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# Imprisonment and Terrorism\*

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## Abstract

While policymakers frequently praise the impact of law enforcement for addressing the threat of terrorism, several cases suggest that the imprisonment of terrorists and potential perpetrators may actually lead to (more) radicalization and, ultimately, a higher risk of terrorism. We take systematic stock of the arguments linking terrorism with incarceration and analyze newly collected data on worldwide prison populations. The results from quantitative analysis highlight that an increase in prison population is correlated with a decline in the number of terrorist attacks, in particular its domestic form. We conclude with a discussion of the implications of this finding for academic and policy circles.

**Keywords:** Law Enforcement; Terrorism; Imprisonment; Quantitative Analysis

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## 1 Introduction

In the wake of the recent terrorist attacks in Europe, there has been a heated debate about the role of law enforcement in the fight against terrorism. This research focuses on imprisonment, which is the most important form of sanction in contemporary societies [15]. Recent decades have experienced a rapid increase in the use of imprisonment as a response to crime, with almost 11 million people currently held in penal institutions across the globe [33, 64]. The role of imprisonment for reducing crime has been studied extensively, ranging from works measuring the responsiveness of crime rates to the size of the prison population, a proxy for the certainty and severity of a state's sanctions regime [e.g., 42, 66, 45, 34, 1, 41]. Using a variety of strategies to overcome the challenges stemming from the simultaneity of crime and prisoners, previous research suggests that more punitive criminal justice sanctions do in fact reduce criminal behavior, up to a -0.7 percent reduction in the crime rate for every 1-percent increase in prison population [17, 8].

Is imprisonment also an effective instrument to counter terrorism? Prisons reduce crime primarily through two mechanisms, the incapacitation of criminals from committing other crimes and the deterrence of potential criminals from offending [2, 15, 1, 47]. Similarly to criminals, the incarceration of terrorists takes them out of circulation, thus preventing terrorist attacks by incapacitating potential perpetrators. This rather mechanical effect is usually expected to suppress common criminal activities while individuals are confined. Yet, in the case of terrorism, the incapacitation of convicted terrorists can actually backfire as jails may be conducive to radicalization. Several prominent terrorists were purportedly radicalized in Western prisons, such as Richard Reid, the 2001 "shoe bomber," and Muktar Ibrahim, the leader of the 2005 London bomb plot. Similarly, high-profile jihadists may have been radicalized while serving a prison sentence in Muslim-majority countries, including Ayman al-Zawahiri, Abu Musab al-Zarqawi, as well as key leaders involved in the 2004 Madrid bombing network [7]. And since the founding of the Islamic State, several of Europe's biggest terrorist attacks were led by former prison inmates.<sup>1</sup> Many studies have investigated emblematic cases of well-known terrorists, but few have paid attention to non-violent radicalization [68]. Whereas radicalization toward violent extremism is overall

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<sup>1</sup>See, e.g., online: <http://tiny.cc/6rndaz>. More recent examples include Abdelhamid Abaaoud, the leader of 2015 Paris attacks, who was drawn to the radical Islamist cause in prison. Some of Abaaoud's former prison mates participated in the Brussels airport attack (March 2016). Similarly, Benjamin Herman, a Catholic teen who went to prison for assault and robbery in 2003, converted to Islam while in the prison system. He killed two female police officers and a civilian in the 2018 Liège attack, within hours of his temporary release (<http://tiny.cc/6yndaz>).

a rare phenomenon, prisons can also serve to reinforce the commitment of existing members or lead to non-violent forms of radicalization. The latter can indirectly foster terrorist groups by, e.g., encouraging networking and the exchange of ideas. Ultimately, this would also lead to a higher incidence of terrorism. We discuss the issue of radicalization (or absence thereof) in more detail in the next section. Next to incapacitation, deterrence is a second mechanism by which imprisonment affects crime. Through its deterrent effect, potential offenders might be deterred from committing crimes by the growing threat of a prison sentence. However, there are critical differences between criminals and potential terrorists, as “the utility of terrorist violence is much greater than the self-interest that typically motivates common criminals” [16, p.618]. Whereas criminals usually want to avoid accountability for their crimes, terrorists are mostly concerned about their organization and common goals, including the successful execution of attacks [16, 48]. As such, strategies that successfully deter common criminals may be ineffective for terrorists [16]. Critics of deterrence strategies in counterterrorism also note that terrorists are often irrational and fanatic individuals, driven by strong (religious) beliefs and willing to die, thus making it difficult to deter them by fear of punishment [51]. Yet, as Trager and Zagorcheva [61, p.94] emphasize, “even though terrorist decision-making processes are certain to consist of both rational and nonrational elements, this is neither peculiar to terrorists nor precludes deterrence. Deterrence requires only that terrorists be sufficiently influenced by cost-benefit calculations.” Landes [39] argues that deterrence was, in fact, an important aspect in the reduction in US hijacking after 1972. Furthermore, terrorist organizations incorporate several actors fulfilling specific roles, and successful attacks often require a lengthy preparation. As such, some elements of the system could be less motivated than others and are more susceptible to traditional forms of deterrence [61]. As the capabilities and activities of a terrorist organization depend on their active support, deterring less motivated members could destabilize and weaken the group as a whole [12].<sup>2</sup>

We offer the first cross-country macro analysis of how imprisonment is associated with terrorism. En route, this is also the first global analysis of the relation between incarceration and political violence. Imprisonment proxies the likelihood of incarceration and the severity of sanctions [39], and we use newly collected data on prison populations across the world from the World Prison Brief. The empirical findings show that imprisonment is negatively correlated with the incidence of terrorist violence, in

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<sup>2</sup>See also Frey and Luechinger [24] and Frey [23] for a discussion of how deterrence offers terrorist groups the possibility to desist from future violent action.

particular domestic terrorism. Our correlational evidence can serve as a foundation for future research to develop research designs, which can explore causal mechanisms and extend this wide research agenda.

## 2 Prisons and Radicalization

In recent years, radicalization and extremist activities in prisons have become a pressing concern for policymakers who are striving to understand the conditions favoring radicalization, recidivism and the potential for de-radicalization [32, 54]. Imprisonment disrupts social relationships and contacts with families and friends, and newly admitted inmates are forced to adapt to harsh and often insecure conditions; to cope with this new reality, inmates seeking confidence, protection against physical violence, membership, and belonging change their beliefs and behavior to be admitted prison subgroups [10, 59, 55]. In fact, the most vulnerable inmates, such as those incarcerated in maximum security facilities and without external support, are more likely to assimilate to prison culture and join prison gangs for protection and recognition [11, 38]. In this environment, inmates are likely to fall prey to the influence of violent extremist groups or ideologies, offering material and moral support to mitigate and deal with the experience of imprisonment [58]. As such, overcrowded correctional institutions often offer an ideal recruitment pool for terrorist organizations, given the presence of many individuals from marginalized groups who are forced into intensive interactions within a closed environment [58, 38]. Radicalization is further facilitated in the presence of charismatic leaders through a process of one-on-one proselytizing [29]. In a study of UK prisons, Liebling et al. [44] note how charismatic Muslim prisoners capitalized on vulnerable prisoners' need to "fill a void" when advertising or propagating their faith.<sup>3</sup>

Although conversion among inmates is common, radicalization toward violent extremism or transitions from radicalization to actual recruitment for terrorism are rare phenomena and only a very small proportion of radicalized inmates turn radical beliefs into terrorist action [29, 58]. Incarceration can lead to non-violent radicalization where most of those who take up extremist beliefs then offer indirect support to terrorist groups. For one, newly radicalized individuals could contribute to terrorism through the diffusion of ideologies and by increasing the exposure of domestic groups to prospects for mobilization, thus making emulation more likely to emerge; they therefore allow for the exchange of

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<sup>3</sup>One of the most interesting trends in Western prisons is the growing number of conversions to Islam, by one estimate around 30,000 in the US only [13]. Joining Islamic religious groups is also a way to obtain protection and a new sense of belonging or purpose in life [28].

ideas, resources, and knowledge; or they can facilitate interactions between terrorist organizations. As such, even without taking an active part in terrorist attacks, non-violent radicalization might foster terrorist groups in an indirect way, and eventually heighten the risk of terrorism [6, 4, 5].

A substantive amount of heterogeneity exists across countries and prison systems in the way they manage and control inmates, their standards of incarceration, or levels of integrity and professionalism of correctional officers, which in turn affect the extent to which prisons provide favorable social environments for radicalization and terrorism recruitment [62, 68]. Whereas inmates are more inclined (or sometimes forced) to join a group for protection in the presence of high levels of disorder and violence [58], improving the level of order and stability and taking appropriate security measures are shown to make prisoners less susceptible to the appeals of radicalization [63]. Similarly, regimes of separation such as the segregation of the most dangerous terrorism-related offenders can prevent extremist individuals from learning from one another and building networks [55]. Moreover, charismatic leaders are less likely to radicalize individuals in the presence of strong networks of prison chaplains and rehabilitation schemes [31]. In addition to mitigating and preventing the risks of radicalization among prison inmates, *ad-hoc* programs can also reintegrate extremists and, ultimately, lead to their de-radicalization, i.e., rejecting the ideology they once embraced [see, e.g., 30, 50, 35, 14]. For example, effective rehabilitation programs, which emphasize self-empowerment through the development of vocational skills and supervised by trained correctional officers, may lead to a decline in violence [60]. As a matter of fact, despite the efforts to build legitimate order behind bars and offer unfavorable environments for terrorist recruitment, many correctional institutions are overcrowded and under-resourced, do not provide any rehabilitation programs, or even lack basic services such as chaplains to provide religious guidance [29]. Yet, as Silke and Veldhuis [58] correctly point out, while existing studies on de-radicalization and disengagement from violence offer novel insights, robust and convincing evidence is still scant and most of the existing works are descriptive or theoretical. At the same time, and perhaps more importantly, individual-level data on political extremists are difficult to access and, with few exceptions [38], previous research on radicalization within prison is either based on a limited number of cases or anecdotal [58]. It is perhaps not surprising that the academic literature on the relation between imprisonment and political extremism offers overall inconclusive evidence, with some studies raising doubts about a strong link between imprisonment and political violence [36, 35, 38].

### 3 Design

We created a unique data set comprising information on terrorism from the Global Terrorism Database (GTD) and states' prison populations from the World Prison Brief (WPB).<sup>4</sup> This is the most comprehensive existing data set on prison systems, updated on a monthly basis with data for up to 180 countries between 1950 and 2017. Our data compilation efforts concentrated on the WPB, while the GTD provides information already in an easily accessible format. The final data set for our analysis is monadic with the country-year as the unit of analysis and, in principle, it comprises all countries in the world since 1950. Some country-years eventually drop out of our analysis, however, due to missing values. The final year of our observation period is 2017.

The dependent variable, given our theoretical interest, pertains to the level of terrorism. The GTD defines terrorism as “the premeditated use or threat to use violence by individuals or sub-national groups against noncombatants in order to obtain a political or social objective through the intimidation of a large audience beyond that of the immediate victims” [21, p.321]. These data comprise information on more than 140,000 terrorist incidents in its latest version. Our outcome variable captures the number of terrorist attacks in a given country-year, which we log-transform after adding the value of 1. In some of our models, we also distinguish between national (domestic) and transnational attacks. Data on terrorism are only available from 1970, which limits our analysis to the period 1970-2017.

We employ OLS regression models with a temporally lagged dependent variable, country fixed effects, and year fixed effects. The lagged dependent variable captures country-specific path dependencies and autocorrelation more generally. The country fixed effects control for any time-invariant, unobserved unit-specific effects, while the year dummies address system-wide shocks simultaneously affecting all countries in the same year in a similar fashion.<sup>5</sup> We also consider a set of substantive controls next to these variables.

Our core explanatory variable is the prison population or the level of imprisonment in each state in a given year. We retrieved the data from the WPB, which provides information about prison systems throughout the world. We focus on the total prison population in a specific country-year, which also log-transformed. We use the total prison population, as opposed to the incarceration rate for two main

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<sup>4</sup>Available online at: <http://www.prisonstudies.org/about-us>.

<sup>5</sup>When using the number of terrorist attacks as the dependent variable and employing negative binomial regression, our results are qualitatively the same. OLS is primarily used for the main estimations due to the ease of interpretation.

reasons. First, our arguments matter for the total size of prison population as large populations of prisoners provide, e.g., more opportunities for radicalization. Second, terrorism is characterized by a rare-events data-generating process. We are interested in explaining the overall incidence of such events in each country, rather than the rate, which is often used in the quantitative literature on crime. Instead of the total size of prison populations, we also analyze data on the number of pre-trial detainees or remand prisoners – who have not been convicted or sentenced yet – and the number of female prisoners from the WPB. These additional analyses allow us to tentatively explore whether different aspects of imprisonment affect terrorism.

As the WPB provides data, particularly in the initial years of coverage, only in five-year intervals, we linearly interpolate the values of the prison-population item before the log-transformation. Using only the observed values produces virtually identical results, however. The final variable is also temporally lagged by one year. The WPB data are widely used by governmental bodies and non-governmental organizations. Next to the transparency in the organization’s data-compilation process, this greatly increases the confidence in the accuracy of the data regarding validity and reliability. Figure 1 maps the prison population rate, i.e., the number of prisoners per 100,000 of the national population, for all states included in our analysis averaged across the years for which data are available. There are sizable cross-section differences, as countries range from an average imprisonment rate of merely 20 prisoners per 100,000 to almost 800. The states with the highest prison population rate over the period 1950-2017 are the US, Russia, South Africa, Cuba, Tunisia, as well a number of countries in Eastern Europe. In addition, notable variations over time within each country exist that we leverage in our empirical analysis. For example, the US has slowly become a global leader in incarceration rates, moving from 222 prisoners per 100,000 in 1980 to 760 in 2008.<sup>6</sup>

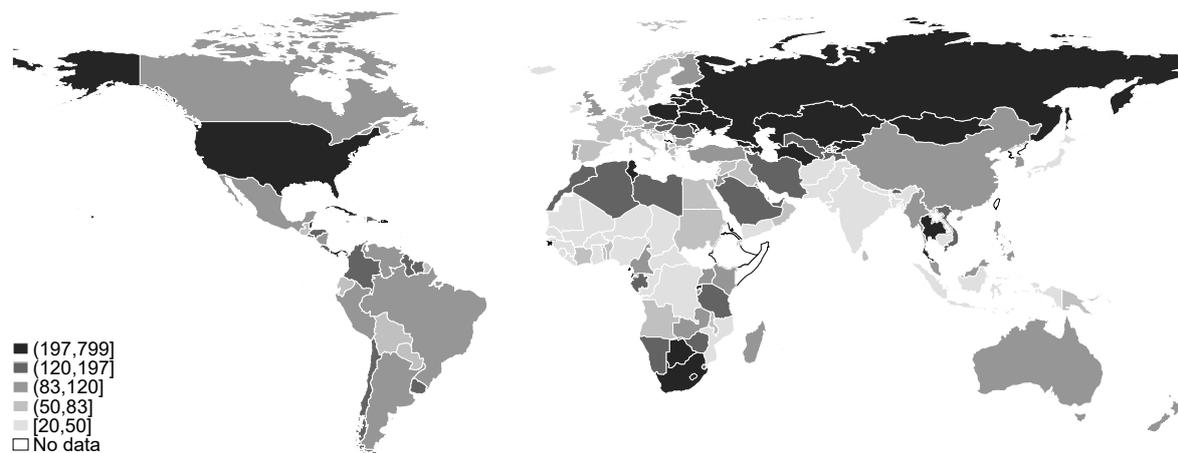
We add a battery of control variables to take into account the most important determinants of terrorism [e.g., 19, 20, 21, 37, 56, 67, 65, 57, 18, 25, 26]. First, we include information on per-capita GDP and population as wealthier and less populous states are likely to experience significantly less terrorism [43, 52]. Both items are log-transformed and, as all other variables, lagged by one year. The data for GDP per capita and population are taken from the World Bank Development Indicators.

We further control for the level of democracy using the revised and combined polity score from the

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<sup>6</sup>Blumstein [3] suggests that a major factor leading to dramatic prison population increase was the incarceration of drug offenders. Langan [40] claims that the increased chance of a prison sentence after arrest for nearly every type of crime had also a major impact on prison populations.

Figure 1: Prison Population Rate



Note: Average number of prisoners per 100,000 of the national population between 1950 and 2017. The numbers in square brackets are minimum and maximum values of discrete prison population categories.

Polity IV database [46]. This item is based on sub-scores for constraints on the chief executive, the competitiveness of political participation, and the openness and competitiveness of executive recruitment. The score potentially assumes values between  $-10$  and  $+10$ , while higher values denote more democratic forms of government. There is little agreement as to how democracy affects terrorism. Advanced democracies, particularly those with an active or ambitious foreign-policy agenda, are often the target of transnational terrorism, although less-developed democracies with territorial conflicts and without institutional channels to express grievances against the state can also be prone to terrorism [9].

Third, we control for economic openness, which is defined as a state's integration in the global economy, measured by its trade (imports and exports) as percentage of GDP. The data are again taken from the World Bank. Finally, terrorism is particularly present in conflict environments [e.g., 22] and we thus control for the incidence of interstate and intrastate conflict. Both variables are count items, measuring the number of active conflicts (0 otherwise) of a specific conflict type in a country-year and we use the Uppsala Conflict Data Program [27] to this end.

Table 1 summarizes the descriptive statistics of the variables we have discussed. As we can see, terrorism is overall a rare event, but displays a large variation across countries, ranging from a minimum of 0 incidents per year to a maximum of 3,933 (i.e., 8.277 when log-transformed) in Iraq in 2017.

Table 1: Descriptive Statistics

Variable	Mean	Std. Dev.	Min.	Max.	Obs.
Terrorism (ln)	0.491	1.210	0.000	8.277	6,275
Lagged Dependent Variable	0.474	1.187	0.000	8.277	6,275
Prison Population (ln)	8.121	3.059	0.000	14.652	6,275
Pre-Trial/Remand Imprisonment (ln)	1.738	3.297	0.000	13.046	6,275
Female Prisoners (ln)	1.469	2.649	0.000	12.263	6,275
GDP per capita (ln)	8.593	1.426	5.346	11.879	5,444
Population (ln)	15.599	2.131	9.151	21.039	5,776
Democracy	4.359	6.425	-10	10	5,127
Economic Globalization	4.225	0.622	-1.787	6.090	5,273
Interstate Conflict	0.023	0.154	0	2	6,245
Intrastate Conflict	0.185	0.649	0	9	6,245

## 4 Results

Table 2 presents our main findings. Model 1 comprises the fixed effects for countries and years, the lagged dependent variable, and the substantive controls. Model 2 omits the latter and only focuses on our core explanatory variable next to the fixed effects and the lagged dependent variable. Model 3 is our full estimation that incorporates all explanatory variables. Finally, Models 4-5 mirror the specification in Model 3, but we focus on either transnational (Model 4) or domestic-level terrorism (Model 5) as defined by the GTD.

Table 2: Imprisonment and Terrorism: Empirical Models

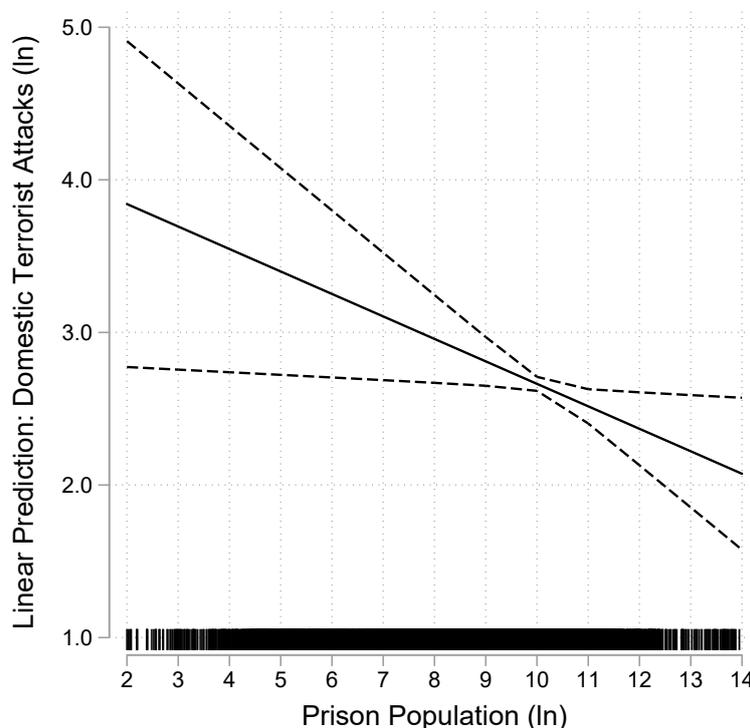
	Model 1 All Terrorism	Model 2 All Terrorism	Model 3 All Terrorism	Model 4 Int. Terrorism	Model 5 Dom. Terrorism
Lagged Dependent Variable	0.780*** (0.008)	0.753*** (0.009)	0.736*** (0.010)	0.640*** (0.020)	0.511*** (0.027)
Prison Population (ln)		-0.016*** (0.003)	-0.017*** (0.004)	-0.014 (0.009)	-0.026*** (0.010)
Democracy	0.000 (0.002)		0.001 (0.003)	-0.003 (0.006)	0.016** (0.007)
GDP per capita (ln)	0.003 (0.023)		0.106** (0.054)	0.318** (0.132)	0.169 (0.169)
Population (ln)	0.061 (0.045)		0.294*** (0.084)	0.607*** (0.234)	1.227*** (0.246)
Economic Globalization	0.080*** (0.020)		0.112*** (0.037)	0.116* (0.066)	0.158 (0.110)
Interstate Conflict	-0.103** (0.041)		-0.155** (0.067)	-0.111 (0.122)	-0.012 (0.102)
Intrastate Conflict	0.074*** (0.014)		0.094*** (0.020)	0.114*** (0.031)	0.111*** (0.031)
Constant	-1.612* (0.893)	1.010*** (0.266)	-5.838*** (1.483)	-12.774*** (3.664)	-17.275*** (3.903)
Observations	6,795	6,275	4,595	1,579	1,191
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Prob. > F	0.000	0.000	0.000	0.000	0.000

Standard errors in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Starting with our core explanatory variable, *Prison Population (ln)* is negatively signed in all models, which suggests that imprisonment is associated to lower levels of terrorism in a country. Interestingly,

though, while the control variables or different sample sizes across Models 1-3 do not seem to affect the main variable's influence in either substance or direction, the distinction between domestic and transnational terrorism in Models 4-5 does. These latter estimations show that the two mechanisms stemming from imprisonment, i.e., the incapacitation of terrorists from committing other attacks and the deterrence of potential terrorists from offending [2, 15], might mainly apply to domestic forms of terrorism, not transnational terrorism as such where *Prison Population (ln)* fails to achieve conventional levels of statistical significance. As a result, the impact identified in Models 2-3 is mostly driven by domestic terrorism. According to the estimate in Model 5, the substantive interpretation is that larger levels of imprisonment in a country-year are correlated to lower levels of domestic terrorism in the following year. This result thus can lend some support to the claims that emphasize an effective law-enforcement approach – in fact, so effective that domestic terrorism is substantially and significantly lowered.

Figure 2: Terrorism: The Role of Prison Populations



Note: Graph shows predicted values of the outcome variable when changing *Prison Population (ln)* from its minimum to its maximum, while holding all other covariates constant at their respective means; dashed lines signify 95 percent confidence intervals; rug plot along horizontal axis displays distribution of *Prison Population (ln)*; figure based on Model 5.

At the same time, this systematic analysis has implications for the frequently expressed, single-case based views that imprisonment could actually lead to more terrorism as it radicalizes prisoners during their captivity. On one hand, we do not find evidence for this at the domestic level. The coefficient estimate of *Prison Population (ln)* is negative throughout, and the marginal effect in Model 5 suggests that a 10 percent increase in *Prison Population (ln)* is associated to a drop in domestic terrorist attacks of about 1.4 percent. In addition, consider Figure 2 that plots the predicted values of the domestic-level variant of the outcome variable, *Terrorism (ln)*, for the values of *Prison Population (ln)* while holding all other variables constant at their means. The graph highlights the negative relation of *Prison Population (ln)* with terrorism as the predicted level of domestic terrorism decreases with higher levels of imprisonment. On the other hand, when focusing on transnational terrorism, we obtain an insignificant effect, which implies that some form of radicalization may in principle exist, at least for this form of terrorism. Specifically, if two opposing forces are at work, i.e., one leading to a negative impact of imprisonment (incapacitation and deterrence) and a second one inducing a positive impact (radicalization), they could eventually mitigate and reduce each other, which might lead as a result to the overall insignificance of *Prison Population (ln)* in Model 4. Therefore, although we cannot directly test for the radicalization claim in the case of terrorism, this mechanism may plausibly shape the finding for transnational terrorism, which is also consistent with the anecdotal evidence and the narrative discussed in the first section [e.g., 7, 62, 31].<sup>7</sup>

Interestingly, weak (failed and failing) states are more likely to be vulnerable to terrorism and offer conditions under which transnational terrorist groups can operate and thrive [53]. States plagued by chronic weakness have also highly dysfunctional law-enforcement institutions, which are often unable to identify, apprehend, and punish criminals. If anything, our results run counter to the expectation that countries with dysfunctional institutions display both low incarceration rates as well as a high incidence of terrorism. At the same time, note that if state weakness is constant over time, or slow-moving, this would be captured by the inclusion of country-specific fixed effects.

In terms of control variables, our results are consistent with recent studies on the economic, political, and social causes of terrorism [e.g., 67, 65, 57, 18, 25, 26]. The coefficient of *Economic Globalization* is positive and significant at conventional levels when examining the total level of terrorism or transnational

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<sup>7</sup>There are two other explanations for the null finding. On one hand, terrorists may not necessarily be deterred by the threat of punishment as they come from another country. On the other hand, when subscribing to the claim that radicalization takes place in prisons and is tied to more terrorism, radicalized international terrorists go to other countries.

terrorism: a country's economic openness and global integration are thus associated with more terrorist attacks, mostly transnational ones. Similarly, we find that the lagged dependent variable is positive and significant, which implies that terrorism displays temporal dependencies and a higher number of terrorist attacks in the previous year correlates with more terrorism in the current period. Terrorism is strongly linked to conflict, but in diverse ways depending on the type of the dispute: while there is a strongly positive relationship with intrastate conflict, terrorism becomes less likely with more involvement in interstate conflict or the corresponding coefficient is not statistically significant. Finally, while the results are less robust for income and population, some of our models highlight that wealthier and more populous countries tend to see a higher level of terrorism.

Table 3: Imprisonment and Terrorism: Additional Models

	Model 6 Pre-Trial/Remand	Model 7 Female Prisoners
Lagged Dependent Variable	0.736*** (0.010)	0.736*** (0.010)
Number in Pre-Trial/Remand Imprisonment (ln)	0.006* (0.003)	
Number of Female Prisoners (ln)		0.011*** (0.004)
Democracy	0.001 (0.003)	0.001 (0.003)
GDP per capita (ln)	0.106** (0.054)	0.099* (0.054)
Population (ln)	0.289*** (0.084)	0.288*** (0.084)
Economic Globalization	0.111*** (0.037)	0.108*** (0.037)
Interstate Conflict	-0.150** (0.067)	-0.151** (0.067)
Intrastate Conflict	0.094*** (0.020)	0.095*** (0.020)
Constant	-5.861*** (1.486)	-5.804*** (1.486)
Observations	4.595	4.595
Country Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Prob. > F	0.000	0.000

Standard errors in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Having explored how total prison-population size is correlated with terrorist attacks, we now further leverage the data and investigate how the number of pre-trial detainees/remand prisoners and of female prisoners – two particular segments of prison populations – are associated with terrorism (Table 3). On one hand, some countries display an overuse of custody at the pre-trial stage and increased levels of detention pre-trial can be taken as another proxy of states' punitive penal policies, although they can also reflect inefficiencies and under-resourcing of judicial systems and processes [33]. Pre-trial facilities are particularly affected by overcrowding and, if anything, prisoners in provisional detention are exposed to some of the same challenges and inherent risks of radicalization that convicted inmates face. At

the same time, women have often been leaders, supporters, and followers of terrorist organizations [49]. As Table 3 shows, both variables are positively correlated with terrorism, and the coefficients are statistically significant at conventional levels. Furthermore, the estimated coefficients are in the same order of magnitude as those in Table 2, thus further corroborating our results.

## 5 Conclusion

The relationship between imprisonment and terrorism is an increasing concern for many countries, particularly in light of the rapid rise in the size of prison populations worldwide. Case studies and anecdotal evidence have identified peer-to-peer radicalization within prisons as one factor fueling extremism. However, incarceration rate is one of the key elements of the judiciary system and enjoys near-consensus support among researchers as an effective measure in reducing violent behavior. Thus far, however, little is known about whether and how prison systems are correlated with the incidence of terrorism. We offer the first quantitative analysis of the relation between prison population, a proxy for the certainty and severity of the punishment, and terrorist attacks using a global sample of up to 180 countries from 1970 to 2017.

The quantitative estimates reported in this research provide evidence that higher prison populations is indeed associated with lower levels of terrorism, lending some support to the mechanisms of incapacitation and deterrence of potential offenders. As such, our study represents a first attempt to detect a statistical relation between incarceration and terrorist attack, but there are a number of caveats and limitations, and we hope that some important avenues for further research might emerge from these limitations. First, our research reveals novel and interesting relations, but the evidence cannot provide a causal explanation of the link between incarceration and terrorism. There are several difficulties in attempting to unravel a causal relationship between prison population size and terrorism. For one, there are other factors, such as the quality of the institutions or the current legislations in place in each country, which are likely to simultaneously affect both the level of terrorism as well as the prison system, and thus confound any estimated relationship. Moreover, we lack data on the number of convicted terrorists and the number of radicalized individuals in each country; as such, we do not have more precise measures of the degree of exposure to extremist beliefs that inmates face and the inherent risk of being recruited, that would be necessary for a more accurate large- $N$  comparative study. But even if these

data were available, there will be lingering hurdles to identification, as people who are more inclined to take steps from radicalization to terrorism may also be more likely to be over-represented in prison than in the community at large and less likely to be deterred. These issues are thorny, and the conclusions one can draw about the effect of imprisonment on terrorism are fraught with difficulty.

Second, it is possible that the two mechanisms we suggest – deterrence and radicalization – are at work at the same time. We also show that imprisonment is correlated with the overall level of terrorism, but this association seems to apply most dominantly to domestic terrorist attacks. In the case of transnational attacks, our analyses and robustness checks do not obtain evidence for a significant effect. Future research will try to isolate the role of the different mechanisms more than we could have done here, given our interest in the overall effect. In order to increase the effectiveness of law enforcement and more successfully target terrorism, practitioners must know whether incapacitation or deterrence is the more influential avenue. En route, scholars will also focus on how different forms of terrorism are correlated with each mechanism behind the total effect of prison population size, highlighting again that future research disentangling the specific influences accurately is needed. Third, as mentioned in our discussion above, prisons differ significantly in a number of observable characteristics, such as the level of security, whether they are short- or long-term facilities, the number of correctional officers, the degree of overcrowding and whether they are designed for specific types of prisoners. Unfortunately, existing data such as those from the World Prison Brief do not provide these types of information. We have offered some suggestive evidence of the effect of female prisoners and number of prisoners in pre-trial, but we hope that future studies will be able to leverage more granular data, ideally at the prison-level and across different regions, to investigate the extent to which these important features of prison systems matter in affecting the risk of terrorism.

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