external threats provide the opportunity for a country to demilitarize. Subplot (b) of Fig. 8 shows yearly changes in domestic offensive and defensive weapon systems around the time of demilitarization. This subplot shows that in the years immediately proceeding, and at the time of, demilitarization, domestic countries dramatically reduce the number of defensive weapons they possess (blue line plot—response to decline in contiguous offensive weapons). At the same time, domestic offensive weapons (gray, dashed line plot) see very little movement. From this, I can infer that defensive units are responding to changes in offensive units of neighboring countries, not the other way around. Offensive units are an internal decision not being influenced by other countries. Defensive unit changes are a response variable and are thus endogenously selected by external countries. In other words, country A is, in a way, selecting how many defensive weapon systems they have on their border by the internal decision of how many offensive weapon systems that possess. Country A has no selection over the contiguous offensive weapons surrounding them as they are selected based on the domestic choices of country B. This information shows that offensive weapons meet the exogeneity assumption, based on the domestic policies of country A, while defensive units do not. A thorough discussion of the semiparametric IV process is included in the Online Appendix, section E.

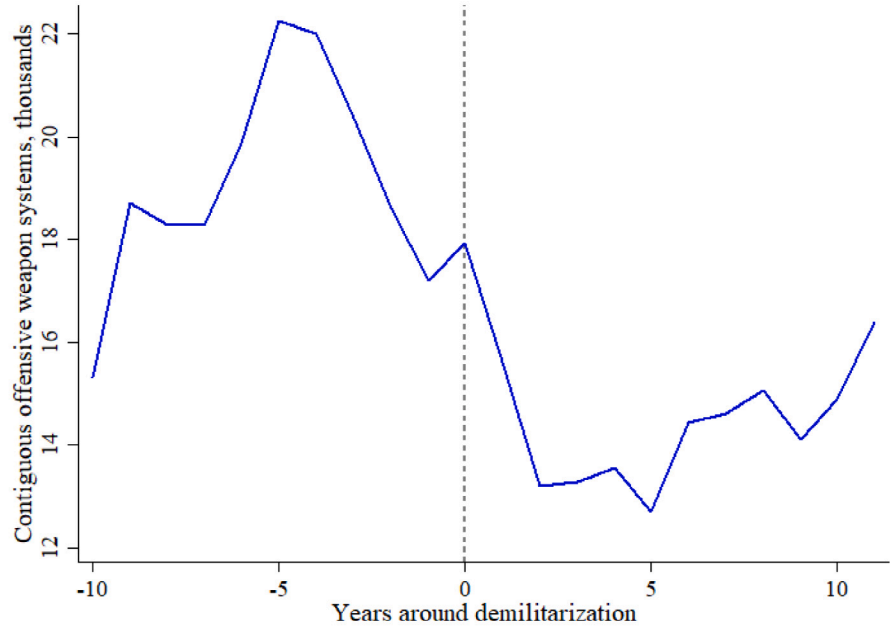
4.2. IV results

Estimates for the effect of demilitarization and militarization, instrumented by contiguous offensive weapon systems, using the CSDiD approach are listed in Table 3. Panel A of that table shows CSDiD IV estimates for all permanent demilitarizations. This includes both strong and weak episodes. Panel B and C separate out demilitarizations by intensity with B estimating only strong episodes and C weak episodes. Panel D reports estimates for all episodes of militarization. Columns indicate a range of years around the transition and estimates are averaged together for those years. Standard errors clustered at the country-level are reported in parentheses below each coefficient. Coefficients in bold are statistically significant at least at the 90% confidence interval. Coefficients are of log GDP per capita multiplied by 100 for interpretation. Therefore, a coefficient of 16.713 (11 to 15 years after demilitarization) signifies that GDP per capita was more than 16 percent higher than if the country had remained militarized in that time period. The first column reports estimates for −20 to −1 years prior to demilitarization, or, pre-treatment period differences between soon to be treated units and comparison units.

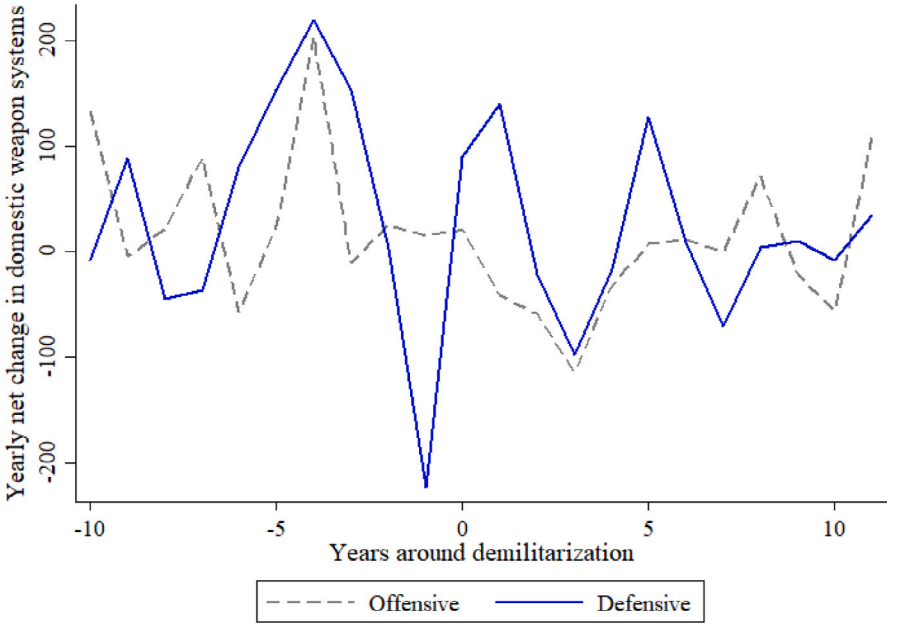
Fig. 9 plots the coefficients for panel A, all permanent demilitarization episodes. The results of the CSDiD estimation process for all permanent demilitarization episodes is roughly the same as the baseline CSDiD estimates in Table 2. However, the IV estimates do yield slightly larger effect. 6 to 10 years after demilitarization (column (3)), the treatment effect is statistically significant at the 90% confidence interval. The coefficient reported in column (3) is 8.587% (s.e. 4.492). The estimation continues to rise and peaks just after 25 years post-transition. Column (7) shows average coefficients 26 to 30 years after demilitarization. The result is statistically significant at the 95% confidence interval and the coefficient is 30.233% (s.e. 14.378). Given that column (1) shows the semiparametric IV does an excellent job of weighting in the pre-treatment period (average difference between treated and untreated units over 20 years is less than a quarter of a percent), I am confident in saying that my baseline estimation is robust to endogenous selection into treatment and that my initial findings may even be slightly underestimated.

Fig. 10 plots the coefficients for strong and weak permanent demilitarization episodes, estimated with the CSDiD IV approach. Subplot (a) shows strong demilitarization episodes. The blue connected line plot is for the coefficients of the estimation process and the shaded area is a 95% confidence interval. Subplot (b) show weak demilitarization episodes. Both plots show that the model is well-fit in the pre-treatment period. In column (1) panel B, strong demilitarization episodes exhibit a difference of 1.132% (s.e. 1.588) between treated and untreated units in the pre-treatment period. Weak demilitarization episodes in panel C have a difference of −1.581% (s.e. 2.611). Both show a similar pattern of economic growth as was depicted in Table 2 with the baseline estimates. Strong demilitarization episodes max out closer to 30 years after treatment. Column (7) shows that average GDP per capita was 44.335% (s.e. 11.880) larger 26 to 30 years after demilitarization compared to the choice to remain militarized. This estimate is at the 99% confidence interval. Weak demilitarization episodes in panel C actually see statistically significant growth 11 to 20 years after transition. Column (5) has a coefficient of 16.102% (s.e. 9.530) that is at the 90% confidence interval. However, that growth trend decline rapidly 25 years after transition. Once again, we see that weak demilitarization episodes have very little impact on growth when compared to strong demilitarizations.

Fig. 11 plots the coefficients for militarization episodes, estimated with the CSDiD IV approach. The blue connected line plot shows the coefficients at different timings around the militarization episode and the shaded area is a 95% confidence interval. Militarization episodes under the IV specification follow a virtually identical pattern to the non-IV specification. 6 to 10 years after



(a) Contiguous offensive weapon systems



(b) Domestic weapons, offensive and defensive

Fig. 8. Instrumental Variable—Exogeneity Assumption: Contiguous offensive weapons.
Notes: This figure plots the exogeneity assumption of the instrumental variable (i.e. instrument is not correlated with the error term of primary CSDiD estimate—military transitions on GDP), contiguous offensive weapon systems. Subplot (a) shows the behavior of contiguous offensive weapon systems (in thousands) around demilitarization (strong only) episodes. The blue line plot depicts the average of the IV around the gray vertical line (year of demilitarization). This subplot shows the dramatic decline in offensive weapons on a countries border prior to the decision to demilitarize. Subplot (b) shows the evolution of domestic offensive and defensive weapons around demilitarization. In response to contiguous offensive weapon decline, domestic decisions are made to reduce defensive weapons. This is because defensive weapons are a response to foreign offensive weapons. Domestic offensive weapons do not see the same response as they are solely a domestic decision. Therefore, offensive weapons in contiguous countries are exogenous to the decisions (and GDP) of the domestic country in question (undergoing transition). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Table 3
CSDiD causal IV estimates of the effect of demilitarization and militarization on (Log) GDP per capita.

	Average effects on log GDP per capita from:							
	−20 to −1 Years (1)	1 to 5 Years (2)	6 to 10 Years (3)	11 to 15 Years (4)	16 to 20 Years (5)	21 to 25 Years (6)	26 to 30 Years (7)	31 to 35 Years (8)
	A. Permanent Demilitarizations							
Not yet treated controls	0.202	2.996	**8.587***	**16.713****	**20.904****	**25.997****	**30.233****	24.463
(clustered s.e.)	(1.446)	(2.565)	**(4.492)**	**(6.525)**	**(8.135)**	**(10.579)**	**(14.378)**	(16.492)
	B. Strong, Permanent Demilitarizations							
Not yet treated controls	1.132	4.386	**10.829****	**18.181****	**23.395*****	**31.884*****	**44.335*****	**44.772*****
	(1.588)	(3.325)	**(5.506)**	**(7.432)**	**(9.071)**	**(10.439)**	**(11.880)**	**(15.205)**
	C. Weak, Permanent Demilitarizations							
Not yet treated controls	−1.581	0.478	4.144	**14.073***	**16.102***	11.055	−2.522	−26.865
	(2.611)	(3.021)	(5.165)	**(7.362)**	**(9.530)**	(17.425)	(27.638)	(21.823)
	D. Permanent Militarizations							
Not yet treated controls	−2.275	−8.505	**−21.542***	**−23.502****	**−29.774****	**−33.141****	**−33.941***	**−34.595***
	(12.219)	(7.728)	**(11.164)**	**(9.942)**	**(12.584)**	**(15.676)**	**(20.486)**	**(19.344)**

Notes: Table shows CSDiD IV estimates of the effect of a demilitarization and militarization on log GDP per capita over different time horizons. Each estimate is instrumented with contiguous offensive weapon systems. I list estimates of the average effect on the treated. Log GDP per capita is multiplied by 100, estimates are 'percent larger than if country had not transitioned.' All panels feature a doubly robust estimator. Each panel addresses a different type of transition. Below each estimate I report robust standard errors clustered at the country level. Stars reported for significant levels: *, **, ***, for 90, 95, and 95 percent, respectively. Statistically significant results are in bold to aid visual interpretation.

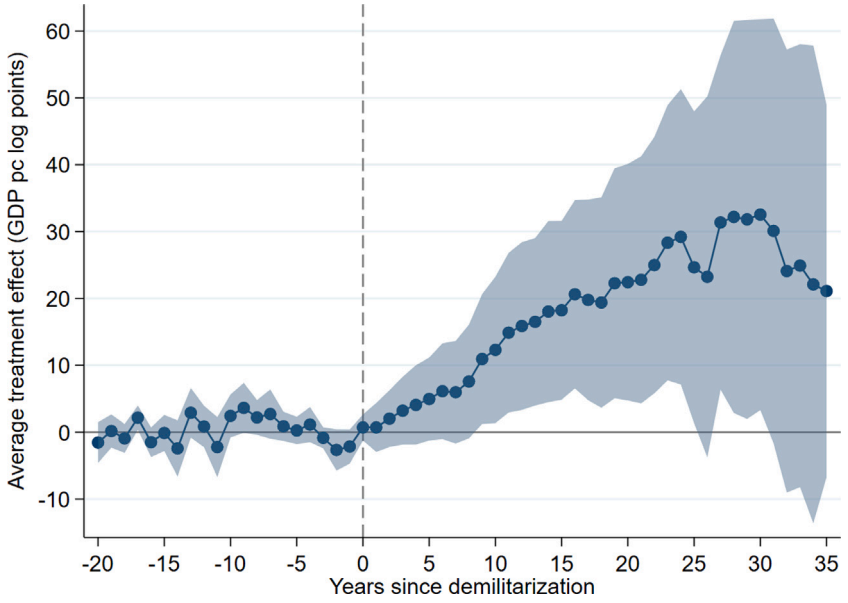
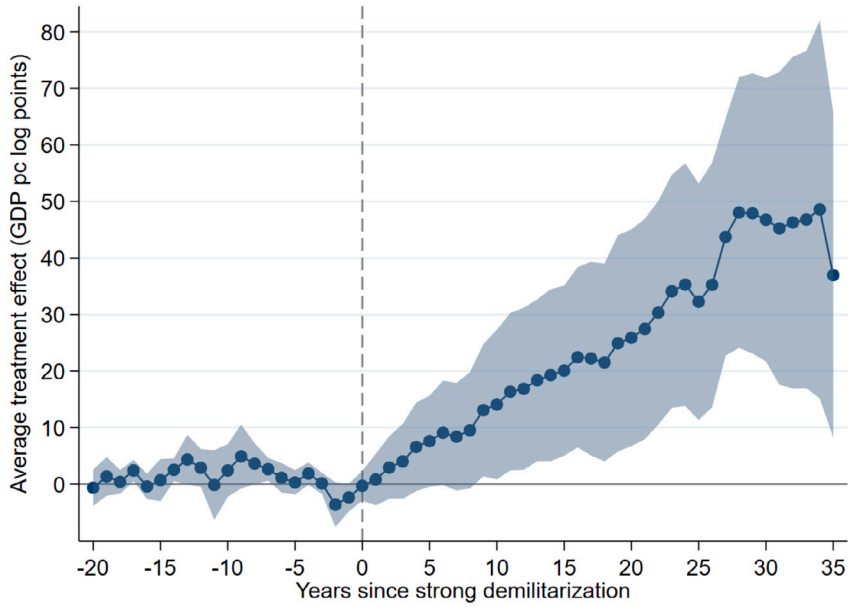
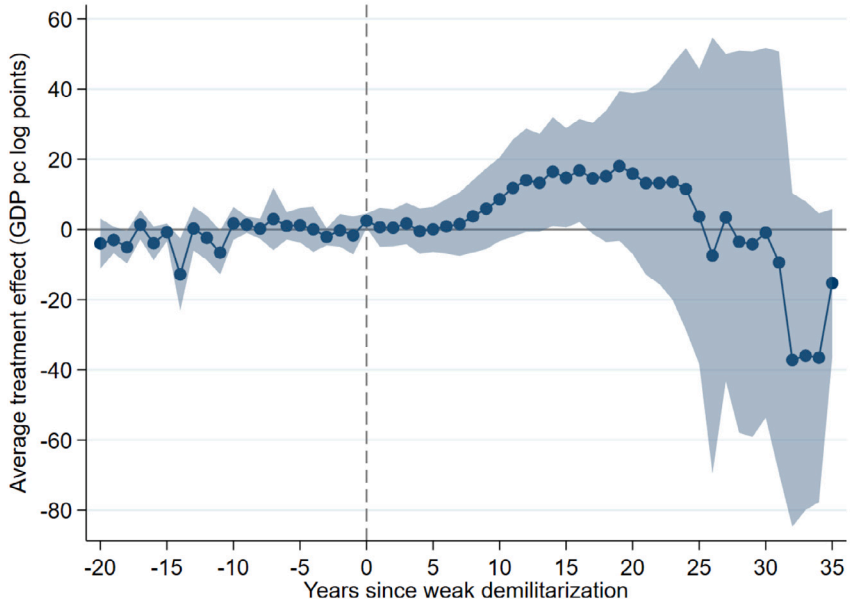


Fig. 9. CSDiD IV Estimate: Effect of (all) demilitarization episodes on GDP per capita.
Notes: CSDiD IV group-time estimates of the over-time effects of all demilitarization episodes on log of GDP; doubly robust estimate with not-yet treated comparison units. This figure plots CSDID IV estimates of the effect of demilitarization on GDP per capita in log points. The blue, connected line plot estimates average effect on GDP per capita on countries that demilitarized (in log points), with a 95 percent confidence interval shown by the gray, shaded area plot. Time (in years) relative to the year of demilitarization runs on the horizontal axis. The estimates are obtained by assuming and estimating a probit model for demilitarizations based on contiguous offensive weapon systems of the time-cohorts, which I use to estimate the propensity score and re-weight the data. In addition, I partial out lags of on contiguous offensive weapon systems linearly, making this approach doubly robust. The difference between this figure and Fig. 4 is that I base the propensity score (and thus, treatment) on the instrumental variable—contiguous offensive weapon systems. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

militarization (column (3)), treated countries have on average 21.542% (s.e. 11.164) lower GDP per capita that if they had remained demilitarized. In column (8), the loss from militarization peaks at −34.595% (s.e. 19.344) and is at the 90% confidence interval. The IV estimations serve as a check on my baseline results and confirm that differences in the distribution of GDP between treated and untreated units are not reflecting differences generated by the treatment selection process, but the actual effect of treatment.



(a) Strong demilitarization episodes



(b) Weak demilitarization episodes

Fig. 10. CSDiD IV Estimate: Effect of strong/weak demilitarization episodes on GDP per capita.
Notes: CSDiD IV group-time estimates of the over-time effects of strong and weak demilitarization episodes on log of GDP; doubly robust estimate with not-yet treated comparison units. This figure plots CSDID IV estimates of the effect of demilitarization on GDP per capita in log points. The blue, connected line plot estimates average effect on GDP per capita on countries that demilitarized (in log points), with a 95 percent confidence interval shown by the gray, shaded area plot. Time (in years) relative to the year of demilitarization runs on the horizontal axis. The estimates are obtained by assuming and estimating a probit model for demilitarizations based on contiguous offensive weapon systems of the time-cohorts, which I use to estimate the propensity score and re-weight the data. In addition, I partial out lags of on contiguous offensive weapon systems linearly, making this approach doubly robust. Subplot (a) shows all cases of strong demilitarization. Subplot (b) shows all cases of weak demilitarization. The difference between this figure and Fig. 5 is that I base the propensity score (and thus, treatment) on the instrumental variable—contiguous offensive weapon systems. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

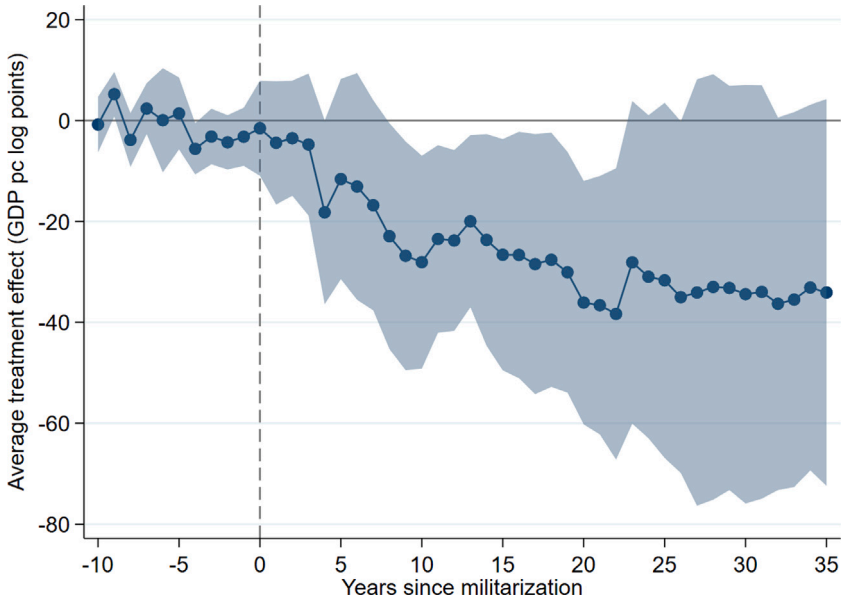


Fig. 11. CSDiD IV Estimate: Effect of militarization episodes on GDP per capita.
Notes: CSDiD IV group-time estimates of the over-time effects of militarization episodes on log of GDP; doubly robust estimate with not-yet treated comparison units. This figure plots CSDID IV estimates of the effect of demilitarization on GDP per capita in log points. The blue, connected line plot estimates average effect on GDP per capita on countries that militarized (in log points), with a 95 percent confidence interval shown by the gray, shaded area plot. Time (in years) relative to the year of militarization runs on the horizontal axis. The estimates are obtained by assuming and estimating a probit model for militarizations based on contiguous offensive weapon systems of the time-cohorts, which I use to estimate the propensity score and re-weight the data. In addition, I partial out lags of on contiguous offensive weapon systems linearly, making this approach doubly robust. The difference between this figure and Fig. 6 is that I base the propensity score (and thus, treatment) on the instrumental variable—contiguous offensive weapon systems. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

With the estimates in Table 3, I have greater confidence that I am estimating the causal effect of demilitarization and militarization on GDP per capita.

5. Placebo test: Safer neighborhood, still militarized

A major threat to the causality of my estimation is the idea that a safer global environment drives growth rather than the mechanism of demilitarization. Collier (1999) finds that countries experience growth following the end of a civil conflict as a result of increased foreign capital flows (e.g. a reduction in threats faced). Capital is often risk adverse to violence. No one wants to build a factory somewhere it might get blown up. As I show in Fig. 1, we live in perhaps the most peaceful time in history. To test this proposition, I conduct another CSDiD estimate but use countries choosing to remain militarized even when they have a shock to the violent threats around them as a placebo treatment status.

There is a large set of countries that remain militarized for my entire data sample. At various points in time, these countries face reduced threats. If my results were being driven by a safer environment for those countries, then these militarized countries which see reduced threats would experience higher growth. If the results are in fact driven by the demilitarization of institutions, then countries remaining militarized would not see an impact.

To test this placebo theory, I compile a list of countries that remain militarized for the entire sample but see contiguous countries around them pursue a strong, permanent demilitarization. Countries experiencing a reduction in external threats but choosing not to demilitarize: United States of America (1968), Belgium (1966), Colombia (1985), Italy (1966), Venezuela (1985), Guinea (1998), Democratic Republic of the Congo (2002), Somalia (1992), Botswana (1992), Malawi (1983), Spain (1975), United Kingdom (1966), Germany (1966), Switzerland (1966), Austria (1990), Serbia (1990), Bosnia and Herzegovina (1980), Moldova (1993), Iraq (2001), Saudi Arabia (2001), Eritrea (1992), Djibouti (1992), Vietnam (1999), Laos (1999), and Philippines (1998).

Using these country-year pairs, I perform the same CSDiD estimation from the previous section with the placebo rather than actual treatments. The results for this estimation are found in Table 4. Panel A in Table 4 shows the coefficients reported over years (in columns) around each placebo treatment. I estimate coefficients using not-yet treated controls, followed by never treated controls, and finishing with an alternative set of endogenous covariates to model selection into treatment. The alternative covariates are the same set as described in the previous section. Standard errors clustered at the country-level are reported in parentheses below each coefficient. Coefficients are of log GDP per capita multiplied by 100 for interpretation. The first column reports estimates for −20 to −1 years prior to demilitarization, or, pre-treatment period differences between soon to be treated units and comparison units.

Table 4
CSDiD estimates of the effect of placebo on (Log) GDP per capita.

	Average effects on log GDP per capita from:							
	−20 to −1 Years (1)	1 to 5 Years (2)	6 to 10 Years (3)	11 to 15 Years (4)	16 to 20 Years (5)	21 to 25 Years (6)	26 to 30 Years (7)	31 to 35 Years (8)
	A. Placebo Treatments							
Not yet treated controls	−0.159	−1.986	−4.909	−2.592	−3.967	5.348	8.577	−16.369
(clustered s.e.)	(2.428)	(3.740)	(6.671)	(8.232)	(9.648)	(8.815)	(14.073)	(36.049)
Never treated controls	−0.168	−1.919	−4.968	−2.684	−3.865	5.642	7.652	−17.711
	(2.453)	(3.794)	(6.820)	(8.379)	(9.785)	(8.869)	(13.950)	(35.832)
Alt. covariates, not yet	0.283	−4.087	−13.141	−11.216	11.275	9.027	−14.609	−24.839
	(5.851)	(8.906)	(15.260)	(20.175)	(22.432)	(32.023)	(36.889)	(49.881)

Notes: Table shows CSDiD estimates of the effect of a placebo treatment on log GDP per capita over different time horizons. Placebo treatments are countries that see a reduced security threat (contiguous country strongly demilitarizes) but remain permanently militarized. I list estimates of the average effect on the treated. Log GDP per capita is multiplied by 100, estimates are 'percent larger than if country had not transitioned.' The lone panel features a doubly robust estimator with three estimation techniques. Below each estimate I report robust standard errors clustered at the country level. Stars reported for significant levels: *, **, ***, for 90, 95, and 95 percent, respectively. Statistically significant results are in bold to aid visual interpretation.

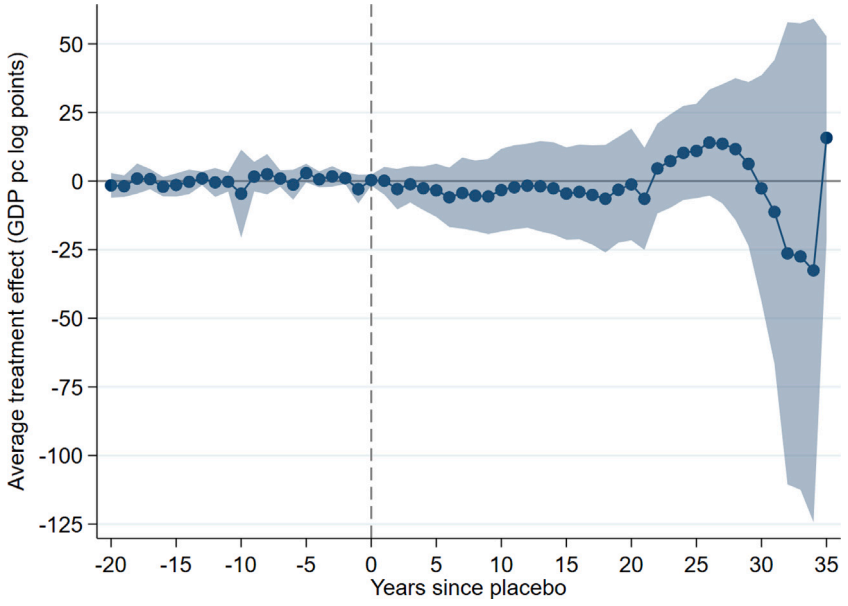
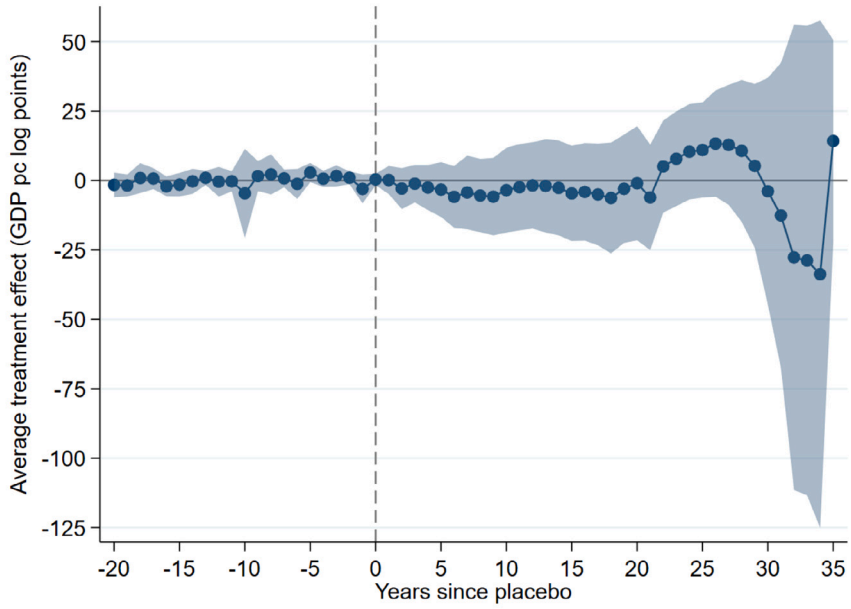


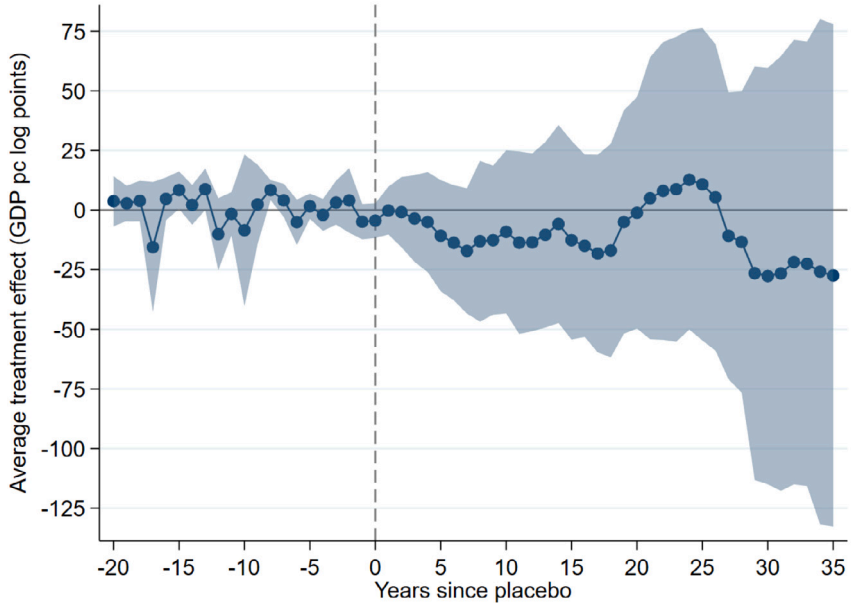
Fig. 12. CSDiD Estimate: Effect of placebo episodes on GDP per capita.
Notes: CSDiD group-time estimates of the over-time effects of all placebo episodes on log of GDP; doubly robust estimate with not-yet treated comparison units. This figure plots CSDID estimates of the effect of placebo treatments on GDP per capita in log points. The blue, connected line plot estimates average effect on GDP per capita on countries that received a placebo treatment (in log points), with a 95 percent confidence interval shown by the gray, shaded area plot. Time (in years) relative to the year of treatment runs on the horizontal axis. Placebo treatments are countries that have a contiguous neighbor (country) strongly demilitarize, but choose to remain permanently militarized. The estimates are obtained by assuming and estimating a probit model for placebo treatments based on GDP lags of the time-cohorts, which I use to estimate the propensity score and re-weight the data. In addition, I partial out lags of GDP linearly, making this approach doubly robust. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Fig. 12 plots the difference in GDP per capita log points between placebo treated and untreated units with not-yet treated controls, my primary specification. The blue connected line graph is difference in GDP per capita log points and the shaded area is a 95% confidence interval. In the pre-placebo treatment period (column (1) of Table 4), the semiparametric specification does an excellent job of weighting. Over the 20-year time period, the average difference between placebo treated and untreated units is −0.159 percent (s.e. 2.428). However, the post-placebo treatment period features no statistically significant coefficients. The average coefficient does not exceed ± 5% until almost 25 years after the placebo treatment.

Fig. 13 plots the CSDiD estimation with never treated controls (subplot a) and alternative covariate modeling into selection (subplot b). I find that despite this reduction in external threats, countries remaining militarized do not see the same economic benefit. The results show no statistically significant effect on GDP per capita. This is a confirmation that my results are not merely



(a) Never-treated placebo



(b) Alternative covariate placebo

Fig. 13. CSDiD Estimate: Effect of placebo episodes on GDP per capita, alternative controls.
Notes: CSDiD group-time estimates of the over-time effects of all placebo episodes on log of GDP; doubly robust estimate with never treated and alternative covariate comparison units. This figure plots CSDID estimates of the effect of placebo treatments on GDP per capita in log points. The blue, connected line plot estimates average effect on GDP per capita on countries that received a placebo treatment (in log points), with a 95 percent confidence interval shown by the gray, shaded area plot. Time (in years) relative to the year of treatment runs on the horizontal axis. Placebo treatments are countries that have a contiguous neighbor (country) strongly demilitarize, but choose to remain permanently militarized. The estimates are obtained by assuming and estimating a probit model for placebo treatments based on GDP lags of the time-cohorts, which I use to estimate the propensity score and re-weight the data. In addition, I partial out lags of GDP linearly, making this approach doubly robust Subplot (a) shows placebo treatments with never treated controls. Subplot (b) shows placebo treatments with selection based on alternative covariates. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Table 5
CSDiD estimates of the effect of strong demilitarization on potential mechanisms.

	Average effects on (log 'var')*100 from:							
	−20 to −1 Years (1)	1 to 5 Years (2)	6 to 10 Years (3)	11 to 15 Years (4)	16 to 20 Years (5)	21 to 25 Years (6)	26 to 30 Years (7)	31 to 35 Years (8)
	A. Total Bilateral Trade, per capita (international)							
Strong demilitarization	−0.914	5.052	**20.678*****	**32.596*****	**43.138*****	**39.841*****	**35.109****	**57.732*****
(clustered s.e.)	(3.575)	(5.097)	**(7.363)**	**(8.435)**	**(10.818)**	**(13.385)**	**(15.015)**	**(19.100)**
Militarization	1.283	−18.057	−14.208	−17.105	**−49.312***	**−50.539***	−55.621	−52.879
	(11.318)	(13.849)	(20.492)	(23.378)	**(25.473)**	**(29.737)**	(34.667)	(38.970)
	B. Foreign direct investment inflows, per capita							
Strong demilitarization	25.594	26.726	46.547	77.063	91.883	**137.370***	**168.481***	**235.323***
	(39.479)	(22.742)	(31.725)	(50.505)	(58.664)	**(72.173)**	**(90.152)**	**(139.995)**
Militarization	5.311	12.781	26.245	5.481	10.915	20.022	31.370	22.934
	(9.074)	(13.607)	(21.699)	(30.966)	(28.982)	(33.825)	(44.069)	(49.404)
	C. Capital stock at current PPPs, per capita							
Strong demilitarization	**7.809****	**16.861*****	**34.413****	**51.038****	**76.186*****	**110.723*****	**133.478*****	**170.896*****
	(3.532)	**(6.222)**	**(13.397)**	**(19.938)**	**(25.526)**	**(30.964)**	**(39.412)**	**(50.257)**
Militarization	−2.944	5.329	10.457	11.241	9.169	2.299	37.792	37.992
	(4.222)	(8.344)	(16.228)	(22.785)	(31.791)	(40.196)	(30.065)	(35.366)
	D. Welfare-relevant TFP levels at current PPPs							
Strong demilitarization	−0.096	1.947	6.342	**10.155***	8.611	**12.782****	**21.410*****	**22.995*****
	(1.453)	(2.623)	(4.029)	**(5.792)**	(5.544)	**(5.914)**	**(6.816)**	**(8.322)**
Militarization	−0.523	−3.298	−16.388	−15.048	−2.462	5.791	13.854	**21.094****
	(2.875)	(9.017)	(11.282)	(9.409)	(12.178)	(13.711)	(16.303)	**(10.635)**
	E. Infant mortality rate							
Strong demilitarization	−0.026	−1.976	**−5.408***	**−9.887****	**−16.524*****	**−26.355*****	**−32.648*****	**−33.164****
	(0.429)	(1.531)	**(3.214)**	**(4.768)**	**(5.837)**	**(7.260)**	**(9.742)**	**(13.439)**
Militarization	1.886	**8.283*****	**17.508*****	**22.083*****	**22.350****	**21.978***	23.297	25.056
	(0.731)	**(3.009)**	**(6.196)**	**(7.859)**	**(10.668)**	**(12.890)**	(17.207)	(19.774)

Notes: Table shows CSDiD estimates of the effect of a demilitarization and militarization on potential mechanisms over different time horizons. I list estimates of the average effect on the treated. Each dependent variable is log(*'var'*) multiplied by 100, estimates are 'percent larger than if country had not transitioned.' All panels feature a doubly robust estimator. Each panel addresses a different type of transition. Below each estimate I report robust standard errors clustered at the country level. Stars reported for significant levels: *, **, ***, for 90, 95, and 95 percent, respectively. Statistically significant results are in bold to aid visual interpretation.

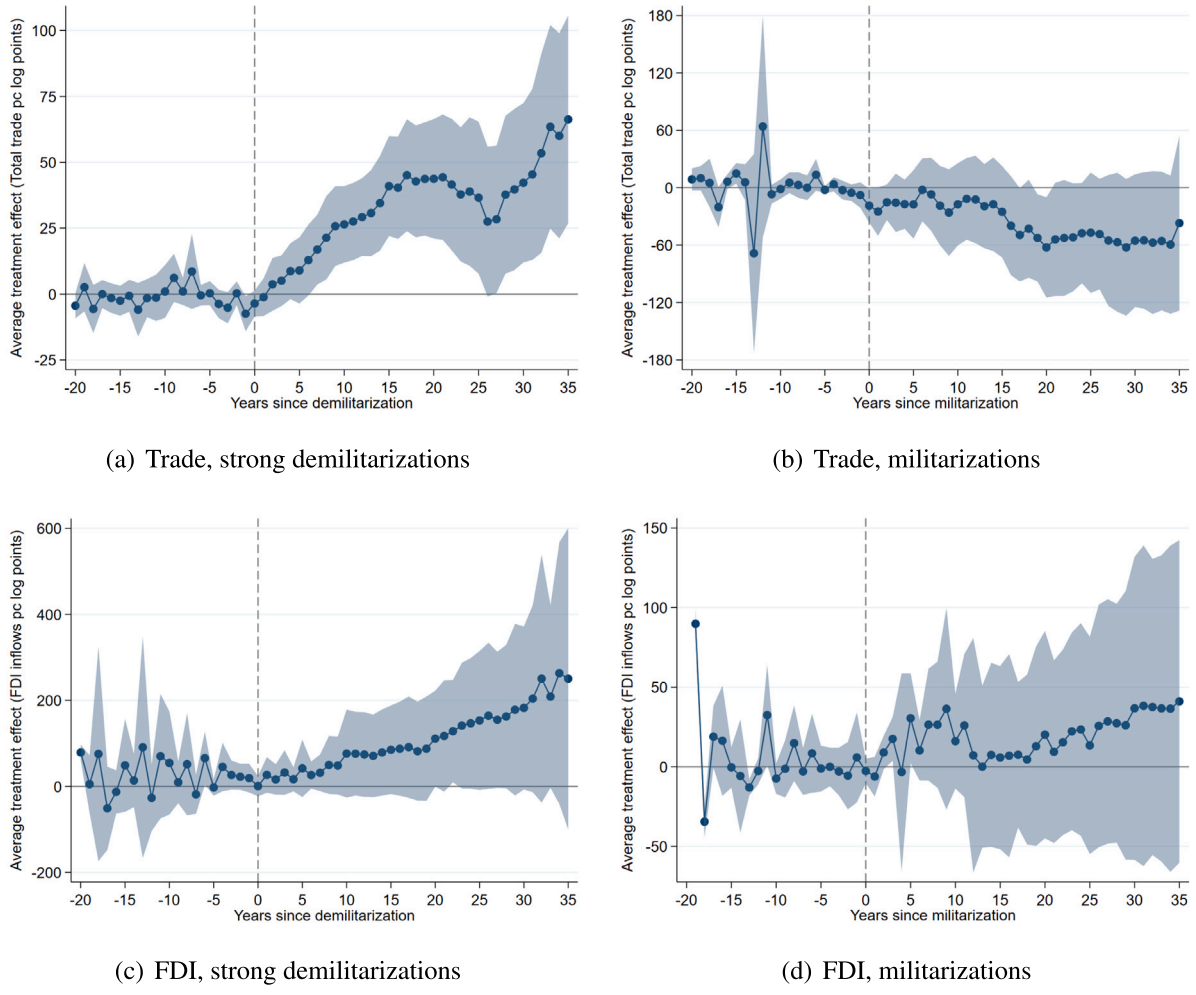
being driven by the reduction of threats. Meaning, becoming safer is not driving economic growth but rather the mechanism of demilitarization.

6. Potential mechanisms

Next, I turn my attention to the potential mechanisms which may be driving economic growth. Existing research on this topic has found that reduced military capacity spurs economic growth by a changing perception of the country on the international stage, as well as a shock to factors of the neoclassical growth framework. Wisniewski and Pathan (2014) find that reduced military spending leads to increased foreign direct investment (FDI). Similarly, Acemoglu and Yared (2010) find that by reducing the number of troops and money spent on the military, a country becomes a more attractive trade partner. Loayza et al. (1999) study the effects of decreased military spending on all three factors of neoclassical growth. With this understanding, I look for empirical evidence of these mechanisms impacting growth. I use the same CSDiD specification as my baseline results and evaluate several mechanisms. To do this, I replace log GDP per capita with each of the potential mechanisms iteratively as the dependent variable. Estimates are presented in Table 5.

Fig. 14 is dedicated to understanding how changes in the external appearance of a country may affect growth stimulating factors. Subplot (a) plots bilateral trade flows for strongly demilitarizing countries. The x-axis of the figure is the time around each demilitarization episode. Subplot (b) plots bilateral trade flows for all militarization episodes. Subplot (c) plots foreign direct investment inflows for strong demilitarization episodes. Subplot (d) plots FDI inflows for militarization episodes.

The evolution of trade flows around demilitarization and militarization is unsurprising. In panel A column (5) of Table 5 (16 to 20 years after transition), strong demilitarization countries have a total bilateral trade (per capita) flow level that is 43.138% (s.e. 10.818) higher than if they had remained militarized. This coefficient is statistically significant at the 99% confidence interval. In that same time period, militarization episodes have a trade flow that is −49.312% (s.e. 25.473) lower than if the country had remained demilitarized. These results have a lot to do with sanctions and international perception. Countries are often economically sanctioned as a way to induce behavior changes. Mayberry (2022) finds that Pakistan was severely sanctioned in an attempt to discourage the expansion of its nuclear weapons' program. Trade flows dramatically fell for Pakistan and its economy under-performed for over



(a) Trade, strong demilitarizations

(b) Trade, militarizations

(c) FDI, strong demilitarizations

(d) FDI, militarizations

Fig. 14. CSDiD Estimate—Trade and FDI: Demilitarization vs Militarization.
Notes: CSDiD group-time estimates of the over-time effects of strong demilitarization and militarization episodes on bilateral, international trade volumes and foreign direct investment inflows; doubly robust estimate with not-yet treated comparison units. This figure plots CSDID estimates of the effect of demilitarization and militarization on total bilateral trade volume and foreign direct investment per capita in log points. The blue, connected line plot estimates average effect on trade volume and FDI on countries that demilitarized or militarized (in log points—multiplied by 100 from interpretation of true percentage), with a 95 percent confidence interval shown by the gray, shaded area plot. Time (in years) relative to the year of demilitarization/militarization runs on the horizontal axis. The estimates are obtained by assuming and estimating a probit model for demilitarizations/militarizations based on pre-treatment trade volumes and FDI inflows, which I use to estimate the propensity score and re-weight the data. In addition, I partial out lags on trade volumes and FDI inflows, making this approach doubly robust. Subplot (a) shows estimates of trade for all cases of strong demilitarization. Subplot (b) shows estimates of trade for all cases of militarization. Subplot (c) shows estimates of FDI for all cases of strong demilitarization. Subplot (b) shows estimates of FDI for all cases of militarization. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

a decade. The average number of economic sanctions on strongly demilitarization countries 5 years before transition is more than 12. 5 years after demilitarization, that number is just over 7. Sanction's relief and sanction's punishment are inextricably linked to military behavior. Thus, the choice between demilitarization and militarization will have a substantial influence on the ability of a country to trade internationally.

Foreign direct investment inflows also expand significantly for strongly demilitarizing countries. In panel B column (6) of Table 5 (21 to 25 years after transition), strong demilitarization countries have foreign direct investment inflows (per capita) that are 137.370% (s.e. 72.173) higher than if the country had remained militarized. This coefficient is statistically significant at the 90% confidence interval. Countries choosing to militarize have no statistically significant difference from the semiparametric counterfactual. This result confirms early findings from Collier (1999). Foreign capital is risk averse and weary of violent conflict. No one wants to build a factory where it might be blown up or attacked. This outcome is increasingly likely in a country that is heavily militarized and prepared for violent conflict. As shown in Fig. 14 subplot (c), there seems to be a large foreign capital influx as a result of demilitarization. Together with subplot (a) and (b), these results empirically confirm that the international community views demilitarized countries as more favorable investment opportunities and more viable trade partners.

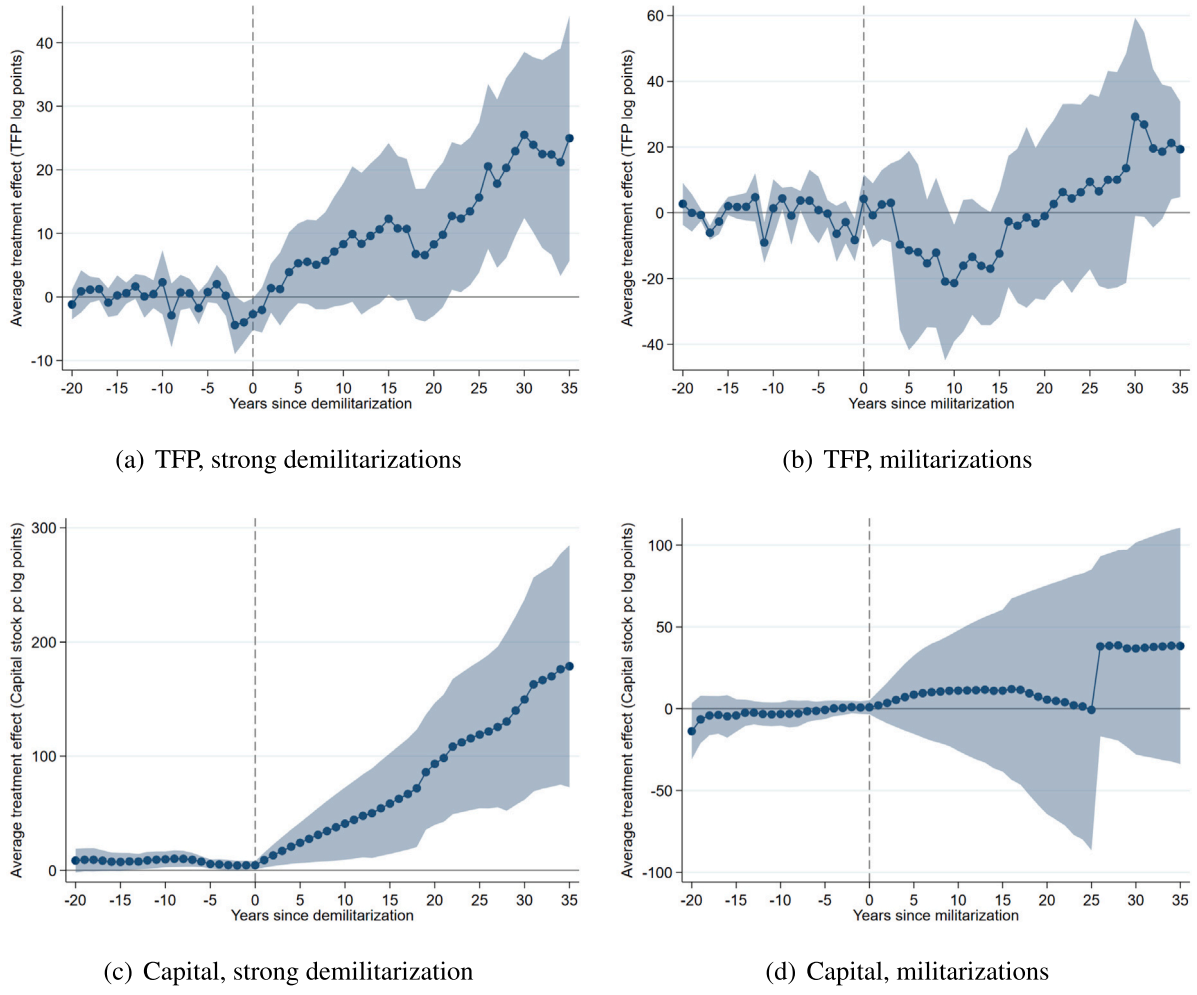


Fig. 15. CSDiD Estimate—TFP and capital stock: Demilitarization vs Militarization.
Notes: CSDiD group-time estimates of the over-time effects of strong demilitarization and militarization episodes on total factor productivity (TFP) and capital stock; doubly robust estimate with not-yet treated comparison units. This figure plots CSDID estimates of the effect of demilitarization and militarization on TFP and capital stock per capita in log points. The blue, connected line plot estimates average effect on TFP and capital on countries that demilitarized or militarized (in log points—multiplied by 100 from interpretation of true percentage), with a 95 percent confidence interval shown by the gray, shaded area plot. Time (in years) relative to the year of demilitarization/militarization runs on the horizontal axis. The estimates are obtained by assuming and estimating a probit model for demilitarizations/militarizations based on pre-treatment TFP and capital, which I use to estimate the propensity score and re-weight the data. In addition, I partial out lags on TFP and capital stock, making this approach doubly robust. Subplot (a) shows estimates of TFP for all cases of strong demilitarization. Subplot (b) shows estimates of TFP for all cases of militarization. Subplot (c) shows estimates of capital stock per capita for all cases of strong demilitarization. Subplot (b) shows estimates of capital stock per capita for all cases of militarization. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Fig. 15 is dedicated to understanding how a country allocated resources which in turn affect growth. Subplot (a) plots total factor productivity for strongly demilitarizing countries. The x-axis of the figure is the time around each demilitarization episode. Subplot (b) plots TFP for all militarization episodes. Subplot (c) plots total capital stock for strong demilitarization episodes. Subplot (d) plots capital stock for militarization episodes.

The evolution of total factor productivity can be ascribed to refocusing of research and development resources to market-oriented goals (Knight et al., 1996). In panel D column (7) of Table 5 (26 to 30 years after transition), strong demilitarization countries have a welfare-relevant TFP level that is 21.410% (s.e. 6.816) higher than if they had remained militarized. This coefficient is statistically significant at the 99% confidence interval. Countries choosing to militarize have no statistically significant difference from the semiparametric counterfactual until more than 30 years after transition. While these results are not as compelling as some other potential mechanisms, it certainly raises questions as to whether R&D focused on market-oriented solutions (as opposed to military R&D) may explain the economic growth associated with demilitarization.

Capital stock levels expand significantly for strongly demilitarizing countries. In panel C column (5) of Table 5 (16 to 20 years after transition), strong demilitarization countries have a capital stock level (per capita) that is 76.186% (s.e.25.526) higher than if

the country had remained militarized. The difference between demilitarizing countries and the counterfactual continues to expand and reaches 170.896% (s.e. 50.257) in column (8). This coefficient is statistically significant at the 99% confidence interval. Countries choosing to militarize have no statistically significant difference from the semiparametric counterfactual. This result is confirmation of some of the original Guns vs Butter arguments. I prefer to think of this as Tanks vs Tractors. Guns vs Butter creates an image of consumption whereas Tanks vs Tractors is a state-level decision on where to investment resources. With demilitarization, a country allocates more resources to economically productive capital accumulation. Tanks are not economically productive pieces of capital as they are only useful in a military setting. Tractors on the other hand, are economically productive capital with countless uses. As shown in Fig. 15 subplot (c) and (d), the large increases in capital for demilitarizing countries are immediate, large, and sustained. No such growth occurs for countries choosing to militarize.

Fig. 16 is dedicated to understanding how a country shifts policy priorities around demilitarization. Subplot (a) plots infant mortality rate for strongly demilitarizing countries. The x-axis of the figure is the time around each demilitarization episode. Subplot (b) plots infant mortality rate for all militarization episodes.

The evolution of infant mortality rate around demilitarization and militarization is something that surprised me in writing this paper. In panel E column (5) of Table 5 (16 to 20 years after transition), strong demilitarization countries have an infant mortality rate that is −16.524% (s.e. 5.837) lower than if they had remained militarized. This coefficient is statistically significant at the 99% confidence interval. In that same time period, militarization episodes have an infant mortality rate that is 22.350% (s.e. 10.668) higher than if the country had remained demilitarized. One observation I have of demilitarizing countries is that they may be shifting public funds that would normally be spent on the military into healthcare. The long-run impact may be a larger, healthier labor force for those countries. Conversely, it is also possible that ending a violent conflict or violent society may generally improve infant mortality. If there are less bombs exploding, it tracks that there would be fewer infant deaths. Summarily, total factor productivity, labor force, and the capital stock of a country constitute the inputs of the neoclassical growth framework. The figures presented in this section and show how they are all positively affected following demilitarization. This helps to explain the large and significant economic growth associate with demilitarization, and the downward trend in growth I see with militarization.

7. Conclusion

In this paper, I am the first to take on the more holistic concept of demilitarization. The value of this paper to existing literature is that I am able to bring together the fragmented strands of research and estimate the Peace Dividend with a broader framework, as Smith (1983) suggests is necessary to truly understand the economic ramifications of militarism. Previous literature has largely been constrained to focus on individual aspects of militarism and has yet to capture the true economic impact of militarization and demilitarization.

I find that demilitarization has been a significant political development in the past several decades. The end of the Cold War brought with it a new outlook on defense policy for many countries and a shift in the demand for securitization. I create a new data set to explore the institutional military changes of countries around the world. In order to estimate how demilitarization has impacted GDP per capita, there are several empirical challenges that I must overcome. I utilize a semiparametric estimation framework calibrated to handle staggered adoption of treatment, divergence of treated and untreated units in the pre-treatment period, and endogenous selection into treatment. Reassuringly, these estimations all yield similar results. I estimate that demilitarization is associated with a 1% higher annual GDP per capita than if the country had remained militarized. Dynamic analysis shows that on average, GDP per capita is 15%–20% higher 20 years after transition. These results are found to be driven by cases of stronger, more substantial military reforms. I also find that militarization is associated with a −2% lower annual GDP per capita than if the country had remained demilitarized. Dynamic analysis shows that on average, GDP per capita is around 30% lower 20 years after transition.

This result appears importantly driven by external and internal investment decisions. Increased foreign direct investment and larger international trade flows depict an environment described by Acemoglu and Yared (2010) and Wisniewski and Pathan (2014). Countries may shift trade and financial flows based on military institutions. That is, the international community may be viewing a country with demilitarized institutions as a more stable and profitable investment opportunity. Internally, demilitarizing countries reallocate money and resources into more economically productive avenues. These reallocated funds could improve TFP through increased R&D or a more robust labor force with improved healthcare. Also, countries become more likely to make long-term investment in market-oriented capital.

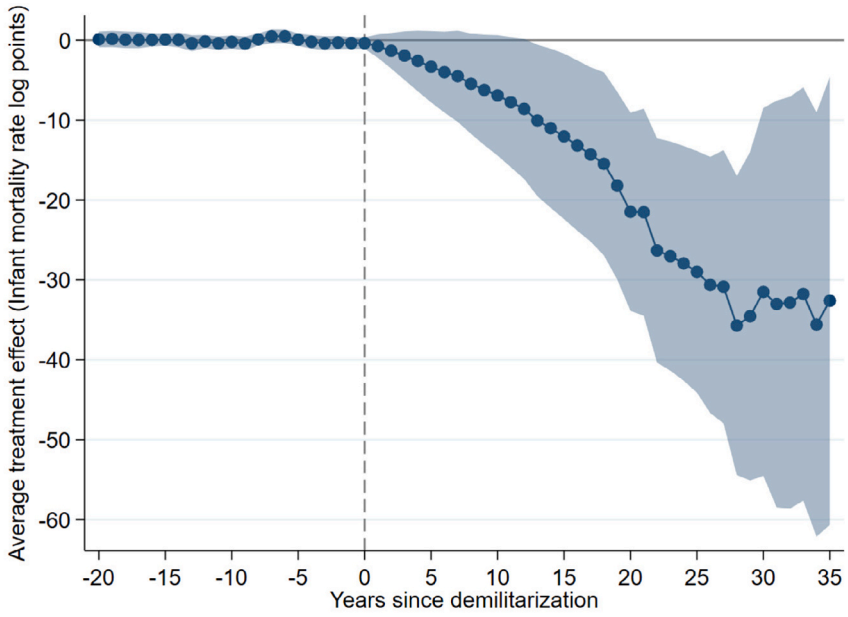
The limitations of this study are based on the lack of randomization for selection into treatment and the ability to generalize these findings. As with any macro study, the dynamics of world powers could alter outcomes in a number of important ways. The benefits of demilitarization may depend on the structure and stability of the global balance of power. Instead, my findings precisely estimate the impact of demilitarization for a specific time and sample of countries.

Declaration of competing interest

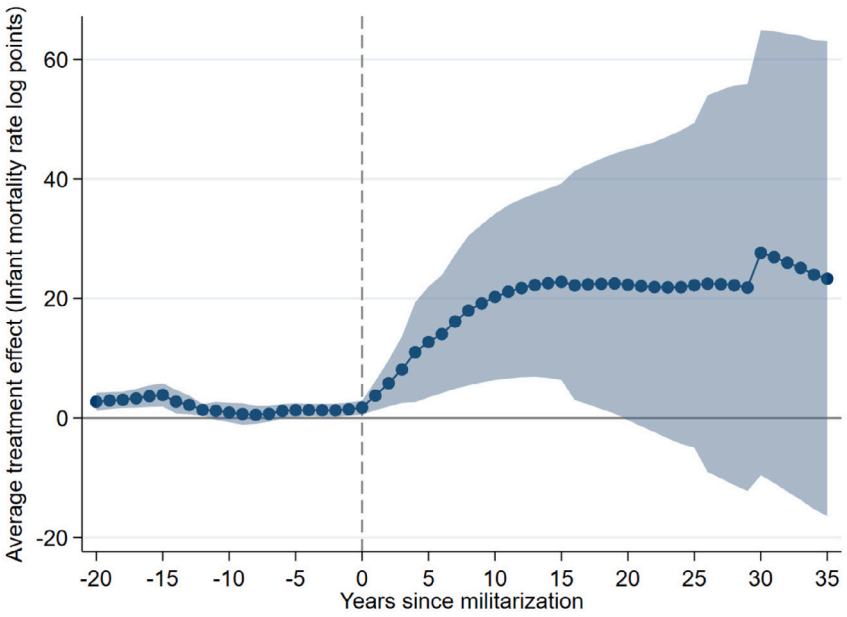
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

All data sets used are publicly available. The combined data from multiple data sets (discussed in the text and online appendix) is available from the author upon reasonable request. This includes the unique demilitarization indicator presented in this study.



(a) Strong demilitarization episodes



(b) Militarization episodes

Fig. 16. CSDiD Estimate on Infant Mortality Rate: Demilitarization vs Militarization.
Notes: CSDiD group-time estimates of the over-time effects of strong demilitarization and militarization episodes on infant mortality; doubly robust estimate with not-yet treated comparison units. This figure plots CSDID estimates of the effect of demilitarization and militarization on infant mortality rate in log points. The blue, connected line plot estimates average effect on infant mortality rate on countries that demilitarized or militarized (in log points—multiplied by 100 from interpretation of true percentage), with a 95 percent confidence interval shown by the gray, shaded area plot. Time (in years) relative to the year of demilitarization/militarization runs on the horizontal axis. The estimates are obtained by assuming and estimating a probit model for demilitarizations/militarizations based on pre-treatment infant mortality rate, which I use to estimate the propensity score and re-weight the data. In addition, I partial out lags on infant mortality rate, making this approach doubly robust. Subplot (a) shows all cases of strong demilitarization. Subplot (b) shows all cases of militarization. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.jce.2023.04.001.

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