Terrorism Financing, Recruitment and Attacks: Evidence from a Natural Experiment in Pakistan*

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Abstract

I investigate the relation between terrorism financing and attacks through a panel of 1,545 Pakistani cities and exogenous variation in a Sharia-compliant funding source. Cities exposed to higher financing experience more attacks, with terrorist organizations reacting to temporary funding flows. Two methods lead to identifying an organization-financing channel. First, a city-organization variation allows: a) dissecting the demand and supply of terrorist attacks, with supply exclusively explaining these results; b) estimating the elasticity of attacks to financing (0.08). Second, a measure of terrorist recruitment, calculated using dark web data and machine-learning, exhibits complementarities with financing in increasing attacks.

JEL: H56, G30, D64

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1 Introduction

Guaranteeing a safe economic environment and protecting property rights are central to promote growth and development (Shleifer and Vishny (1993), Besley (1995), Acemoglu et al. (2001)). Introducing suitable policies to counter criminal and illegal activities necessitates a thorough understanding of their underlying functioning. Among the various threats, terrorism has been particularly severe over the past decade because of its capacity to combine violence against civilians with media presence, global recruitment and para-military training. Such initiatives are able to instill a culture of fear and heightened risk, which can result in large emotional and human costs, beyond adverse economic and financial outcomes. As the solid line in Figure 1 shows, the past decade has seen an unprecedented rise in the number of terrorist attacks all over the world.

Among the various causes behind this surge, the financing of terrorist organizations is considered key (Feldstein (2008)) and policy makers have been trying to curb this link for decades.[1] Such initiatives considerably expanded in the aftermath of 9/11, as funding sources were placed under stricter scrutiny for terrorism financing (e.g. banks, payment platforms, et cetera) and national agencies toughened their action all over the world. However, despite such global effort, there is a lack of studies exploring whether the funding of terrorist groups affects their attacks and how. This is due to the inability to quantify the funding flows, as classifying monetary transfers towards extremist groups can be challenging. Even if such data exists, identifying the effect of terrorism financing on terrorist attacks would require a demanding quasi-experimental design and thus be unfeasible. As a result, such absence of quantitative evidence led to challenge the scope of regulation via judicial trials, with juries deadlocked because of poor evidence.[2] At the same time, this ongoing vacuum weakens the work of counter-terrorism in recognizing which financial transactions can affect attacks, how and over which horizon.

This research investigates the relation between terrorism financing and terrorist attacks through two intertwined questions. First, is finance the binding constraint of terrorist organizations? This is ambiguous ex-ante, as terrorist groups may face alternative constraints (e.g. labour market, political) which limit the importance of funding shocks. Second, do the timing and location of finance affect attacks? While in a frictionless world, such relation is unlikely to hold, as terrorist groups are able to smooth financial resources over time and across locations; the opposite may be true in the presence of frictions (e.g. credit constrains, storage frictions). Therefore, documenting the relation between the timing and location of financing and terrorist attacks is central to understanding whether extremist organizations face financial frictions.

[1] The General Assembly of the United Nations adopted the "International Convention for the Suppression of the Financing of Terrorism" on December 9th, 1999. Refer to the UN website https://www.un.org/law/cod/finterr.htm.

[2] Refer to New York Times, October 22nd, 2007, http://www.nytimes.com/2007/10/22/us/22cnd-holyland.html, and to the American Bar Association Journal, June 4th, 2008, http://www.abajournal.com/news/article/fedl_judge_voids_jury_convictions_in_islamic_charity_jihad_case/, for the case of the "Holy Land Foundation for Relief and Development" accused of funneling charity funds to terrorists. Refer to the New York Times, August 14th 2015, for the case of "Arab Bank" accused of terrorism financing https://www.nytimes.com/2015/08/15/nyregion/arab-bank-reaches-settlement-in-suit-accusing-it-of-financing-terrorism.html.

This also provides insights on the effectiveness of curbing the terror-finance link in lowering terror-related attacks and casualties.

In this paper I present causal evidence on the impact of terrorism financing on terrorist attacks assisted by two methods. The test takes place in Pakistan, where I can combine three data sources: a) a panel that follows 1,545 cities between 1992 and 2015; b) the universe of terrorist attacks over the corresponding period (around 12,000 events); c) a natural experiment that generates exogenous variation in terrorism financing over time and across cities. Two methods contribute to identifying the relation between terrorism financing and attacks via the additional funding available to terrorist organizations, the organization-financing channel. First, I build an additional panel that follows a set of terrorist organizations operating in multiple cities. By exploiting variation both within organization and within city, I can disentangle the effect of the natural experiment on the demand and supply of terrorist attacks. This shows that the supply exclusively explains the increase in attacks, as terrorist organizations become more active in the aftermath of a positive funding shock. This variation allows also to estimate a novel parameter: the elasticity of terrorist attacks to terrorism financing. The second method offers an original measure of terrorist recruitment combining data from Jihadist fora operating in the dark web, with the work of two judges and a machine-learning algorithm. Such measure allows exploring a mechanism through which funding shocks to extremist groups can transmit and amplify due to terrorist recruitment.

Pakistan is the ideal country to conduct this study for two reasons. First, it exhibits an evolution of terror attacks in line with the rest of the world (Figure 1, dashed line), which makes it a convenient case study. Second, it presents a unique natural experiment, the Zakat levy, that induces exogenous variation in a particular source of terrorism financing over time and across cities: charitable donations. When Ramadan arrives, Muslims are expected to give a charitable donation to the poor, the Zakat. While this is an individual choice in most countries, the Pakistani government imposes a mandatory contribution on its citizens through a 2.5% levy on bank deposits. Such funds are then directly appropriated by the government and partially spent on vulnerables soon after Ramadan (e.g. chronic poors, blind and disabled people, et cetera).[3] However, individuals typically donate above the mandatory contribution either directly to another individual or by transferring funds through the Pakistani charities specialized in collecting Zakat donations.[4]

I exploit three features of the Zakat levy that create exogenous variation in charitable donations over time and across cities. First, the timing of the donation. Because the levy takes place on the first day of Ramadan, which moves over time due to the Lunar calendar, I can net out the effect of seasonality and agricultural cycles on terrorism. Second, the location of the donation. As Pakistan is a Sunni Islamic Republic, this levy only applies to Sunni Muslims, while other religious groups are exempt. As a result, I code each city as being Sunni-

[3]Refer to the government website on Zakat for an overview of the programs http://www.zakat.gop.pk/Programs.

[4]Pakistan is one of the countries with the highest share of philanthropic donations in South Asia. Refer to the report by Charities Aid Foundation, https://www.cafonline.org/about-us/publications/2015-publications/caf-world-giving-index-2015

majority (treated) or not Sunni-majority (control) using a religious map of this country. Third, the existence and definition of the eligibility threshold on taxable deposits. Individuals below the threshold are not taxed and give their contribution through charities or personally, while those above it face the 2.5% tax on their overall deposits, which lowers their disposable income and donations. The legal definition of the threshold is central for identification, as it stems from a local interpretation of the Sharia law. The threshold (*Nisab-i-Zakat*) is specified as the monetary value of 600 grams of silver and announced only two days before Ramadan using the international price of silver on that specific day. As a result, the revenue collection and charitable donations depend on silver prices and with opposite signs. In fact, when silver prices are low, the threshold declines, more deposits become taxable and fewer donations to private charities are made; while the opposite happens for high silver prices. Therefore, I exploit the time-series variation in silver prices, which affect the amounts that charities and terrorist groups receive over time. Given that Pakistan is neither a top 20 producer nor consumer of such commodity,[5] I take the price of silver as being exogenously determined to the Pakistani economy.

This paper consists of four parts. In the first part of my empirical analysis, I illustrate the first stage relating silver prices to charitable donations through three stylized facts: 1) the Zakat collection by the central government declines with silver prices; 2) individual Zakat donations increase when silver prices are high in Sunni locations and, particularly, by individuals who are marginally tax exempt because of fluctuations in silver; 3) the total donations received by charities, expressed through their balance sheets, are highly correlated with silver prices. These results are consistent with charities receiving more funds when silver prices are high and, in these cases, funneling a larger amount toward illicit groups. While individuals may not choose to donate to extremist groups directly, some charities may be associated with terrorist organizations more or less formally, as I document in Section 2.

In the second part, I offer reduced-form evidence on the relation between the price of silver before Ramadan and attacks in Sunni cities, employing both a lead-and-lag analysis and a difference-in-difference-in-difference strategy. My results show that both the probability of attacks and their number are not statistically different between Sunni and non-Sunni cities prior to Ramadan. However, this difference becomes large and statistically different from zero only during the Ramadan quarter and the following one (when donations are made and spent) and only when silver prices are high (more Sunni donations to charities). Beyond the probability and number of terrorist attacks, also the attack-related killed and wounded individuals increase. Moreover, there is an escalation in capital-intensive attacks (bombings, attacks through chemical, biological and radiological weapons), while other types of events (e.g. hijacking, kidnapping, et cetera) do not react.

[5]Refer to the statistics on silver for 2012 to 2014 provided by the United States Geological Survey, published by the United States Department of the Interior, available at http://minerals.usgs.gov/minerals/pubs/commodity/silver/mcs-2014-silve.pdf, and the World Silver Survey 2015, issued by the Silver Institute, available at https://www.silverinstitute.org/site/publications/.

In the third part of this paper, I present the two methods which contribute to identifying the organization-financing channel. I construct a city-organization panel and follow 20 terrorist organizations in 485 cities for 96 quarter-year periods. By analyzing documentation on each terrorist organization (e.g. briefings by national/international security organizations, documents and web content published by terrorist groups), I am able to distinguish between Sunni organizations, affected by the financing shock, and non-Sunni organizations, that act as a control. Hence, I identify changes in terrorist attacks due to the supply of events by organizations (controlling for time-varying city-specific unobservables) and to the demand from cities (controlling for time-varying organization-specific unobservables). This novel source of variation advances the identification of income shocks on conflict, and in particular the work of Dube and Vargas (2013), who pioneered the dissection of demand and supply of conflict by identifying shocks to labour intensive commodities in Colombia. Through such method, I verify that the increase in terrorist attacks found at the city level is entirely explained by the supply of attacks as terrorist organizations become better-funded. In addition to this, I join the city-organization dataset with a representative dataset on individual charity donations. In so doing, I offer an estimate of the elasticity of terrorist attacks to financing measured through OLS (0.02) and, then, instrument the financing through the Zakat experiment and silver prices. The corresponding IV estimate indicates a larger elasticity (0.08), which is constant across different measures of attacks (probability of an attack, number of attacks, killed and wounded individuals).

In order to understand a mechanism through which terrorism financing transmits, I introduce a measure of terrorist recruitment. This is constructed by scraping more than 2.5 million messages from 7 Jihadist fora operating in the dark web between 2000 and 2012. Moreover, I design an algorithm that identifies all messages presenting recruitment material through supervised learning and natural language processing. This is based on the initial work of two judges who evaluated a sample of random messages and, manually and independently, highlighted those containing an intent to recruit violent extremists to some group or movement. The algorithm is trained using such sample and applied to all other messages, replicating the work of thousand of judges marking each post. Subsequently, I exploit this variable to verify whether the effect of terrorism financing on attacks is significantly stronger in period of intense terrorist recruitment. Such heterogeneity is consistent with a complementarity between capital (finance) and labour (new recruits) in producing terrorist events and offers valuable policy implications on the mechanisms through which terrorism financing can affect attacks. This method builds on the work of Scanlon and Gerber (2014) in computer science and is conceptually in line with Mueller and Rauh (2018), who use machine learning to extract topics from newspaper analysis and predict the onset of a conflict.

In the fourth part of this paper, I exploit an alternative Islamic celebration that offers the ideal placebo: Eid Adha. It takes place between two and three months after Ramadan and is also an important period of festivals and family gatherings; in particular, donations and gifts are given to family and the poor. Because there is no explicit connection to silver prices (no levies, no silver-related behaviour), I replicate my empirical strategy and cannot reject a zero effect of

silver in Sunni-majority areas on terrorism following this celebration. This is accompanied by a section in which I explore a rich series of alternative specifications and robustness checks.

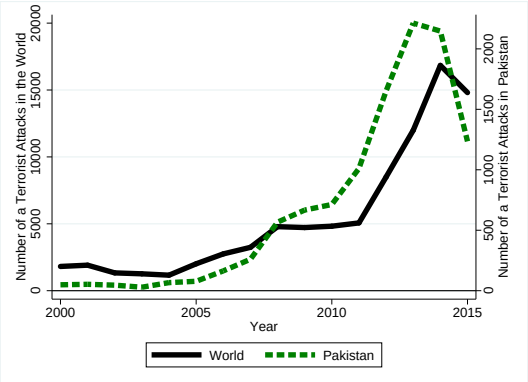
This work contributes to the literature on the organizational economics of terrorist and violent groups. Berman (2011) and Shapiro (2013) are pioneers in this field, as they show how terrorist organizations are sophisticated in their reward structure, respond to incentives (e.g. risk-sharing, career-concerns, et cetera) and mix economics and political motives, that go beyond religion and afterlife. The role of finance and its relation to terrorism is introduced by Shapiro and Siegel (2007), who note that while some large scale organizations may enjoy significant funding, their local level operatives may be cash constrained because of agency problems (e.g. monitoring the funds, misalignment of objectives). This argument is consistent with my results since a funding shock to local operatives may complement centralized funding and promote attacks. My results are also in line with the work of Wright (2016), who shows how both the level of conflict and tactics depend on financing by exploiting commodity prices in Colombia. In addition to this, Crost et al. (2016) offer evidence compatible with an organization-financing channel in the Philippines, combining swings in commodity prices with groups' extortions of export firms. As Bueno de Mesquita (2005) highlights, disrupting the financial network of terrorist organizations may be preferable to other government initiatives (e.g. closing borders, abusive policing, et cetera) and generate lower opposition. My estimate of the elasticity of terrorist attacks to financing may be useful in calibrating structural models of counter-terrorism and assess the relative strength of alternative crackdown strategies. This paper is also related to the work of Benmelech and Berrebi (2007), who show the importance of human capital in producing terrorist attacks and note the link between bombers' age and education with the attack-related casualties and success. My contribution points toward the other factor of production, capital, and highlights its importance in generating attacks both in isolation and as a complement of labour. An alternative perspective on finance and terrorism is offered by Berman et al. (2011) and Fetzer (2014), who show that an increase in funding and strengthening of local public goods lowers terrorist attacks respectively in Iraq and India, which would be interpretable as a negative shock to the local demand for terrorist attacks/conflict in my framework. In terms of attack types, Bueno de Mesquita (2013) shows that extremist groups rationally decide their tactics depending on its ex-post effects on mobilization and recruitment. In line with this finding, the work of Dell and Querubin (2017) highlights that the choice of certain attack strategies can directly affect the final outcome that an organization may achieve. My paper adds to these strategic considerations the role of capital intensity and the importance of funding, by noting a particular increase in bombings, chemical, biological and radiological attacks but not in other attack types.

This paper also contributes to the literature on the determinants of terrorism, which has highlighted the lack of a link with poverty both from a cross-country perspective (Abadie (2006), Krueger and Malečková (2009)) and a within-country focus (Krueger and Malečková (2002), Krueger (2008), Blair et al. (2013)). In particular, the results on the lack of a demand-driven increase in terrorist attacks are in line with the work of Benmelech et al. (2012) and Krueger

(2017), showing that labour market shocks do not have a direct effect on terrorist attacks. I cross-validate this finding by studying the city wages for the 40 largest cities in Pakistan and verifying the lack of a response to Zakat. This paper is also connected to the literature on income shocks and conflict, that documented this link both through a series of cross-country studies (Miguel et al. (2004), Burke et al. (2009), Miguel and Satyanath (2011), Besley and Persson (2011), Bazzi and Blattman (2014)) and a detailed collection of within-country analysis and local-level shocks (Dube and Vargas (2013), Nunn and Qian (2014), Crost et al. (2014), Berman et al. (2017)). My results complement this literature through an organization-financing channel. The contribution to identifying the impact of shocks to the demand and supply on conflicts is in line with the methodology used in finance to dissect credit supply from demand, as introduced by Khwaja and Mian (2008). Finally, it is useful to highlight that existence of a relation between the Zakat donations, terrorism financing and attacks has been noted in different settings since 9/11.[6]

In Section 2, I offer some institutional aspects of the Zakat levy and the role of silver prices. Section 3 investigates the reduced-form evidence on Zakat donations and terrorism. In Section 4, I describe two methods to dissect the demand and supply of terrorism and measure terrorist recruitment. In Section 5, I describe the Eid Adha placebo and some additional robustness checks. Finally, Section 6 offers some concluding remarks.

Figure 1: Terrorist Attacks between 2000 and 2015



Notes: The solid black line shows the evolution in the number of terrorist attacks all over the World between 2000 and 2015 reported on the left y-axis, while the dashed green line reports the number of terrorist attacks in Pakistan on the right y-axis. For the data on terrorist attacks refer to the Global Terrorism Database from the National Consortium for the Study of Terrorism and Responses to Terrorism, START (2017).

2 Institutional Features

In this section I present the relation between the Zakat donation and the price of silver, and how it affects the financing of charities and terrorist organizations. Each subsection presents

[6]Basile (2004) notes the link between Zakat donations, their misuse by charities and attacks through a qualitative study. Levi (2010) discusses how such specific donations are hard to tackle given the current anti-money laundering initiatives. Milton-Edwards (2017) shows how a stricter oversight of the Palestinian Zakat committees by Israel and the Palestinian Authority became a powerful device of counter-terrorism. Aman-Rana (2014) and Aman-Rana (2017) explore the economic causes of terror and analyse the effect of charity donations on violence in Pakistan, detecting a positive effect. Regarding terrorism and Ramadan, Reese et al. (2017) do not find evidence of an increase in violent attacks at Ramadan in Iraq, Afghanistan, and Pakistan.

a stylized fact and some additional institutional features. First, I describe in detail how the Zakat levy works, its relation to silver prices, the religious map of the country and show that the government revenue declines in silver prices. Second, I analyze the data on charity donations at individual level and verify that donations increase with silver prices in Sunni-majority areas and, in particular, by individuals that are marginally tax-free because of silver fluctuations. Third, I give some anecdotes on the small distance between some charities in Pakistan and terrorist groups and verify that their funding is positively and highly correlated with silver prices.

2.1 Government Revenue, Zakat and Silver Prices

The Zakat donation is one of the five pillars of Islam and part of Sharia law. As Ramadan begins, Muslims are required to donate to the poor and vulnerable, in exchange for a religious regeneration of their wealth. While this donation is left as an individual contribution in most countries, Malaysia, Saudi Arabia and Pakistan adopt a government-run scheme to collect and allocate these resources.

However, Pakistan offers a unique system to manage Zakat, which leads to a useful natural experiment. In 1981, a conservative government introduced the mandatory Zakat payment to the state.[7] This was implemented as a Sharia-compliant obligation corresponding to a 2.5% levy on those deposit accounts above an eligibility threshold (*Nisab-i-Zakat*). The definition of such threshold is grounded in the local interpretations of the Sharia law by Pakistani scholars and is defined by the international price of silver. As a result, the yearly threshold is calculated as the price of 612.32 grams of silver on the day of the threshold announcement.

Two key characteristics in the implementation of this levy play an important role. First, the local authorities (State Bank of Pakistan and Ministry of Religious Affairs) announce the threshold two days before the collection. This implies that the international price of silver at the announcement day determines the threshold and, consequently, the tax base and revenue collection. Figure 2 shows the one-to-one correlation between the Zakat threshold and the international price of silver in the day of the announcement. The left panel of Figure 3 reports the country-wide government collection of Zakat revenue, while the right panel shows the high and negative correlation of such revenue with silver prices, -0.86. In addition to this, Table 1 presents some summary statistics on the Zakat revenue, which highlights an important feature for this study: the tax collection is high but not particularly large (equivalent to an average of 363 million real USD per year). While this is not a sizable amount for the Pakistani government, given that the overall tax revenue lies between 15 and 19 billion USD,[8] this amount may be sufficiently large to impact the behaviour of charities and terrorist organizations.

Finally, Figure 4 plots the volatility of the international price of silver, showing that the exact value of the threshold and, hence, the revenue and donations may be hard to predict ex

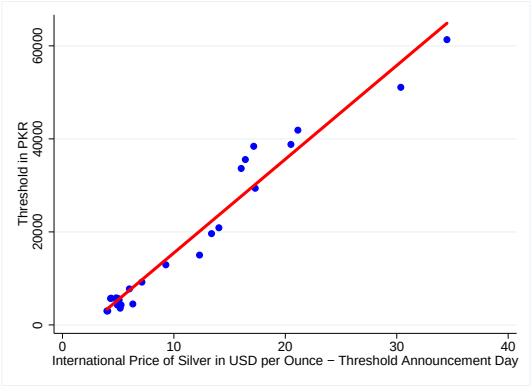
[7] Refer to the Zakat and Ushr Ordinance, 1980, available at http://www.zakat.gop.pk/system/files/zakatushr1980.pdf. For a historical review, refer to Nasr (2004).

[8] Refer to the IMF report available at https://www.imf.org/external/pubs/ft/scr/2016/cr1602.pdf

ante, given that silver is one of the most volatile metallic commodities. Figure 4 offers two plots in this direction. The left panel compares the quarterly volatility in the price of silver (solid blue line) and gold (dashed red line) for the past 15 years and shows that silver is 43% more volatile than gold. The right panel offers a long-term perspective on silver volatility, showing its large swings between 1980 and 2015.

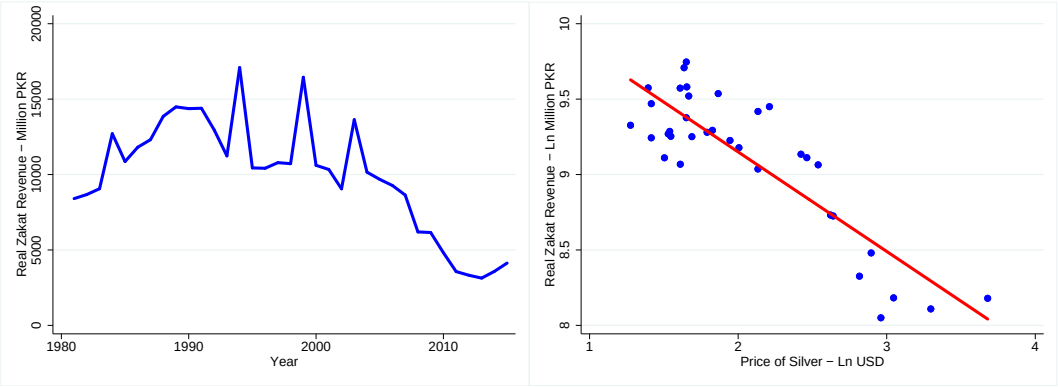
Another central characteristic in the implementation of the Zakat levy is given by the fact that Pakistan is an Islamic Republic professing the Sunni school of Islam, closer in its interpretation to Saudi Arabia and 76% of Pakistanis belong to this sect. The second largest group adheres to the Shia school of Islam (closer to the Iranian interpretation) and accounts for 19% of the country. The remaining 5% is composed by Hindus, Christians, Animists and other smaller groups. Given that only Sunni Muslims are subject to the levy, I exploit a religious map of the country published by the Gulf 2000 - Columbia University project to classify whether a city belongs to the treatment or control group through their religious majority. It is crucial to emphasize that, while highly informative, the map may not be perfect and is based on a combination of census data, historical maps and additional material. As a result, there may be a measurement error in the definition of cities, which would make my estimates a lower bound.

Figure 2: Zakat Threshold and the International Price of Silver



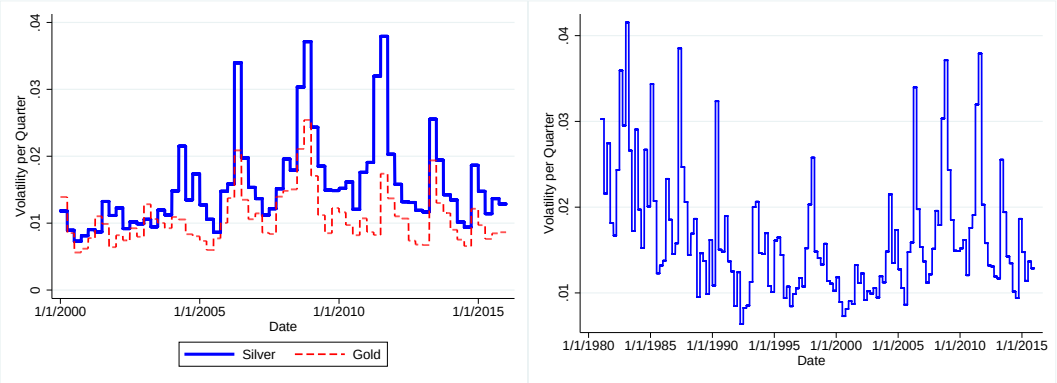
Notes: This figures reports a scatterplot between the Zakat Threshold in Pakistani Rupees (PKR), on the y-axis, and the international price of silver per Ounce at the announcement day, x-axis. The correlation between the two is 0.98***.

Figure 3: Zakat Revenue over Time and Silver Prices



Notes: The left panel shows the evolution in the Zakat Revenue collected by the Pakistani Government between 1981 and 2015 in millions of real PKR. The right panel correlates the revenue in natural logarithm of million PKR with the international price of silver in the day of the announcement in the natural logarithm of USD. These two variables are correlated -0.86***.

Figure 4: The Volatility in Silver and Gold Prices



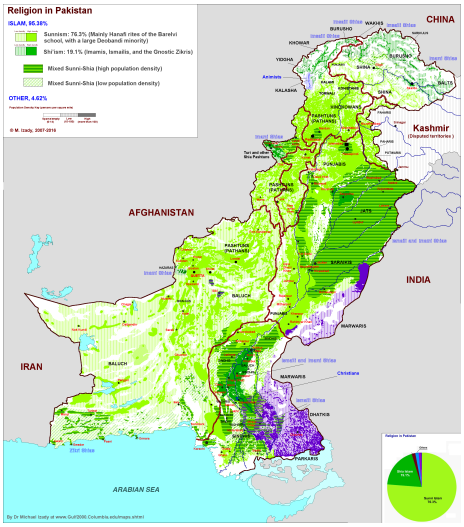
Notes: The left panel compares the volatility in the price of silver and gold calculated for every quarter between 2000 and 2015. The volatility is defined as the standard deviation of the daily difference in the natural logarithm of each commodity (silver and gold) in a quarter. Between 2000 and 2015, the average volatility of silver is 0.0154, while for gold it is 0.0106. Gold is 43% less volatile than silver, with this difference being -0.0067 and statistically different from zero below 1 percent. The right panel reports the same measure of volatility only for silver between 1980 and 2015 and showing large fluctuations in silver volatility over time.

Table 1: Summary Statistics on Zakat Collection 1981-2015

	(1)	(2)	(3)	(4)	(5)
Variable	Obs.	Mean	S.D.	Min	Max
Real Zakat Million PKR	35	9,924	3,760	3,134	17,091
Real Zakat Mill PPP USD	35	363.83	282.89	30.84	904.83

Notes: This table reports the summary statistics on Zakat collection by the central government between 1981 and 2015. The variables are expressed in real million PKR for the first variable and real million of PPP United States Dollar (USD) for the second variable. Column (1) counts the number of observations, (2) the mean, (3) the standard deviation indicated as S.D., (4) and (5) express the minimum and maximum collection.

Figure 5: A Religious Map of Pakistan



Notes: The map shows the geographic distribution of different religious groups in Pakistan, elaborated by Dr Michael Izady through the Gulf 2000 - Columbia University project. Different colours describe the presence of different religious groups. Bright green areas report cities that exhibit a Sunni-majority, dark green cities with Shia-majority, Purple with Hindu majority and Blue with Christian majority. Shaded colour indicates areas with a low population density, not shaded areas refer to areas with a high density. Mixed areas are reported with multi-colour horizontal lines.

2.2 Individual Donations and Zakat

In this section, I use individual data on charitable donations and verify that silver prices affect both donors and charities. I find that when silver prices are high, individual donations increase in Sunni-majority areas (treatment group) compared to non-Sunni areas (control) and charities receive more funds. It is important to note that because I focus on the differential effect of silver prices between Sunni and non-Sunni majority areas, this nets out the possible increase in donations due to a wealth effect of higher silver prices that may similarly affect Sunni and non-Sunni individuals.

The "Pakistan Social and Living Standards Measurement Survey" (PSLM) conducted by the Pakistan Bureau of Statistics offers information on individual donations and receptions of Zakat. Such survey contains a repeated cross-section and reports several economic indicators for more than 80,000 individuals across the 30 divisions of Pakistan for five years (2005, 2007, 2010, 2011 and 2013), with divisions being second-order administrative units equivalent to counties in the United States. The survey is stratified at this aggregated geographic level rather than city, as a result the analysis concerning charity donations and in Section 4.1.1 take place at this higher level of geographic aggregation.

The survey asks the amount that an individual donates for Zakat, making this an ideal source of data for my analysis. Because Zakat is a sensitive topic in Pakistan, the response rate is not high: only 5,485 (6.8%) provide information on their donation. However, there are enough observations to verify how donations respond to silver prices in Sunni-majority divisions through a difference-in-difference model. For this reason I run the following regression

$$\ln \, Zakat_{idt} = a_1 \, Silver_t \times Sunni_d + a_2 Income_{idt} + \iota_d + \iota_t + u_{idt} \tag{1}$$

in which the Zakat donated by individual i in division d at time t is regressed over an interaction between the standardized international price of silver and a dummy identifying Sunni-majority divisions, $Silver_t \times Sunni_d$, a control for the income of the individual, $Income_{idt}$, and then division and time fixed effects, ι_d and ι_t. Table 2 reports the results of equation (1): I do not control for income in column (1) and subsequently introduce it in (2). Two interesting results emerge from these regressions. First, when silver prices are one standard deviation higher, then Zakat donations increase by 7-9% in Sunni-majority divisions. Second, people with a higher income offer more Zakat donations (one percent higher income corresponds to 0.160 percent more donations).

Table 2: Zakat Donations and Silver

	(1)	(2)
Variables	Zakat Donations in Ln(PKR)	
$Silver_t \times Sunni_d$	0.0753**	0.0940**
	(0.0371)	(0.0396)
Ln Yearly Income		0.160***
		(0.0196)
Observations	5467	5467
Division FE	Yes	Yes
Year FE	Yes	Yes
Adj. R sq.	0.139	0.187
Mean Dep. Var.	8.043	8.043
S.D. Dep. Var.	1.330	1.330

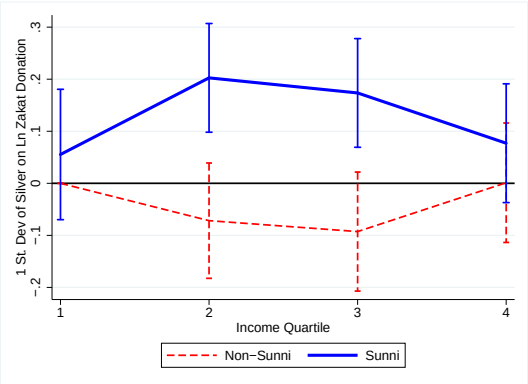
Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is individual i in division d in year t. Division and year fixed effects are present in all columns and standard errors are clustered at individual level. The dependent variable in columns is the natural logarithm of the Zakat donated by an individual. This is regressed over an interaction between the international price of silver at the announcement of the Zakat threshold, $Silver_t$, and a dummy taking unit value for Sunni-majority districts, $Sunni_d$. In all columns the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation (S.D.) of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

In addition to the previous test, I offer additional evidence on the first stage, which links a higher silver-induced tax to donations. The price of silver only affects the charitable donations of individuals around the silver threshold, hence in the middle of the deposit distribution: very wealthy people are always taxed regardless of the price of silver, as they stand above the threshold; on the contrary, very poor individuals are never taxed, as they lack a bank account or do not hold sufficient deposits. As a result, in the absence of data on bank deposits from the PSLM, I exploit information on the income distribution, which is available, and verify whether the elasticity of donations to silver prices differs across quartiles.

The mean income per individual in the survey is roughly 240,000 Pakistani Rupees (PKR), corresponding to 2,100 United States Dollars (USD), and the average threshold between 2005 and 2013 is approximately 25,000 PKR (corresponding to 215.93 USD). I use the information on income to study how donations respond across different income quartiles by interacting the coefficient $Silver_t \times Sunni_d$ in equation (1) with a series of dummies for each income quartile. Figure 6 shows how individuals respond to a one standard deviation increase in silver prices depending on their income quartile and whether they are in a Sunni or non-Sunni division. The red dashed line shows that individuals living in non-Sunni areas do not change their donations depending on the price of silver, independently of their income. This is consistent with the fact that non-Sunni are not affected by the deposit tax and, hence, do not change their charity behaviour based on silver. On the contrary, the solid blue line shows that individuals living in Sunni-majority areas react positively to changes in the price of silver, with the second and third quartiles being the only with a strong and statistically significant reaction in charity donations. For these quartiles, a one standard deviation increase in silver generates a 20%

increase in donations by these two groups. As expected, the effects are significantly smaller and insignificant for individuals placed in the first and forth quartile: the taxes on both very poor and very wealthy individuals are unlikely to change with silver price fluctuations.

Figure 6: Heterogeneous Effect of Silver by Income Quartile



Notes: This picture shows the coefficients of a regression estimating the effect of a one standard deviation increase in silver prices on Zakat donations of individuals living in Sunni and non-Sunni cities, depending on their income quartile. The model is expressed in equation (1) and the standard errors are clustered at individual level. The red dashed line shows the coefficient for individuals living in non-Sunni majority cities, while the blue solid line shows the coefficients for individuals living in Sunni-majority cities.

2.3 Charity Funding, Terrorist Groups and Silver Prices

Regarding the role of charities in Pakistan, it is important to clarify that while some conduct admirable work, others are different. In fact, several charities have been directly associated to terrorist groups over the past decade. For example, this link was clearly direct for Hafiz Saeed, who was one of the founder of a prominent terrorist group (Lashkar-e-Taiba) and, at the same time, head of a charitable foundation in Pakistan until February 2018.[9] Similarly, the terrorist group Jihad bi al-Saif has been linked to the charity Tablighis Jamaat.[10] Other groups have actively used charities to promote their fund-raising. This has been the case of Harkat-ul-Mujahedeen, led by Maulana Fazlur Rehman Khalil, and Jammat-ul-Furqan, led by Maulana Abdullah Shah Mazhar, two banned militant outfits linked to the TTP and al Qaeda. These terrorist groups created charitable foundations, under the new names Ansar-ul-Umma and Tehreek-e-Ghalba Islam, to boost their funding.[11]

After corroborating the existence of a link between some specific charities and terrorist groups, it is necessary to investigate the relation between silver prices and the funding of charities. This is a difficult task, given that Pakistani charities are not required by law to publish annual reports. In order to provide some evidence in line with the mechanism, I digitize the annual reports of one of the largest Pakistani charities (the Cancer Hospital charity) that presents a detailed and accessible record of its annual reports for a long period (from 2000 to 2016). In addition to this, I also digitize the balance sheets of other 19 charities, that

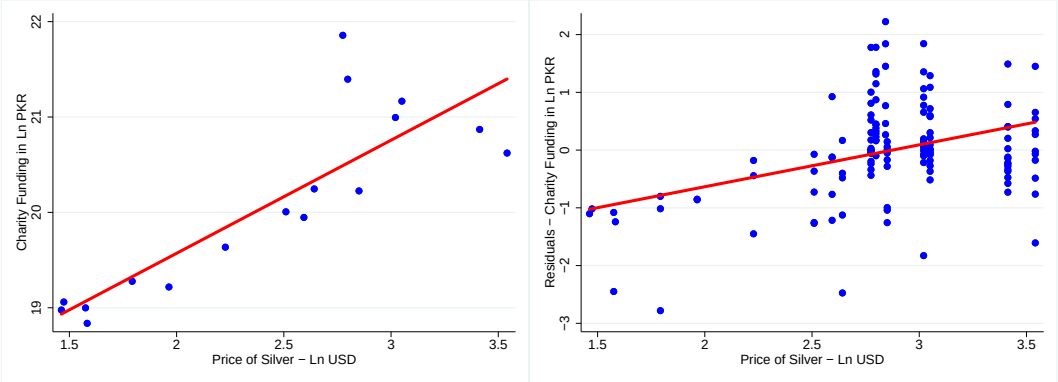
[9]Refer to this Reuters article https://www.reuters.com/article/us-pakistan-militants-financing/pakistan-bans-charities-linked-to-founder-of-militant-group-idUSKCN1FY1SN

[10]Refer to this Stratfor - WorldView article https://worldview.stratfor.com/article/tablighi-jamaat-indirect-line-terrorism

[11]Refer to this Global Ecco article https://globalecco.org/it/pakistan-money-for-terror

present at least two financial reports.[12] Figure 7 presents two scatterplots. In the first, I correlate the annual funding of the the Cancer Hospital charity to the international price of silver at the threshold announcement. In the second, I analyze 20 charities by demeaning their charity-specific funding and correlating this residual with the price of silver. In both cases the correlation is positive, quantitatively large and statistically different from zero. While I do not claim that such specific charities are involved in any activities related to terrorist organizations, this data is consistent with the fact that Sunni Muslims increase their charity donations in periods of low government Zakat, given by high silver prices, and that some of this funding (that reaches other charities) may finance terrorist organizations.

Figure 7: Charity Donations and Silver



Notes: The left panel shows a scatterplot between the funding of the Cancer Hospital measured in log PKR and the international price of silver at the threshold announcement in ln USD. The right panel reports a scatter between the residuals of a regression of the log PKR donated to 20 charities on the charity fixed effect and the international price of silver at the threshold announcement in log USD. The correlations are respectively 0.85*** and 0.39***.

3 Terrorism Financing and Attacks

3.1 Data

In order to study the effect of charity donations on terrorist attacks, I build a panel that reports the terrorist attacks recorded in 1,545 Pakistani cities over 96 quarter-years between 1992 and 2015. The Global Terrorism Database (GTD) published by the National Consortium for the Study of Terrorism and Responses to Terrorism, START (2017), contains the universe of terrorist attacks in Pakistan, which reports around 12,000 events and covers 4,600 periods in which a city is hit by at least one attack. In order to make the panel reliable and usable, I harmonize the names of the cities that could present multiple spellings (given the transliteration from Urdu to English) and code each city with a dummy for whether they are in a Sunni-majority area, by using the map presented in Figure 5.

The database contains information on whether a terrorist attack took place, as well as the number of attacks and attack-related killed and wounded. It also reports the specific type

[12]The charities presented in Figure 7 are Aurat Foundation, Awaz Foundation, CARE Foundation, Cancer Hospital, Child Aid, Durul Sukun Foundation, EHSAAS Trust, Indus Hospital, LRBT Foundation, Marie Adelaide Leprosy Centre, Pukar Foundation, Roshni Homes, SHARP Foundation, Sahara Foundation, Sustainable Development Institute, Sustainable Social Development Foundation, The Citizens Foundation, Trust Democratic Education Foundation and the Zindagi Trust.

of each attack (e.g. bombing explosion, assassination, armed assault, infrastructure attack, et cetera) and the corresponding number of individuals that were killed and wounded. Such dataset is further joined with information on specific quarters in which Ramadan took place in every year and the international price of silver at the announcement day of every Zakat payment.

Table 3 reports the summary statistics for the main variables in each dataset. Panel A presents four variables: a dummy that takes unit value whenever a city is hit by at least one terrorist attack in a quarter-year, Probability of Attack, and then the Number of Attacks, Killed and Wounded. The first variable shows that the unconditional probability of a terrorist attack in a quarter-year in Pakistan is 3.1%, with a high standard deviation given that more than 50% of Pakistani cities experience only one attack between 1992 and 2015. Similarly the variables number of attacks, killed and wounded present a similar pattern: low means, high standard deviations and high maxima. Panel B shows that 53.4% of Pakistani cities are coded as being Sunni-majority, as expected since 76% of the local population professes the Sunni school of Islam. Finally, Panel C reports statistics on the international price of silver per ounce in USD, based on data widely available through online platforms (e.g. Bloomberg, et cetera). For every year I only focus on the price of silver at the threshold announcement and report it for all other quarters. The mean price of silver is 10.829 USD, with a high standard deviation which implies a strong volatility of silver prices, as clarified by the minimum and maximum price of this commodity ranging between 3.640 and 39.892 USD.

Table 3: Summary Statistics on Attacks, Cities and Silver

	(1)	(2)	(3)	(4)	(5)
Variable	Obs.	Mean	S.D.	Min	Max
Panel A - Terrorist Attacks					
Probability of Attack	148,320	0.031	0.174	0	1
Number of Attacks	148,320	0.081	1.363	0	211
Number of Killed	148,320	0.138	2.556	0	222
Number of Wounded	148,320	0.232	4.799	0	452
Panel B - Sunni-Majority Cities					
$Sunni_c$	1,545	0.534	0.499	0	1
Panel C - International Price of Silver					
$Silver_t$	96	10.829	8.814	3.640	39.892

Notes: This table presents the summary statistics for the three databases used in this section. Panel A reports these for all the variables related to terrorist attacks in city and quarter-year period: 1) the probability of an attack in a city, 2) number of terrorist attacks, 3) the number of attack-related killed and 4) the number of attack-related wounded. Panel B presents the summary statistics for the dummy variable coding whether cities are Sunni-majority. Panel C summarizes data on the international price of silver at the announcement of the Zakat threshold. Column (1) reports the number of observations, (2) and (3) the mean and standard deviation of each variable, while (4) and (5) indicate their corresponding minimum and maximum values.

3.2 Empirical Model and Results

The empirical analysis proceeds in two steps. First, I offer a lead-and-lag analysis to study the differential evolution of terrorist attacks in Sunni-majority cities around Ramadan and

depending on silver prices. The identification of these effects is possible because of the Lunar Calendar and the fact that the Ramadan begins in different quarters between 1992 and 2015. Since I find that there is an increase in terrorist attacks only in the quarter in which the financing takes place (Ramadan) and the following, I bundle these two quarters in a single dummy and proceed with a difference-in-difference-in-difference estimation.

The following empirical model presents the lead-and-lag evaluation

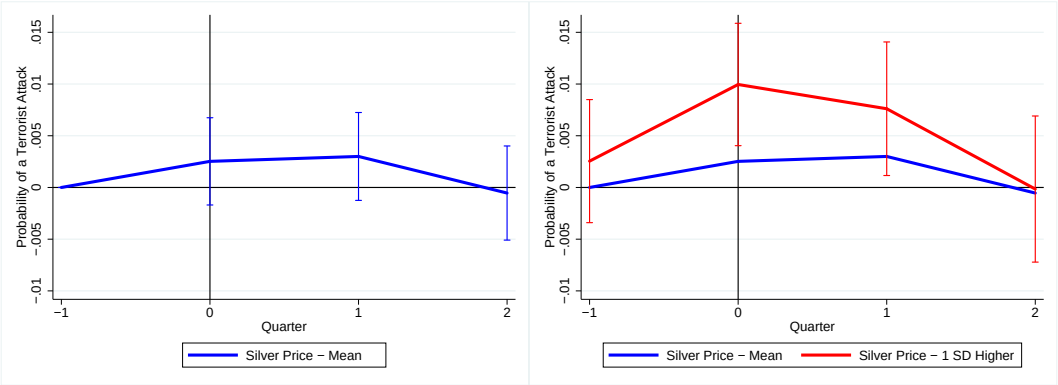
$$Terror_{ct} = \sum_{t=0}^{2} c_t Sunni_c \times Q_t + \sum_{t=-1}^{2} d_t Sunni_c \times Silver_t \times Q_t + \iota_c + \iota_t + \varepsilon_{ct} \tag{2}$$

equation (2) regresses a terror variable in city c at quarter-year t, $Terror_{ct}$ on a set of Ramadan fixed effects, Q_t, that corresponds to the quarter before Ramadan (Q_{-1}), the Ramadan quarter (Q_0) and subsequent quarters (Q_1 and Q_2), which are interacted with the dummy coding Sunni-majority cities, $Sunni_c$. The same two variables are interacted again with the standardized price of silver at the threshold announcement, $Silver_t$. Fixed effects are included for each city, ι_c, and quarter-year period, ι_t, and standard errors are clustered at the city level. In equation (2), all coefficients are relative to the quarter prior to Ramadan (Q_{-1}) when silver prices are at the mean value: hence the coefficient c_{-1} is the omitted category.

The coefficients reported by c_t verify the differential evolution between Sunni-majority cities (treatment) and non Sunni-majority cities (control) when the price of silver is at its average value. The coefficients d_t embody this differential effect when the price of silver is one standard deviation above the mean. This is the key source of variation in such regression: high silver prices imply low government Zakat revenue and high charity donations, which finance terrorist organizations. Note that because the Ramadan takes place in every year, I am unable to include dummies going back more than one period or going forward more than two periods, as they would be collinear with the previous or following Ramadan.

Figure 8 reports the results of this lead-and-lag analysis for the probability of terrorist attacks. The left panel shows that in periods of silver prices at the mean, the probability of terrorist attacks in Sunni-majority cities is not statistically higher in any quarter around Ramadan. The right panel displays the corresponding results when silver prices are one standard deviation above the mean. While there is no statistical difference in the quarter before Ramadan (Q_{-1}) and the two quarters after Ramadan (Q_2) between Sunni-majority and non-Sunni majority cities, there is a statistically higher probability of an attack in the quarter in which Ramadan takes place and the following. Beyond being statistically significant, such spike is quantitatively large as it implies a 1% higher probability of an attack, against a baseline probability of an attack of 3.1%, as Table 3 shows. Appendix A reports the table including all the coefficients presented in Figure 8 and the corresponding figures for the number of terrorist attacks, that present a similar pattern.

Figure 8: Terrorism, Zakat and Silver Prices



Notes: Both panels show the differential evolution in the probability of a terrorist attack between Sunni-majority and non Sunni-majority cities across different quarters around Ramadan. The x-axis measures the quarter prior to Ramadan (-1), of Ramadan (0), following Ramadan (1) and two quarters following Ramadan (2). The vertical line in 0 corresponds to the quarter of Ramadan. The left panel shows the differential probability of a terrorist attack in a Sunni-majority city when silver prices are at the mean, while the right panel exhibits the same coefficients when silver is one standard deviation above the mean. Equation (2) presents the empirical model behind these panels and Appendix A contains the table with the corresponding coefficients. The bars around each observation represent the 95% confidence interval and standard errors are clustered at the city level.

Given that the effect is concentrated only in two quarters, I define a dummy variable that takes unit value for each quarter of a year that contains Ramadan and the subsequent quarter, $Ramadan_t$, and proceed with a difference-in-difference-in-difference model

$$Terror_{ct} = f_1 Sunni_c \times Silver_t + f_2 Sunni_c \times Ramadan_t +$$

$$+ f_3 Sunni_c \times Silver_t \times Ramadan_t + \iota_c + \iota_t + \varepsilon_{ct} \tag{3}$$

in which the terror variable observed in city c at time t, $Terror_{ct}$, is regressed on: 1) an interaction between the Sunni-majority dummy, $Sunni_c$, and the price of silver at the threshold announcement, $Silver_t$; 2) an interaction between $Sunni_c$ and $Ramadan_t$; and 3) a triple interaction between these variables. The coefficient f_1 measures the differential effect of silver prices at the threshold announcement date on terrorist attacks in Sunni-majority cities across all quarters of a year; f_2 shows the differential probability of a terrorist attack in Sunni-majority cities at Ramadan; while f_3 identifies the key coefficient of equation (3): the differential effect in attacks in Sunni-majority cities, when silver prices are one standard deviation higher in the Ramadan quarter and following one.

Table 4 reports the results of (3) for the probability of a terror attack in column (1), the natural logarithm of the number of terror attacks (column (2)), the number of terror-related killed individuals (column (3)) and wounded individuals (column (4)). In all cases the price of silver does not produce a differential effect on the probability of a terrorist attack in Sunni-majority cities, as I cannot reject a zero effect for the variable $Sunni_c \times Silver_t$. The second coefficient highlights that there is an increase in the probability of a terrorist attack when Ramadan arrives in Sunni-majority cities and the price of silver is at its mean. This effect is statistically different from zero only for the probability of an attack, but not for all other variables and its size is not large, as it corresponds to a 10% increase on the 3.14% baseline probability. The final row shows that there is a large increase in terrorist activities when Ramadan takes place in Sunni-majority cities and the price of silver is one standard deviation

above its mean. The quantitative effect is large as the increase in the probability of a terrorist attack is overall 1%, which corresponds to a 33% higher probability of an attack than the baseline probability, and is significantly different from zero below 1%. The effect is similar for the number of attacks in terms of size, magnitude (20% above the baseline mean) and significantly different from zero below 5%.

Table 4: Terrorist Attacks, Sunni Cities and Silver

Variables	(1) Terror Dummy	(2) Attacks Ln(1+N)	(3) Killed Ln(1+N)	(4) Wounded Ln(1+N)
$Sunni_c \times Silver_t$	0.00115	0.00216	-0.000973	-0.00158
	(0.00296)	(0.00420)	(0.00432)	(0.00476)
$Sunni_c \times Ramadan_t$	0.00324**	0.00149	0.000269	0.000886
	(0.00155)	(0.00145)	(0.00192)	(0.00205)
$Sunni_c \times Silver_t \times$	0.00727***	0.00471**	0.00384	0.00476*
$Ramadan_t$	(0.00219)	(0.00196)	(0.00276)	(0.00283)
City FE	Yes	Yes	Yes	Yes
Quarter-Year FE	Yes	Yes	Yes	Yes
Obs.	148320	148320	148320	148320
Adj. R sq.	0.183	0.280	0.211	0.213
Mean Dep. Var.	0.0314	0.0311	0.0270	0.0305
S.D. Dep. Var.	0.175	0.198	0.237	0.277

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is a city c in quarter-year t. City and Quarter-Year fixed effects are present in all columns and standard errors are clustered at the city level. The dependent variables are: the probability of a terror attack in Column (1), Terror Dummy; the natural logarithm of the number of terrorist attacks in Column (2), Attacks $Ln(1+N)$; the natural logarithm of the number of terrorist-related killed individuals in Column (3), Killed $Ln(1+N)$; the natural logarithm of the number of terrorist-related wounded individuals in Column (4), Wounded $Ln(1+N)$. These are regressed over a dummy taking unit value in Sunni-majority cities, $Sunni_c$; the price of silver at the announcement of the Zakat threshold, $Silver_t$; a dummy taking unit value for the quarter in which Ramadan takes place and the following quarter, $Ramadan_t$. In order to simplify the interpretation of the coefficients, the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

The results on the triple interaction for the last two variables of Table 4, number of killed and wounded, are always positive, quantitatively large but borderline significant at the 5% or 10% depending on the specification. This may be due to the fact that the figures on casualties are often imprecise and such measurement error squeezes the coefficients toward zero. Overall, the killed variable presents a positive sign and a coefficient on the triple interaction in line with the previous results: a 15% increase in the number of attack-related killed compared to the baseline mean, however its coefficient is not statistically different from zero with a t of 1.4. Similarly, the number of wounded individuals appears to increase by a notable magnitude with respect to the baseline (19%), though is statistically different from zero only at a 10% significance level.

In order to verify whether the results of Table 4 are compatible with an organization-financing channel, I study which type of attacks change at Ramadan. I analyze whether capital-intensive ones increase as funding flows toward terrorist groups. For this reason, I exploit the fact that the Global Terrorism Database attaches to each attack a specific category and defines a new variable, called "capital-intensive" terrorist attacks, which groups three categories of attacks. The following definitions are quoted from the codebook of START (2017):

1. Bombing/Explosion - this includes attacks where the "*primary effects are caused by an energetically unstable material undergoing rapid decomposition and releasing a pressure wave that causes physical damage to the surrounding environment*". Different types of explosives belong to this classification (high, low, dirty bombs), while nuclear events, attacks in which the decomposition takes place at a slower rate and exclusive use of firearms are excluded.

2. Unarmed Assault - this classifies events whose "*primary objective is to cause physical harm or death directly to human beings by any means other than explosive, firearm, incendiary, or sharp instrument (knife, etc.). Attacks involving chemical, biological or radiological weapons are considered unarmed assaults.*".

3. Assassination - this is an act whose "*primary objective is to kill one or more specific, prominent individuals. Usually carried out on persons of some note, such as high-ranking military officers, government officials, celebrities, etc.*". This is included as a capital-intensive attack, as most assassinations of prominent figures in Pakistan take place through bombings, but these are classified as assassinations given that if "*an assassination is carried out through the use of an explosive, the Attack Type is coded as Assassination, not Bombing/Explosion*".

The remaining classifications tend to have a lower capital-intensity (e.g. firearm assault, hijacking, hostage-taking, kidnapping, et cetera) and are not included in this variable. As a result, I study whether these specific attacks respond to the funding shock according to equation (3). Table 5 presents the results from this test with column (1) measuring the probability of a capital-intensive attack, column (2) the number of capital-intensive attacks and (3) and (4) the corresponding number of killed and wounded individuals. In line with Table 4, I find that the first two interactions ($Sunni_c \times Silver_t$ and $Sunni_c \times Ramadan_t$) are small in magnitude and not statistically different from zero. On the contrary, the triple interaction ($Sunni_c \times Silver_t \times Ramadan_t$) is positive, presents large magnitudes in all four columns as in Table 4 and is statistically different from zero in columns (1) and (2). In Sunni-majority cities, a one standard deviation increase in silver prices during the Ramadan period leads to a higher probability of capital-intensive terrorist attacks (20% of the baseline mean of 2.33%), a larger number of attacks (14% of the baseline mean) and more attack-related killed and wounded (15% and 13% respectively). The results on the borderline significance for killed and wounded individuals can be explained either as a result of measurement error (the standard deviation of these variables is particularly high, as the last row of Table 5 shows) or as due to these additional attacks having a low marginal product of capital. Appendix B reports the results of equation (3) for the non capital-intensive attacks and highlights that in this case I cannot reject a zero effect of an increase neither in their probability nor in the number of attacks. Also the magnitudes of the corresponding effects on the triple interaction ($Sunni_c \times Silver_t \times Ramadan_t$) for these attacks is smaller than in Table 5, often by one or two orders of magnitude.

Table 5: Capital-Intensive Attacks and Zakat

Variables	(1) Terror Dummy	(2) Attacks Ln(1+N)	(3) Killed Ln(1+N)	(4) Wounded Ln(1+N)
$Sunni_c \times Silver_t$	0.00233	0.00263	0.00003	-0.000466
	(0.00264)	(0.00355)	(0.00314)	(0.00430)
$Sunni_c \times Ramadan_t$	0.00238*	0.00120	0.000617	0.000549
	(0.00130)	(0.00122)	(0.00151)	(0.00182)
$Sunni_c \times Silver_t \times$	0.00483***	0.00331**	0.00242	0.00322
$Ramadan_t$	(0.00180)	(0.00163)	(0.00207)	(0.00247)
City FE	Yes	Yes	Yes	Yes
Quarter-Year FE	Yes	Yes	Yes	Yes
Obs.	148320	148320	148320	148320
Adj. R sq.	0.167	0.247	0.173	0.192
Mean Dep. Var.	0.0233	0.0224	0.0160	0.0239
S.D. Dep. Var.	0.151	0.164	0.185	0.250

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is a city c in quarter-year t. City and Quarter-Year fixed effects are present in all columns and standard errors are clustered at the city level. The dependent variables consider terrorist attacks that are defined "capital-intensive" which are executed through bombings, unarmed events (chemical, biological or radiological) and assassinations of high-ranking officials, as described in the text. Column (1) reports the probability of a capital-intensive terror attack, Terror Dummy; the natural logarithm of the number of capital-intensive terrorist attacks in Column (2), Attacks $Ln(1+N)$; the natural logarithm of the number of terrorist-related killed individuals in a capital-intensive attack in Column (3), Killed $Ln(1+N)$; the natural logarithm of the number of terrorist-related wounded individuals in a capital-intensive attack in Column (4), Wounded $Ln(1+N)$. These are regressed over a dummy taking unit value in Sunni-majority cities, $Sunni_c$; the price of silver at the announcement of the Zakat threshold, $Silver_t$; a dummy taking unit value for the quarter in which Ramadan takes place and the following quarter, $Ramadan_t$. In order to simplify the interpretation of the coefficients, the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Section 5 offers some additional tests, that refine the results of Table 4. In Section 5.1 I replicate the same results of equation (3) but for an alternative Islamic celebration, Eid Adha, compute the price of silver traded two days before this celebration and using this specification I cannot reject a zero on all coefficients. In Section 5.2, I address various additional robustness checks. First, I control for city-specific seasonality by introducing a city-quarter fixed effect, that nets out city-specific confounding factors (e.g. local agricultural cycle, local rain season, et cetera). Second, I control for the fact that different Pakistani states may evolve following different trend (e.g. income, inflation, et cetera) and I can exclude such state-year common shocks through fixed effects. Third, I follow the same approach as Crost et al. (2016) by replacing the silver variable with time fixed effects and display that these effects are highly correlated with silver prices. Fourth, I find that silver as well as other commodities (e.g. Gold, Copper, Tin) do not have an effect on terror attacks outside the Ramadan period.

4 Empirical Methods

4.1 Dissecting the Demand and Supply of Terrorist Attacks

The results on the relation between financing and terrorist attacks may be rationalized through two complementing stories: 1) an increase in the supply of terrorist attacks by extremist organizations, as a result of increased funding given by charitable donations; 2) a higher demand

of terrorist attacks by the local population of a city, because of changes in local characteristics due to lower donations reaching poor people or local institutions (e.g. more policing/military, increase in labour supply, et cetera). It is typically hard to dissect these elements in the terrorism and conflict literature and Dube and Vargas (2013) pioneered this field by focusing on different types of shocks to isolate the "rapacity" effect (supply) from the "opportunity cost" effect (demand).

I introduce an alternative method to investigate the effect of this natural experiment, which can be generalized in other studies on conflict and violence. I build an additional panel in which I follow 485 cities and 20 terrorist organizations over the 96 quarter-year periods between 1992 and 2015 containing almost 1 million observations. In addition, I enrich and cross-check information on terrorist organizations from the GTD database with local newspapers (in English and Urdu) and cross-validate the names/affiliations of the terrorist organizations claiming the attack. As a result, I am able to:

1. exploit a finer level of variation by separately identifying city and organization time-varying heterogeneity;

2. code each terrorist organization as Sunni, which is likely to receive the exogenous change in charity donations and hence treated, or non-Sunni, who are unlikely to receive it and hence are a control;

3. combine this novel panel with the individual data on charity donations from the PSLM survey and estimate the elasticity of terrorism financing on attacks (Section 4.1.1).

The combination of 1. and 2. uncovers a novel identification in this literature. In fact, I am able to isolate the supply of terrorist attacks by an extremist organization by analyzing the within-city variation and exploit the cross-sectional variation in attacks between Sunni and non-Sunni organizations. Analogously, I can focus on the demand of terrorist attacks that could be due to city shocks to policing or labour markets, by studying the within-organization and exploit the cross-sectional variation between Sunni-majority and non-Sunni majority cities. If the findings reported in Table 4 are robust to changes in city time-varying unobservables (accounted by city-time fixed effects), then the relation between the timing and location of donations and attacks offers evidence consistent with terrorist organization being subject to credit constraints and/or storage frictions.

Unfortunately it was impossible to identify all of the terrorist organizations behind each attack, because of either inaccurate/conflicting sources or simply the lack of an organization claiming the attack. As a result, this panel contains fewer cities, from 485 compared to the original 1,545. However, all the major Pakistani cities and terrorist organizations are still part of the sample and, in fact, these results are close to those presented in Table 4 in terms of sign, magnitude and statistical significance.

Table 6: List of Terrorist Organizations and Religious Affiliation

Sunni Organizations
Al-Intiqami al-Pakistani, Baloch Liberation Front
Baloch Liberation Tigers, Baloch Waja Liberation Army
Islamist Extremists Group, Jaish Usama, Jaish as-Saiyouf
Jaish-e-Islam, Jaish-e-Khorasan, Jaish-e-Mohammad
Lashkar-e-Taiba, Majlis-e-Askari, Mutahida Majlis-e-Amal
Sunni Muslim Group, Tehrik-i-Taliban Pakistan

Non-Sunni Organizations
Fedayeen Imam Mahdi (Shia)
Muttahida Qami Movement (Non Religious)
Sindhu Desh Liberation Army (Sindh/Hindu)
Sipah-I-Mohammed (Shia)
Tribesmen Group (Tribal - Animists)

Notes: This table presents a list with the religious affiliation of each terrorist group in this sample. Appendix C describes in detail each group and offers material on the classification.

Table 6 reports the list of terrorist organizations and their corresponding religious affiliations. As Pakistan is a Sunni-majority country, most religious groups are associated to the Sunni school of Islam (15 out of 20), while only a minority can be identified as non-Sunni. Most of these groups typically fight against the Pakistani government, with varying degrees of political ambition. For example, the Talibans (Tehrik-i-Taliban Pakistan) fight for a more extensive application of the Sharia law, others favour an Islamic state across South Asia (Lashkar-e-Taiba) or have more restricted territorial ambitions (Baloch groups in the Balochistan state, Jaish-e-Mohammad in Kashmir, the Sindhu army in the Sindh state), while others engage in sectarian violence (most Sunni groups, Sipah-I-Mohammed among the non-Sunni et cetera). Appendix C reports a detailed description of each group, including materials that support the religious classification. In Section 5.2, I offer two robustness checks to address some heterogeneities across terrorist organizations.

In this setting, I study only the probability of a terror attack by an organization in a city in a given quarter-year, because only the top 0.02% of observations present more than one attack by an organization in a given quarter-year (typically the largest cities, Karachi, Lahore and Islamabad). Given this novel method, I expand equation (3) through this richer empirical model

$$Terror_{cot} = h_1 Sunni_c \times Silver_t + h_2 Sunni_c \times Ramadan_t +$$

$$+ h_3 Sunni_c \times Silver_t \times Ramadan_t + h_4 Sunni_o \times Silver_t + h_5 Sunni_o \times Ramadan_t +$$

$$+ h_6 Sunni_o \times Silver_t \times Ramadan_t + \iota_c + \iota_o + \iota_t + \varepsilon_{cot} \quad (4)$$

equation (4) regresses the probability of a terror attack from organization o in city c in quarter-year t on the fixed effects for city, organization and quarter-year (ι_c, ι_o, ι_t). It includes the same regressors from equation (3), hence the interactions between the standardized price of silver, $Silver_t$; the Ramadan dummy, $Ramadan_t$, and the dummy for being Sunni-majority, $Sunni_c$. Finally, to account for the supply of terrorist attacks, it presents the same first two

variables ($Silver_t$ and $Ramadan_t$) interacted with a dummy coding each terrorist organization as being Sunni, $Sunni_o$. Standard errors are two-way clustered at the level of the city and organization. While the expression reported in equation (4) only exploits the within-city and within-organization variation, in Table 7 I also separately introduce city-time, ι_{ct}, and organization-time fixed effects, ι_{ot}, to eliminate respectively city-time varying unobservables (demand of terrorist attacks) and organization-time varying unobservables (supply of terrorist attacks).

Table 7 reports the results of equation (4). In column (1), I introduce only city, organization and quarter-year fixed effects; in column (2), I introduce the organization-time fixed effects to remove the supply of terrorist attacks and, finally, in column (3), the city-time fixed effects remove the corresponding demand.

The main result from this table highlights that only the supply of attacks is statistically different from zero and presents a quantitative magnitude in line with Table 4. Hence only the interaction between $Sunni_o$, $Silver_t$ and $Ramadan_t$ is statistically different from zero. This implies that as Sunni terrorist organizations receive higher donations during the Ramadan period, implied by a one standard deviation in silver prices, they exhibit a higher probability of a terrorist attack by 0.05%, a 60% increase in the baseline average probability. This result is quantitatively in line with Table 4 and highlights the importance of organizations behind the increase in terrorist attacks. Once the role of organizations is explicitly acknowledged, the triple interaction $Sunni_c \times Silver_t \times Ramadan_t$ is not statistically different from zero neither in column (1) nor in (2), once organization-time fixed effects are included.

In terms of robustness of the result, the point estimate of the coefficient on $Sunni_o \times Silver_t \times Ramadan_t$ does not change as the city-time variation is introduced in column (3), as there is only a mild increase in the precision of the estimate. This could be due to the fact that the exogenous shock to the funding of terrorist organizations is orthogonal from city-specific characteristics. As a result, the city-time fixed effects remove confounders and add precision.

The finding that the Zakat shock affects only terrorist organizations but not city-specific characteristics is consistent with additional data on wages from the Pakistani Bureau of Statistics. I digitize the monthly-level data on the wages of four worker categories (unskilled workers, carpenters, electricians and construction workers) from the Pakistani Intercity Consumer Price survey for the 40 largest cities between September 2014 and September 2017. I replicate the city-level strategy previously presented and verify whether wages change differentially in Sunni-majority cities in presence of high silver prices around Ramadan. An inspection of Table 8 leads not to reject the null hypothesis that salaries do not respond differentially.

Table 7: Dissecting the Demand and Supply of Attacks

Variables	(1)	(2)	(3)
	Probability of a Terrorist Attack		
$Sunni_c \times Silver_t$	-0.000459	-0.000459	
	(0.000329)	(0.000332)	
$Sunni_c \times Ramadan_t$	0.000007	0.000007	
	(0.000009)	(0.000009)	
$Sunni_c \times Silver_t \times$	0.000124	0.000124	
$Ramadan_t$	(0.000121)	(0.000121)	
$Sunni_o \times Silver_t$	0.000802		0.000802
	(0.000991)		(0.000991)
$Sunni_o \times Ramadan_t$	0.000007		0.000007
	(0.000124)		(0.000123)
$Sunni_o \times Silver_t \times$	0.000556**		0.000556**
$Ramadan_t$	(0.000247)		(0.000245)
City FE	Yes	Yes	Yes
Organization FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
City-Time FE			Yes
Organization-Time FE		Yes	
Obs.	931,200	931,200	931,200
Adj. R sq.	0.0171	0.0373	0.0149
Mean Dep. Var.	0.0009	0.0009	0.0009
S.D. Dep. Var.	0.0311	0.0311	0.0311

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is an organization o in city c in quarter-year t. Organization, City and Quarter-Year fixed effects are present in all columns, column (2) also introduces organization-time fixed effects, while column (3) adds city-time fixed effects. Standard errors are two-way clustered at the level of the city and organization. The dependent variable is the probability of a terror attack. This is regressed over a dummy taking unit value in Sunni-majority cities, $Sunni_c$; a dummy taking unit value for Sunni organizations, $Sunni_o$; the price of silver at the announcement of the Zakat threshold, $Silver_t$; a dummy taking unit value for the quarter in which Ramadan takes place and the following quarter, $Ramadan_t$. In order to simplify the interpretation of the coefficients, the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table 8: City Wages, Sunni Cities and Silver

Variables	(1) Unskilled Wage Ln(PKR)	(2) Carpenter Wage Ln(PKR)	(3) Builder Wage Ln(PKR)	(4) Electrician Wage Ln(PKR)
$Sunni_c \times Silver_t$	0.702	0.0986	0.257	0.843
	(0.461)	(0.217)	(0.251)	(0.852)
$Sunni_c \times Ramadan_t$	0.277	0.0200	0.0213	0.418
	(0.209)	(0.128)	(0.133)	(0.411)
$Sunni_c \times Silver_t \times$	-0.665	0.0741	-0.120	0.808
$Ramadan_t$	(0.437)	(0.231)	(0.250)	(0.824)
City FE	Yes	Yes	Yes	Yes
Month-Year FE	Yes	Yes	Yes	Yes
Obs.	1480	1480	1480	1480
Adj. R sq.	0.883	0.936	0.922	0.919
Mean Dep. Var.	6.198	6.703	6.800	4.733
S.D. Dep. Var.	0.198	0.178	0.204	0.317

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is a city c in month-year t. City and Month-Year fixed effects are present in all columns and standard errors are clustered at the city level. The dependent

variables are: the monthly wage of an unskilled worker expressed through the natural logarithm of PKR, the monthly wage of a carpenter expressed through the natural logarithm of PKR, the monthly wage of a builder reported through the natural logarithm of PKR and the monthly wage of an electrician expressed through the natural logarithm of PKR. These are regressed over a dummy taking unit value in Sunni-majority cities, $Sunni_c$; the price of silver at the announcement of the Zakat threshold, $Silver_t$; a dummy taking unit value for the quarter in which Ramadan takes place and the following quarter, $Ramadan_t$. In order to simplify the interpretation of the coefficients, the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. Note that the mean wage of the electrician is not reported over the month like the other three categories, but per worked hour. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

4.1.1 Estimating the Elasticity of Terrorist Attacks to Financing - An IV Approach

In this Section I combine the city-organization panel with a local measure of terrorism financing per organization, exploiting the detailed data on individual donations. As a result, I can estimate the elasticity of terrorist attacks to finance, both through an OLS and an IV relying on the international price of silver and the religious affiliation of a group.

Section 2 introduced the PSLM survey conducted by the Pakistan Bureau of Statistics, which is a representative survey that contains an individual measure of donations across the divisions of Pakistan. I use this survey to derive a time-varying measure of charity donations per division, by aggregating the individual donations at this geographic unit. Similarly, I aggregate the city-organization panel, which reports the city-level statistics on terror events, to a higher geographic level (a division-organization panel) and track all such variables at this aggregated level.

In order to identify the share of the charity donations that an organization receives in a given division and period, I use a simple Bartik-style instrument and the following formula

$$Donations_{odt} = Exposure_{odt-1} \times Donations_{dt} = \frac{\sum_{c=1}^{N} Attacks_{ocdt-1}}{\sum_{c=1}^{N} Attacks_{cdt-1}} \times Donations_{dt}$$

in which I model the donations received by the terrorist organization o in division d at time t as the product between the overall donations given in division d at time t, $Donations_{dt}$, multiplied by the exposure of organization o in division d in the previous year $t-1$, $Exposure_{odt-1}$. I define this measure of exposure as the share of attacks executed by organization o in all cities c of division d at time $t-1$. Once this local variable is defined, I can explore the following model

$$Terror_{odt} = l_1 \, Donations_{odt} + \iota_o + \iota_d + \iota_t + \varepsilon_{odt} \tag{5}$$

relating the number of terror events that organization o implements in division d at time t, $Terror_{odt}$, to the natural logarithm of the overall donations received by the same organization in that division and time, $Donations_{odt}$, including organization, division and time fixed effects. The Zakat experiment is particularly useful, because creates a natural instrument for equation (5)

$$Donations_{odt} = m_1 \, Sunni_o \times Silver_t + \iota_o + \iota_d + \iota_t + u_{odt} \tag{6}$$

which focuses on the increase in donations exogenously determined by changes in the international price of silver for the days before Ramadan flowing to Sunni terrorist groups. Because the Zakat donations take place exclusively around Ramadan, I estimate equations (5) and (6) only for the Ramadan and subsequent quarter, and only in the years in which I can offer the aggregated measure of donations given by the PSLM survey waves (2005, 2007, 2010, 2011 and 2013).

Table 9 presents the results of equations (5) and (6) for the probability that a terror attack takes place in division d at time t. Column (1) reports the first stage, in which I regress the donations over the interaction between the price of silver and the religious affiliation of a terrorist group, as presented by equation (6). Column (2) shows the reduced-form estimates, in which I regress the Terror Dummy over the instrument given by the interaction between the Sunni organization dummy, $Sunni_o$, and the price of silver, $Silver_t$. Both results are in line with the findings of Table 2, for donations, and Table 4 for attacks. Column (3) shows the OLS regression, in which the probability of a terror attack is regressed on the donations variable, as displayed by equation (5). This elasticity indicates that a 100% increase in the donations received by an organization leads to a 2.26% increase in the probability of a terrorist attack, corresponding to 30% of a standard deviation. This effect is significantly higher in column (4), in which I combine equations (5) and (6) and present the IV estimates of the elasticity of terrorist attacks to financing. In this case, the elasticity increases by 3.5 times, and the effect goes from 2.26 to 8.64 percent.

Such point estimate is in line with the findings of Table 10, in which I report the OLS and IV coefficients also for the number of events, killed and wounded. While for all variables the OLS estimates lie between 2.8 and 4 percent, the instrumental variables estimation leads to a larger coefficient, between 7 and 8 percent depending on the specification. Such estimate is more precise for the number of attacks and less precise for the number of killed and wounded, as these are noisier measure of terrorism. Overall, these findings reinforce the result that terrorism financing has an important effect on attacks and offer a quantitative benchmark to evaluate the gains from disrupting the financial networks of terrorists.

Table 9: Donations and Attack, OLS and IV

Variables	(1) Donations Ln(1+N)	(2) Terror Dummy	(3) Terror Dummy	(4) Terror Dummy
			OLS	IV
$Sunni_o \times Silver_t$	0.0460**	0.00397**		
	(0.0216)	(0.00145)		
Donations			0.0226***	0.0864*
			(0.00605)	(0.0444)
Division FE	Yes	Yes	Yes	Yes
Organization FE	Yes	Yes	Yes	Yes
Quarter-Year FE	Yes	Yes	Yes	Yes
Obs.	5520	5520	5520	5520
Adj. R sq.	0.162	0.0851	0.192	0.660
Mean Dep. Var.	0.149	0.00743	0.00743	0.00743
S.D. Dep. Var.	1.359	0.0859	0.0859	0.0859

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is an organization o in a division d at quarter-year t. Division, Organization and Quarter-Year fixed effects are present in all columns and standard errors are clustered at the division level. The dependent variables are: the natural logarithm of the charity donations received by an organization in a division in Column (1), Donations Ln(1+N), and the probability of a terror attack in Columns (2), (3) and (4), Terror Dummy. These are regressed over a dummy taking unit value for Sunni organizations, $Sunni_o$, and the price of silver at the announcement of the Zakat threshold, $Silver_t$, in columns (1) and (2). In column (3), the Terror Dummy is regressed on Donations through an OLS and, in column (4), through an IV exploiting the first stage presented in column (1). In order to simplify the interpretation of the coefficients, the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table 10: Donations and Attack, OLS and IV

Variables	(1) Attacks Ln(1+N)	(2) Killed Ln(1+N)	(3) Wounded Ln(1+N)	(4) Attacks Ln(1+N)	(5) Killed Ln(1+N)	(6) Wounded Ln(1+N)
	OLS	OLS	OLS	IV	IV	IV
Donations	0.0281***	0.0331***	0.0426***	0.0784*	0.0778*	0.0815
	(0.00915)	(0.00824)	(0.0132)	(0.0400)	(0.0455)	(0.0543)
Division FE	Yes	Yes	Yes	Yes	Yes	Yes
Organization FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	5520	5520	5520	5520	5520	5520
Adj. R sq.	0.210	0.137	0.129	0.213	0.00376	0.0678
Mean Dep. Var.	0.00733	0.0101	0.0124	0.00733	0.0101	0.0124
S.D. Dep. Var.	0.0962	0.152	0.196	0.0962	0.152	0.196

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is an organization o in a division d at quarter-year t. Division, Organization and Quarter-Year fixed effects are present in all columns and standard errors are clustered at the division level. The dependent variables are: the natural logarithm of the number of terrorist attacks in Columns (1) and (4), Attacks $Ln(1+N)$; the natural logarithm of the number of terrorist-related killed individuals in Column (2) and (5), Killed $Ln(1+N)$; the natural logarithm of the number of terrorist-related wounded individuals in Columns (3) and (6), Wounded $Ln(1+N)$. These are regressed over a variable measuring the amount of donations, Donations, through an OLS in Columns (1), (2) and (3) and an IV in Columns (4), (5) and (6). The IV estimation exploits the first stage presented in Column (1) of Table 9, in which donations are regressed over a dummy taking unit value for Sunni organizations, $Sunni_o$, and the price of silver at the announcement of the Zakat threshold, $Silver_t$. In order to simplify the interpretation of the coefficients, the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

4.2 Measuring Terrorist Recruitment

High silver prices induce a positive funding shock to terrorist organizations: as charities receive more donations, some of them channel these funds toward such illicit activities. The result on the funding shock suggests that terrorist organizations are credit constrained or are unable to store their funding. Therefore, even small increases in their assets lead to a significant and immediate increase in attacks. In this section, I verify a related mechanism: whether such positive funding shocks generate more attacks in periods of stronger recruitment by terrorist organizations. This result is consistent with a production function of terrorist attacks exhibiting complementarities between human and financial capital.

Measuring the "recruitment" of terrorist or criminal organizations is an inherently hard task because it is distinctively unobservable. For this reason, I present an innovative method relying on novel data and measuring this latent variable. This requires two key elements:

1. data - a quantitative source that contains a signal of terrorist recruitment;
2. statistical methodology - a framework that allows to codify certain elements and extract information on recruitment.

In order to access useful data sources for this task, I navigate and analyse data from the dark web. This is an alternative internet network requiring a specific software for its access/navigation and unavailable through browsers or search engines. The most common dark web networks are accessible through TOR (The Onion Router). Websites, fora and platforms on the dark web contain discussions on sensitive topics and the trade of illicit material: 17% of the content is adult-only, 15% drug-related, 9% political, 4% weapons et cetera (Biryukov et al. (2014)).

In order to analyse a consistent and impartial reference, I scrape data from some of these platforms and access the Dark Web Forums data from the AI Lab Dark Web project of the University of Arizona. This database contains more than 2.5 million messages from 7 message boards containing messages in English between 2000 and 2012. Appendix C contains a detailed report on the platforms used in the analysis and their characteristics. Each dataset contains the universe of messages exchanged on platforms and fora in which members sympathize with extremist and terrorist groups or the concept of war against the unfaithful (Jihad). This is a rich database which includes a set of specific characteristics per forum: the thread under which the topic is under discussion; the date/time of each message; the name of the member as registered on the platform and the content of each specific message. These features satisfy point 1. in the previous list.

In order to measure terrorist recruitment, I follow a paper in the computer science literature by Scanlon and Gerber (2014) on the automatic detection of cyber-recruitment by violent extremists. The authors apply this method exclusively to one platform in English (Ansar AlJihad Network), while I collect also data from 6 additional Jihadi message boards,.

The following steps lead to construct an algorithm identifying whether a post presents recruitment material:

1. I use the same sample of random messages from the Ansar AlJihad Network used by Scanlon and Gerber (2014);

2. two judges in the US were asked to separately and independently evaluate whether each post presents the intent to recruit violent extremists to some group or movement;

3. the judges marked each post with a dummy for "*contains violent extremist recruitment*" (11%);

4. I create an algorithm using supervised learning and natural language processing to back out the textual regularities of "recruitment" posts using a support vector machine algorithm (SVM);

5. the algorithm codes a recruitment dummy to all messages and an additional dummy for recruitment messages that specifically focus on Pakistan.

This method replicates the work of thousands of judges in marking each post with a dummy for recruitment. To provide some anecdotal material, in Appendix D I report two messages that are graded as containing recruitment material by the algorithm. The performance of the algorithm is satisfactory, as it achieves an 82% success rate. It is initially trained on 80% of the original posts and marks correctly 82% of the remaining posts, not used for the initial training.

This constitutes an innovative way to measure terrorist recruitment, which may offer a useful method for future studies involving the use of experts in assessing third-party material. However, it is important to underline that this is a specific measure of recruitment and there exists alternative channels of recruitment beyond this specific record (e.g. recruitment through social media, interaction in public spaces, schools and religious events). At the same time, it is plausible that these measures are correlated and that this indicator captures the ability of terrorist groups to reach out to new recruits across various platforms and locations. I define a measure of recruitment intensity as the ratio between the number of posts identified as recruitment in quarter-year t, $Recruitment\ Messages_t$, and the total number of posts in the period, $Total\ Messages_t$, $Recruitment_t = \frac{Recruitment\ Messages_t}{Total\ Messages_t}$. In order to capture a measure that is more closely related to this specific setting, I focus on recruitment posts that specifically mention Pakistan, which may better proxy the specific recruitment intensity.

Table 11 reports the summary statistics on five key variables collected through the previous exercise: the number of messages exchanged on such Jihadist fora, the number of recruitment messages and those explicitly mentioning Pakistan, and the recruitment intensity considering both the global recruitment messages and those specific to Pakistan. In order to measure this variable, I aggregate the information on all messages for each quarter-year in which such information is available: respectively 47 periods, from the forth quarter of 2000 to the second quarter of 2012. The average number of messages per quarter-year is 53767.17, with a very high standard deviation and a large range. The algorithm measures 2943.01 recruitment messages per period (6.1 percent) and with a standard deviation that is very high, yet lower than for the

overall number of messages. Among these messages, only 594.42 on average explicitly discuss Pakistan (1 percent) and are used in the following empirical analysis.

Figure 9 reports the evolution over time both for the number of messages and recruitment intensity between 2000 and 2012. The overall number of messages is reported with a dashed blue line, while the intensity of recruitment through a solid red line. It is interesting to note the sharp increase in the number of messages around 2004, with a peak activity between 2006 and 2008 and then a slow decline as more and more messages move towards encrypted mobile apps. Interestingly, recruitment intensity seems to move inversely to the overall number of messages: high in periods of low number of messages, with an average of 8% before 2004, and lower in periods of many messages, with a mean of 5% from 2004 onward.

Table 11: Summary Statistics on Jihadist Messages and Recruitment

	(1)	(2)	(3)	(4)	(5)
Variable	Obs.	Mean	S.D.	Min	Max
Number of Messages	47	53767.17	39822.07	84	134728
Number of Recruitment Messages	47	2943.01	2194.27	9	8357
Number of Recruitment Messages on Pakistan	47	594.42	591.77	0	2369
Recruitment Intensity	47	0.061	0.016	0.040	0.107
Recruitment Intensity on Pakistan	47	0.010	0.006	0	0.026

Notes: This table presents the summary statistics for the overall number of messages exchanged in the platforms per quarter-year, the number of messages rated by the algorithm as containing recruitment material, the number of messages rated by the algorithm as containing recruitment material and explicitly mentioning Pakistan, the recruitment intensity defined as the ratio between the number of recruitment messages and total number of messages and finally the recruitment intensity on Pakistan, defined as the total number of recruitment messages on Pakistan divided by the overall number of messages. The information contained here is based on seven English-speaking platforms presented in Appendix C.

Having access to this information, I expand the model presented in equation (4)

$$Terror_{oct} = g_1 Sunni_o \times Silver_t + g_2 Sunni_o \times Ramadan_t +$$

$$+ g_3 Sunni_o \times Silver_t \times Ramadan_t + g_4 Sunni_o \times Recruitment_{t-1} +$$

$$+ g_5 Sunni_o \times Silver_t \times Recruitment_{t-1} + g_6 Sunni_o \times Ramadan_t \times Recruitment_{t-1} +$$

$$+ g_7 Sunni_o \times Silver_t \times Ramadan_t \times Recruitment_{t-1} + \iota_o + \iota_{ct} + \varepsilon_{oct} \quad (7)$$

and equation (7) regresses the probability of a terrorist attack by organization o in city c at time t on the same model presented in (4) using the Sunni organization dummy, $Sunni_o$, and embodied by the coefficients g_1, g_2 and g_3. I also introduce all the interactions with the recruitment intensity variable, that I standardize to simplify the coefficient interpretation and I lag by one quarter to consider it pre-determined to the funding shock, $Recruitment_{t-1}$. Given that I establish the organization-financing channel in Section 4.1, I do not include the interactions with the Sunni city dummy and absorb all remaining city-time variation through the corresponding fixed effects.

As a result, equation (7) evaluates an heterogeneity of the main Zakat effect on terrorism using the recruitment intensity of the previous quarter as given. This estimation should be

interpreted as follows: if the coefficient g_7 is statistically different from zero and positive, then the effects of financing on terrorist attacks are stronger in period in which organizations are particularly effective at recruiting individuals.

Table 12 reports the result of equation (7) analyzing the recruitment intensity in Pakistan and considering the universe of English speaking messages. Column (1) reports the results of equation (7), while in column (2) I add an organization-quarter fixed effect to account for seasonality and, finally, column (3) also includes a linear time trend per organization. In all cases the results on the triple interaction between $Sunni_o$, $Ramadan_t$ and $Silver_t$ and their quadruple interaction with $Recruitment_{t-1}$ are positive, statistically different from zero and large.

The first three coefficients of this table are analogous to those presented in Table 7, except the triple interaction between $Sunni_o$, $Ramadan_t$ and $Silver_t$ which reports a slightly larger point estimate, yet not statistically different from Table 7. This may be due to the fact that while the previous analysis was covering all quarter-years between 1992 and 2015, Table 12 only focuses on the period in which the recruitment variable can be calculated, hence between 2000 and 2012.

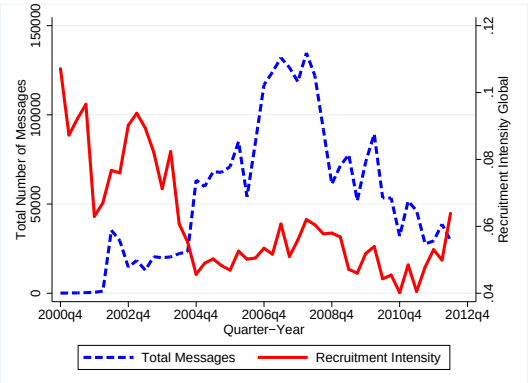
The most interesting effect comes from analysing the last coefficient of this table, the quadruple interaction between $Sunni_o$, $Ramadan_t$, $Silver_t$ and $Recruitment_{t-1}$, which is the only statistically significant effect among the last four. It implies a positive interaction between the financial shock of the terrorist group (as measured by the interaction between the variables $Sunni_o$, $Ramadan_t$ and $Recruitment_{t-1}$) and the ability to recruit new individuals (as measured by $Recruitment_{t-1}$). This interaction is large and not different from the main effect of the financing coefficient, $Sunni_c \times Ramadan_t \times Silver_t$. Such coefficient embodies a particularly important message for counter-terrorism strategies: a funding shock in periods of intense recruitment, one standard deviation higher, can generate an increase in attack twice as large as under average recruitment.

Table 12: Terrorism, Silver and Recruitment Intensity in Pakistan

	(1)	(2)	(3)
Variables	Probability of a Terrorist Attack		
$Sunni_o \times Silver_t$	0.000367	0.000241	-0.000422
	(0.000882)	(0.000831)	(0.000569)
$Sunni_o \times Ramadan_t$	0.000009***	0.000006	0.000004
	(0.000002)	(0.000178)	(0.000297)
$Sunni_o \times Silver_t \times$	0.000830***	0.00113***	0.000900*
$Ramadan_t$	(0.000234)	(0.000372)	(0.000445)
$Sunni_o \times Recruitment_{t-1}$	0.000330	0.000355	0.000252
	(0.000322)	(0.000323)	(0.000237)
$Sunni_o \times Silver_t$	-0.00006	-0.000109	-0.000294
$\times Recruitment_{t-1}$	(0.000304)	(0.000310)	(0.000268)
$Sunni_o \times Ramadan_t \times$	0.000277	0.000319	0.000211
$Recruitment_{t-1}$	(0.000196)	(0.000227)	(0.000159)
$Sunni_o \times Silver_t \times$	0.000722**	0.000869**	0.000593**
$Ramadan_t \times Recruitment_{t-1}$	(0.000355)	(0.000394)	(0.000293)
Organization FE	Yes	Yes	Yes
City-Quarter-Year FE	Yes	Yes	Yes
Organization-Quarter FE		Yes	Yes
Organization Linear Time Trend			Yes
Obs.	455,900	455,900	455,900
Mean Dep. Var.	0.0009	0.0009	0.0009

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is an organization o in city c in quarter-year t. Organization and City- Quarter-Year fixed effects are present in all columns, column (2) adds an organization-quarter fixed effect and column (3) also an organization linear time trend. Standard errors are two-way clustered at the level of the city, organization and time. The dependent variable is the probability of a terror attack. This is regressed over a dummy taking unit value for Sunni organizations, $Sunni_o$; the price of silver at the announcement of the Zakat threshold, $Silver_t$; a dummy taking unit value for the quarter in which Ramadan takes place and the following quarter, $Ramadan_t$, and a measure of terrorist recruitment lagged by one period, $Recruitment_{t-1}$. In order to simplify the interpretation of the coefficients, the price of silver and the recruitment variable are standardized, hence I subtract the corresponding means across all periods and divide by the standard deviations. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Figure 9: Total Number of Messages and Recruitment Intensity



Notes: This picture shows the evolution of the total number of messages through the blue dashed line (left y-axis) and the measure of recruitment intensity through the solid red line (right x-axis). Both of these measures are calculated using the universe of messages from English-speaking platforms.

5 Placebo and Robustness Checks

5.1 Placebo

My identification strategy relies on silver affecting the funding of terrorist organizations through the charity donations at Ramadan and this effect being uniquely associated to the silver-related levy induced by the threshold. The lead-and-lag analysis and the difference-in-difference-in-difference specification provided evidence that silver prices in Sunni-majority cities do not have an effect on terrorism outside the Ramadan quarters. However, it could be argued that this effect may be present in any other Islamic festivity. For example, suppose that the wealth of terrorist organizations is placed in an asset that correlates with commodities during festivities, then an analogous result could take place. It could also be imagined that any other period might lead to replicate the results of Section 3.

In this Section I exploit another Islamic celebration: Eid Adha. This also relies on the Lunar calendar and takes place every year. It celebrates the submission of Abraham to God following his attempt to kill his only son, Isaac, and the appearance of angel Gabriel (Jibra'il in the Islamic tradition, also meaning Holy Spirit) to stop this from taking place at the last moment. This festivity is home to several festivals and family gatherings. This celebration is ideal, because it is comparable to the beginning of Ramadan in terms of importance and individual consumption. Because these variables may affect terrorist behaviour or interact with silver prices beyond the levy, then I can use this celebration to replicate the difference-in-difference-in-difference model presented by equation (3) and Table (4) and evaluate the following model

$$Terror_{ct} = g_1 Sunni_c \times Silver_t^{Eid\ Adha} + g_2 Sunni_c \times Eid\ Adha_t +$$

$$+ g_3 Sunni_c \times Silver_t^{Eid\ Adha} \times Eid\ Adha_t + \iota_c + \iota_t + r_{ct}$$

in this expression I regress the previous terror variables (probability of attacks, number of attacks, killed and wounded) on the same variables defined in equation (3), with two important differences: 1) the price of silver in this expression is calculated in the two days before the Eid Adha celebration, $Silver_t^{Eid\ Adha}$, as done for the Zakat threshold; 2) I define the quarter in which Eid Adha takes place and the subsequent quarter with a dummy, $Eid\ Adha_t$, similarly to what I did for Ramadan.

In addition to the previous model, I also present a specification that includes both the Ramadan and Adha specifications

$$Terror_{ct} = h_1 Sunni_c \times Silver_t^{Ramadan} + h_2 Sunni_c \times Ramadan_t +$$

$$+ h_3 Sunni_c \times Silver_t^{Ramadan} \times Ramadan_t + h_4 Sunni_c \times Silver_t^{Eid\ Adha} +$$

$$+ h_5 Sunni_c \times Eid\ Adha_t + h_6 Sunni_c \times Silver_t^{Eid\ Adha} \times Eid\ Adha_t + \iota_c + \iota_t + s_{ct}$$

hence I can directly compare the effects of the two treatments relative to quarters that neither include the Ramadan nor the Eid Adha dummy, which are 23.96% of the sample. In this specification, I separately analyze the Ramadan period by reporting the price of silver at the announcement of the Zakat threshold, $Silver_t^{Ramadan}$, and the quarter of Ramadan and following, $Ramadan_t$, and then the corresponding variables for Eid Adha, $Eid\ Adha_t$ and $Silver_t^{Eid\ Adha}$.

Table 13 reports the first specification, in which I cannot reject a zero for neither of the coefficients. Beyond the rejection of the triple interaction due to statistical significance, it is important to note that while the coefficients for the interaction between $Sunni_c \times Silver_t^{Eid\ Adha}$ and $Sunni_c \times Silver_t^{Eid\ Adha} \times Adha_t$ are positive for the probability of a terrorist attack and the number of attacks, these numbers are negative for the number of killed and wounded. This is different from the baseline results of Table 4, in which all of these coefficients were positive. Table 14 directly compares the two periods, by exploiting the fact that there are quarters over the 24 years that are not included in neither celebration. As it is evident from all columns, while the coefficients on the Ramadan variable stay unaffected or become marginally more precise, the coefficients on the Eid Adha celebration cannot be rejected to be statistically different from zero.

Table 13: Eid Adha and Silver

Variables	(1) Terror Dummy	(2) Attacks Ln(1+Num)	(3) Killed Ln(1+Num)	(4) Wounded Ln(1+Num)
$Sunni_c \times Silver_t^{Eid\ Adha}$	0.00384	0.00448	0.00261	0.000503
	(0.00292)	(0.00408)	(0.00426)	(0.00499)
$Sunni_c \times Eid\ Adha_t$	0.00199	0.000762	-0.00238	-0.000597
	(0.00159)	(0.00157)	(0.00222)	(0.00268)
$Sunni_c \times Silver_t^{Eid\ Adha} \times$	0.00196	0.000270	-0.00367	-0.000467
$Eid\ Adha_t$	(0.00227)	(0.00212)	(0.00299)	(0.00342)
City, Quarter-Year FE	Yes	Yes	Yes	Yes
Obs.	148320	148320	148320	148320
Adj. R sq.	0.183	0.280	0.211	0.213
Mean Dep. Var.	0.0314	0.0311	0.0270	0.0305
S.D. Dep. Var.	0.175	0.198	0.237	0.277

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is a city c in quarter-year t. City and Quarter-Year fixed effects are present in all columns and standard errors are clustered at the city level. The dependent variables are: the probability of a terror attack in Column (1), Terror Dummy; the natural logarithm of the number of terrorist attacks in Column (2), Attacks $Ln(1+N)$; the natural logarithm of the number of terrorist-related killed individuals in Column (3), Killed $Ln(1+N)$; the natural logarithm of the number of terrorist-related wounded individuals in Column (4), Wounded $Ln(1+N)$. These are regressed over a dummy taking unit value in Sunni-majority cities, $Sunni_c$; the price of silver two days before the beginning of Eid Adha, $Silver_t^{Eid\ Adha}$; a dummy taking unit value for the quarter in which Eid Adha takes place and the following quarter, $Eid\,Adha_t$. In order to simplify the interpretation of the coefficients, the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table 14: Ramadan, Adha and Silver

Variables	(1) Terror Dummy	(2) Attacks Ln(1+Num)	(3) Killed Ln(1+Num)	(4) Wounded Ln(1+Num)
$Sunni_c \times Silver_t^{Ramadan}$	0.00201	0.000816	-0.00303	0.00201
	(0.00355)	(0.00342)	(0.00472)	(0.00539)
$Sunni_c \times Ramadan_t$	0.00322**	0.00149	0.000458	0.00101
	(0.00157)	(0.00147)	(0.00193)	(0.00205)
$Sunni_c \times Silver_t^{Ramadan} \times$	0.00700***	0.00469**	0.00472*	0.00508*
$Ramadan_t$	(0.00221)	(0.00203)	(0.00282)	(0.00288)
$Sunni_c \times Silver_t^{Eid\ Adha}$	-0.00111	0.00166	0.00350	-0.00366
	(0.00428)	(0.00482)	(0.00588)	(0.00727)
$Sunni_c \times Adha_t$	0.00172	0.000539	-0.00288	-0.000772
	(0.00165)	(0.00167)	(0.00230)	(0.00273)
$Sunni_c \times Silver_t^{Eid\ Adha} \times$	0.000979	-0.000384	-0.00449	-0.00108
$Adha_t$	(0.00231)	(0.00220)	(0.00302)	(0.00348)
City, Quarter-Year FE	Yes	Yes	Yes	Yes
Obs.	148320	148320	148320	148320
Adj. R sq.	0.183	0.280	0.211	0.213
Mean Dep. Var.	0.0314	0.0311	0.0270	0.0305
S.D. Dep. Var.	0.175	0.198	0.237	0.277

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is a city c in quarter-year t. City and Quarter-Year fixed effects are present in all columns and standard errors are clustered at the city level. The dependent variables are: the probability of a terror attack in Column (1), Terror Dummy; the natural logarithm of the number of terrorist attacks in Column (2), Attacks $Ln(1+N)$; the natural logarithm of the number of terrorist-related killed individuals in Column (3), Killed $Ln(1+N)$; the natural logarithm of the number of terrorist-related wounded individuals in Column (4), Wounded $Ln(1+N)$. These are regressed over a dummy taking unit value in Sunni-majority cities, $Sunni_c$; the price of silver at the announcement of the Zakat threshold, $Silver_t^{Ramadan}$; a dummy taking unit value for the quarter in which Ramadan takes place and the following quarter, $Ramadan_t$; the price of silver two days before the beginning of Eid Adha, $Silver_t^{Eid\ Adha}$; a dummy taking unit value for the quarter in which Eid Adha takes place and the following quarter, $Eid\ Adha_t$. In order to simplify the interpretation of the coefficients, the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

5.2 Robustness Checks

In this section, I extend the previous results and explore a number of potential alternative factors and interpretations. The first four re-examine the key results presented in Table 4 on the relation between local level financing and attacks. I show their robustness to additional information on city-level seasonality and state-specific trends. Then, I verify that silver prices account for most of the variation by replacing the silver variable with time fixed effects and highlight that neither silver nor other metallic commodities (e.g. Gold, Tin, Copper) affect terrorism outside the Ramadan period. In the second set of checks, I show that the findings of Table 7 on the supply of terrorism are robust to the alternative coding of two terrorist groups, which may be controversial, and taking into account issues of common support across Sunni and non-Sunni terrorist groups.

First, given that Ramadan begins in different quarters across years, I can further exploit this empirical design to remove seasonality. On the one hand, I am already controlling for quarter-year fixed effects that remove any common shock that affects all cities in every quarter of every year (hence including the country-wide seasonality). On the other hand, I can further refine this result by controlling for the city-specific seasonality by including an interaction between

the city fixed effect and a quarter fixed effect (that takes 1 for January-March, 2 for April-June, et cetera). This adds an additional layer of 6,180 fixed effects (1,545 city fixed effects times 4 quarter fixed effects) that allow to net out possible local confounding factors (e.g. local agricultural cycle, local rain season, et cetera), which may independently affect terrorism via income shocks. Table 15 presents these results: the coefficients do not react, neither in sign nor in magnitude. Only the coefficient on the triple interaction in column (4), that was marginally significant at 10%, slightly exceeds this level.

Second, I deepen the set of common shocks that are removed. While in Table 4 I remove shocks common to all Pakistani cities over time through the time fixed effects, in Table 16 I remove state-specific time-varying common shocks by adding a state × quarter-year fixed effect. This is important if there is a concern that the main results are driven by a specific set of cities that are hit by repeated and state-specific shocks. As Table 16 highlights, the results are in line with Table 13 and 4, again the only coefficient that marginally changes is the triple interaction on the number of wounded, that was marginally significant in Table 4 and now is above the 10% level.

Third, I replicate the results of Table 4 and replace the triple interaction with an interaction between the Sunni-majority dummy, the Ramadan dummy and a set of quarter-year fixed effects instead of silver. I subsequently verify that silver is highly correlated with the resulting coefficients and explain the majority of the variation, this parallels the work of Crost et al. (2016) with Cavendish banana prices and conflict intensity in the Philippines. Instead of equation (2), I estimate

$$Terror_{ct} = \beta\, Sunni_c \times Silver_t + \sum_{j=1}^{96} \theta_j Sunni_c \times Ramadan_t \times \iota_t + \iota_c + \iota_t + \varepsilon_{ct} \qquad (8)$$

in which the coefficients θ_j capture the differential probabilities of a terrorist attack in Sunni-majority cities during Ramadan quarters across the different quarter-year periods. If silver prices affect these probabilities, then the θ_j coefficients should match the evolution of silver prices. Figure 10 plots θ_j coefficients from equation (8) next to the time series of silver prices, on the left panel, and their correlation through a scatterplot on the right. The left panel shows that the coefficients and silver evolve similarly over time. This is clearer in the scatter-plot that illustrates their correlation, which is high (0.51) and statistically different from zero at less than 1 percent. These two pieces of evidence point toward silver being the key driver of the increase in terrorist attacks observed in Table 4 and throughout this paper.

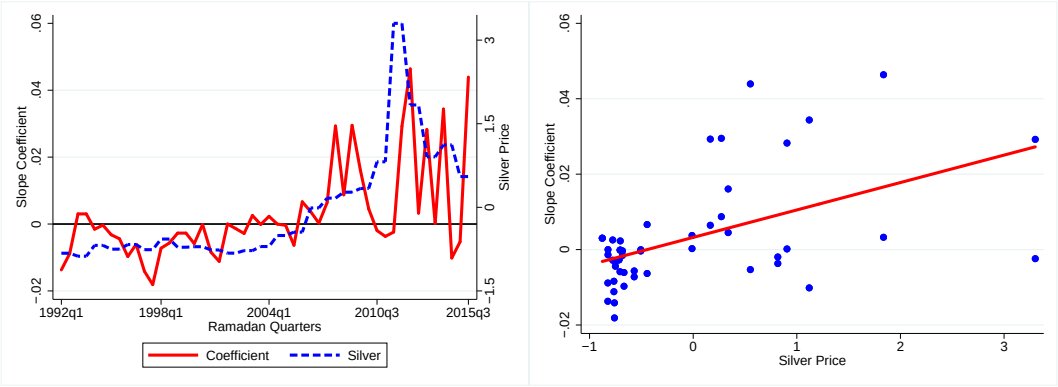
Forth, the role of silver prices in promoting terrorist attacks are driven by the specific structure of the Zakat levy. Because metallic commodities are highly correlated and their prices co-move, it would not be possible to repeat the analysis presented in Table 4 during Ramadan using alternative commodities, as the independent information that each commodity brings is negligible and all are highly correlated with silver. The Eid Adha placebo offers one way to tackle the problem of identification, verifying that in an alternative celebration there is no silver effect, given the lack of a silver-induced tax. In Table 17, I provide additional evidence that neither silver nor other metallic commodities (e.g. Gold, Tin, Copper) have a differential

effect on terrorist attacks outside of Ramadan. Hence I replicate the structure of equation (3), restricting my sample to exclude the Ramadan quarters and combining the time-series variation in different commodity prices with the cross-sectional variation in Sunni cities. The results point toward both negligible magnitudes for all commodities and the inability to reject a zero under all specifications.

Fifth, Table 7 shows that among the 20 terrorist organizations that are followed across 485 cities in 96 quarter years, 15 are Sunni and only 5 are non-Sunni. As a result, it may be disputed that the results of Table 7 are due to a possible lack of action by non-Sunni groups in certain years, implying a lack of common support. In Figure 11, I plot the time-series of the log number of terrorist attacks by Sunni groups (solid blue line, on left y-axis) and by non-Sunni groups (dashed red line, on right y-axis) across all Pakistan over the whole period 1992 to 2015. This picture highlights that the evolution of Sunni and non-Sunni groups does not seem to differ particularly except for the years 2006, 2007, 2008 and 2009. In order to show that the results of Table 7 are not driven by this period in which non-Sunni groups are not active, I replicate the table by excluding those years and as Table 18 shows, the results are unaffected in significance, sign and point estimate.

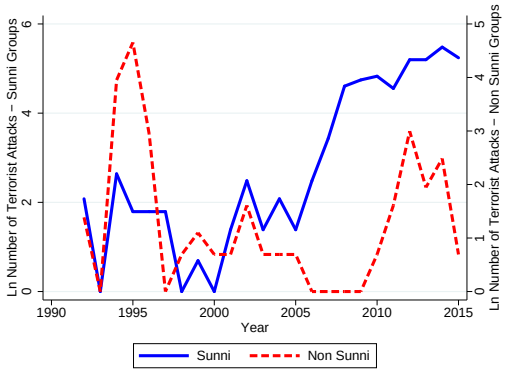
Sixth, the classification of terrorist groups into Sunni and non-Sunni was particularly labour-intensive, as it required reading the documentation of various sources per each group and matching hundreds of small organizations to their corresponding umbrella organization. The list of groups presented in Table 6 offers an aggregation and is documented in detail in Appendix C. Among the groups described in that table, there are two organizations whose classification may be disputed: the Muttahida Qami Movement and Tribesmen Group. The former is a political group, with no particular references of sectarian or religious objectives and as a result has been set as non-Sunni. The latter operates in the North of the country, in which the majority of the Muslim population professes the Shia school and there are many Animist-majority cities and groups, which led to a non-Sunni classification. However, it may be argued that both groups have a disputable classification or may present a non-negligible share of Sunni operatives. As a result, Table 19 replicates the results of Table 7 for Column (1) and (3) in the following two scenarios: 1) I re-code both groups as Sunni and columns (1) and (2) of Table 19 report these coefficients - the point estimates are slightly larger but marginally less precise; 2) I exclude both groups and columns (3) and (4) of Table 19 display these results - also in this case the magnitudes are slightly higher but the results are not statistically different than those in Table 7.

Figure 10: Terrorist Attacks and Silver Prices



Notes: The left panel of this picture shows the evolution of silver prices, through the dashed blue line, and the θ_j coefficients from Equation 8. These capture the differential probabilities of a terrorist attack in a Sunni-majority city in Ramadan quarters. The right panel shows a scatterplot between the θ_j coefficients from Equation 8 and the price of silver, the correlation between these two is 0.51 and is statistically significant at less than 1 percent.

Figure 11: Number of Terrorist Attacks for Sunni and Non-Sunni Groups



Notes: This picture shows the evolution in the natural logarithm of one plus the number of terrorist attacks claimed by Sunni and non-Sunni groups between 1992 and 2015. The solid blue line shows the attacks by Sunni groups, as described in Table 6 and reported on the left y-axis; the dashed red line reports the attacks by Non-Sunni groups and is described by the right y-axis.

Table 15: Terrorist Attacks, Sunni Cities, Silver and City Seasonalities

Variables	(1) Terror Dummy	(2) Attacks Ln(1+N)	(3) Killed Ln(1+N)	(4) Wounded Ln(1+N)
$Sunni_c \times Silver_t$	0.00163	0.00237	-0.000759	-0.00179
	(0.00293)	(0.00405)	(0.00427)	(0.00474)
$Sunni_c \times Ramadan_t$	0.00393**	0.00218	0.00147	0.00107
	(0.00170)	(0.00160)	(0.00214)	(0.00231)
$Sunni_c \times Silver_t \times$	0.00630***	0.00430**	0.00340	0.00521
$Ramadan_t$	(0.00243)	(0.00211)	(0.00308)	(0.00341)
City, Quarter-Year FE	Yes	Yes	Yes	Yes
City × Quarter FE	Yes	Yes	Yes	Yes
Obs.	148320	148320	148320	148320
Adj. R sq.	0.183	0.280	0.211	0.213
Mean Dep. Var.	0.0314	0.0311	0.0270	0.0305
S.D. Dep. Var.	0.175	0.198	0.237	0.277

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is a city c in quarter-year t. City, Quarter-Year and City × Quarter fixed effects are present in all columns and standard errors are clustered at city level. The dependent variables are: the probability of a terror attack in Column (1), Terror Dummy; the natural logarithm of the number

of terrorist attacks in Column (2), Attacks $Ln(1+N)$; the natural logarithm of the number of terrorist-related killed individuals in Column (3), Killed $Ln(1+N)$; the natural logarithm of the number of terrorist-related wounded individuals in Column (4), Wounded $Ln(1+N)$. These are regressed over a dummy taking unit value in Sunni-majority cities, $Sunni_c$; the price of silver at the announcement of the Zakat threshold, $Silver_t$; a dummy taking unit value for the quarter in which Ramadan takes place and the following quarter, $Ramadan_t$. In order to simplify the interpretation of the coefficients, the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table 16: Terrorist Attacks, Sunni Cities, Silver and State Time-Varying Shocks

Variables	(1) Terror Dummy	(2) Attacks Ln(1+N)	(3) Killed Ln(1+N)	(4) Wounded Ln(1+N)
$Sunni_c \times Silver_t$	-0.00144	-0.000861	-0.00399	-0.00566
	(0.00324)	(0.00453)	(0.00484)	(0.00548)
$Sunni_c \times Ramadan_t$	0.00337**	0.00197	0.000413	0.00128
	(0.00169)	(0.00162)	(0.00211)	(0.00217)
$Sunni_c \times Silver_t \times$	0.00627***	0.00413**	0.00333	0.00498
$Ramadan_t$	(0.00236)	(0.00213)	(0.00316)	(0.00321)
City, Quarter-Year FE	Yes	Yes	Yes	Yes
State × Quarter-Year FE	Yes	Yes	Yes	Yes
Obs.	148320	148320	148320	148320
Adj. R sq.	0.191	0.287	0.216	0.219
Mean Dep. Var.	0.0314	0.0311	0.0270	0.0305
S.D. Dep. Var.	0.175	0.198	0.237	0.277

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is a city c in quarter-year t. City, Quarter-Year and State × Quarter-Year fixed effects are present in all columns and standard errors are clustered at the city level. The dependent variables are: the probability of a terror attack in Column (1), Terror Dummy; the natural logarithm of the number of terrorist attacks in Column (2), Attacks $Ln(1+N)$; the natural logarithm of the number of terrorist-related killed individuals in Column (3), Killed $Ln(1+N)$; the natural logarithm of the number of terrorist-related wounded individuals in Column (4), Wounded $Ln(1+N)$. These are regressed over a dummy taking unit value in Sunni-majority cities, $Sunni_c$; the price of silver at the announcement of the Zakat threshold, $Silver_t$; a dummy taking unit value for the quarter in which Ramadan takes place and the following quarter, $Ramadan_t$. In order to simplify the interpretation of the coefficients, the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table 17: Terrorist Attacks, Sunni Cities and Commodities out of Ramadan

Variables	(1) Terror Dummy	(2) Attacks Ln(1+N)	(3) Killed Ln(1+N)	(4) Wounded Ln(1+N)
$Sunni_c \times Silver_t$	-0.00579	-0.00322	-0.00565	-0.00248
	(0.00419)	(0.00406)	(0.00576)	(0.00683)
$Sunni_c \times Gold_t$	-0.00219	-0.00207	-0.00214	-0.00512
	(0.00700)	(0.00755)	(0.00811)	(0.0101)
$Sunni_c \times Copper_t$	0.00320	0.00310	0.00343	0.00374
	(0.00300)	(0.00308)	(0.00318)	(0.00391)
$Sunni_c \times Tin_t$	0.00753	0.00564	0.00456	0.00302
	(0.00542)	(0.00515)	(0.00670)	(0.00736)
City FE	Yes	Yes	Yes	Yes
Quarter-Year FE	Yes	Yes	Yes	Yes
Obs.	71070	71070	71070	71070
Adj. R sq.	0.184	0.277	0.211	0.206

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is a city c in quarter-year t. City and Quarter-Year fixed effects are present in all columns and standard errors are clustered at the city level. The dependent

variables are: the probability of a terror attack in Column (1), Terror Dummy; the natural logarithm of the number of terrorist attacks in Column (2), Attacks $Ln(1+N)$; the natural logarithm of the number of terrorist-related killed individuals in Column (3), Killed $Ln(1+N)$; the natural logarithm of the number of terrorist-related wounded individuals in Column (4), Wounded $Ln(1+N)$. These are regressed over a sample that excludes all quarters of Ramadan and the following to verify the lack of a differential effect of commodity prices on terror out of Ramadan. The terror attacks variable are regressed over interactions of the dummy taking unit value in Sunni-majority cities, $Sunni_c$, with the mean quarterly price of Silver, Gold, Copper and Tin. In order to simplify the interpretation of the coefficients, all of these commodity prices are standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table 18: Organizations and Attacks - Excluding 2006-2009

	(1)	(2)	(3)
Variables	Probability of a Terrorist Attack		
$Sunni_c \times Silver_t$	-0.000502	-0.000502	
	(0.000363)	(0.000366)	
$Sunni_c \times Ramadan_t$	0.000004	0.000004	
	(0.000110)	(0.000110)	
$Sunni_c \times Silver_t \times$	0.000135	0.000135	
$Ramadan_t$	(0.000130)	(0.000130)	
$Sunni_o \times Silver_t$	0.000778		0.000778
	(0.000980)		(0.000979)
$Sunni_o \times Ramadan_t$	0.000137		0.000137
	(0.000147)		(0.000146)
$Sunni_o \times Silver_t \times$	0.000567**		0.000567**
$Ramadan_t$	(0.000252)		(0.000249)
City FE	Yes	Yes	Yes
Organization FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
City-Time FE			Yes
Organization-Time FE		Yes	
Obs.	931,200	931,200	931,200
Adj. R sq.	0.0171	0.0373	0.0149
Mean Dep. Var.	0.0009	0.0009	0.0009
S.D. Dep. Var.	0.0311	0.0311	0.0311

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is an organization o in city c in quarter-year t. Organization, City and Quarter-Year fixed effects are present in all columns, column (2) also introduces organization-time fixed effects, while column (3) adds city-time fixed effects. All quarter-years between 2006 and 2009 are not present in this sample, due to the few attacks claimed by non-Sunni terrorist groups. Standard errors are two-way clustered at city and organization. The dependent variable is the probability of a terror attack. This is regressed over a dummy taking unit value in Sunni-majority cities, $Sunni_c$; a dummy taking unit value for Sunni organizations, $Sunni_o$; the price of silver at the announcement of the Zakat threshold, $Silver_t$; a dummy taking unit value for the quarter in which Ramadan takes place and the following quarter, $Ramadan_t$. In order to simplify the interpretation of the coefficients, the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table 19: Organizations and Attacks - Religious Affiliation

	Sunni Group		Excluded	
	(1)	(2)	(3)	(4)
Variables	Probability of a Terrorist Attack			
$Sunni_c \times Silver_t$	-0.000459		-0.000552	
	(0.000327)		(0.000366)	
$Sunni_c \times Ramadan_t$	0.000007		0.000006	
	(0.000009)		(0.0001080)	
$Sunni_c \times Silver_t \times$	0.000124		0.000139	
$Ramadan_t$	(0.000121)		(0.000132)	
$Sunni_o \times Silver_t$	0.000439	0.000439	0.000573	0.000573
	(0.000937)	(0.000937)	(0.00104)	(0.00104)
$Sunni_o \times Ramadan_t$	0.000169	0.000169	0.000162	0.000162
	(0.000134)	(0.000132)	(0.000138)	(0.000136)
$Sunni_o \times Silver_t \times$	0.000631*	0.000631*	0.000675*	0.000675*
$Ramadan_t$	(0.000359)	(0.000357)	(0.000361)	(0.000360)
Organization FE	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
City-Time FE		Yes		Yes
Obs.	931200	931200	838080	838080
Adj. R sq.	0.0170	0.0147	0.0170	0.0150
Mean Dep. Var.	0.000968	0.000968	0.00104	0.00104
S.D. Dep. Var.	0.0311	0.0311	0.0322	0.0322

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is an organization o in city c in quarter-year t. Organization, City and Quarter-Year fixed effects are present in all columns, columns (2) and (4) add city-time fixed effects. Standard errors are two-way clustered at city and organization. The dependent variable is the probability of a terror attack. The coding of two terrorist organizations that were reported as non-Sunni in Tables 6 and 7 are changed to Sunni in columns (1) and (2) and excluded from the sample in columns (3) and (4). The dependent variable is the probability of a terror attack. This is regressed over a dummy taking unit value in Sunni-majority cities, $Sunni_c$; a dummy taking unit value for Sunni organizations, $Sunni_o$; the price of silver at the announcement of the Zakat threshold, $Silver_t$; a dummy taking unit value for the quarter in which Ramadan takes place and the following quarter, $Ramadan_t$. In order to simplify the interpretation of the coefficients, the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

6 Concluding Remarks

This paper provides quantitative evidence on the link between terrorism financing and attacks, which documents the existence of credit constraints and storage frictions of terrorist organizations. Pakistan offers the ideal setting to verify this relation because of a unique natural experiment that induces exogenous variation in a specific source of terrorism financing over time and across cities due to a Sharia-compliant obligation. I build a variety of novel databases, in particular a panel that follows 1,545 cities over 96 quarter-year periods between 1992 and 2015. Through this, I verify that cities with exogenously higher terrorism financing experience more terrorist attacks. I also find that terrorists tend to attack mainly through capital intensive attacks (e.g. bombings and chemical, biological and radiological weapons).

I introduce two methods to investigate the underlying mechanism behind this natural experiment and advance the identification of an organization-financing channel. First, I set up a

panel that follows 485 cities and 20 terrorist organizations over 96 quarter-year periods. This novel method allows dissecting the demand and supply of terrorist attacks by: 1) studying the within-city and within-organization variation; 2) coding each organization as being a potential recipient of such exogenous increase in terrorism financing. I find that the entire effect of terrorism financing on terrorist attacks is due to a temporary increase in the supply for terrorist attacks by extremist organizations. This source of variation, combined with the individual data on charity donations, leads to estimating the elasticity of terrorist attacks to financing, both through an OLS and IV approach. The OLS estimation leads to a 0.02 coefficient, while the IV estimate is larger, 0.08, and implies a significantly stronger impact of finance on terrorism. Second, I measure terrorist recruitment by analyzing data from the dark web on Jihadist fora using a machine-learning algorithm. Through this procedure I verify that in periods of higher terrorist recruitment, there is a significantly larger effect of terrorism financing on attacks. Such result is compatible with a complementarity between labour and capital in the production function of terrorist attacks.

These results provide an original insight to the literature on the organizational economics of terrorist and violent groups, as well as informing policy makers on a key element behind counter-terrorist strategy and the oversight of charitable organizations. Finally, the two novel methods could be exploited in other settings. First, the organization-city variation may be useful for other studies on conflict and violence to deepen the understanding of the mechanisms driving such events. Second, the machine-learning approach may allow to identify and study various issues, for instance cyber crime and illicit financial transactions.

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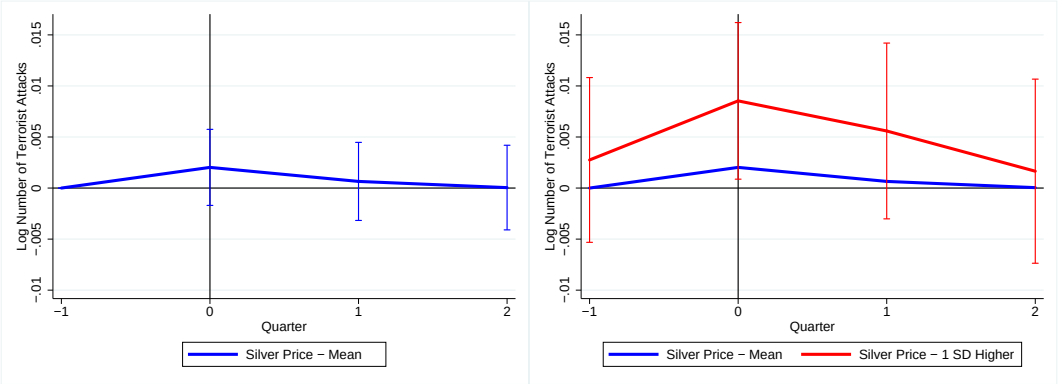
Appendix

Appendix A - Additional Material on the Empirical Model

Figure A1: Number of Attacks and Lead-and-Lag



Notes: Both panels show the differential evolution in the log number of terrorist attacks between Sunni-majority and non Sunni-majority cities across different quarters around Ramadan. The x-axis measures the quarter prior to Ramadan (-1), of Ramadan (0), following Ramadan (1) and two quarters following Ramadan (2). The vertical line in 0 corresponds to the quarter of Ramadan. The left panel shows the log number of terrorist attacks in a Sunni-majority city when silver prices are at the mean, while the right panel exhibits the same coefficients when silver is one standard deviation above the mean. Equation (2) presents the equation behind these panels and Table A1 contains the corresponding coefficients. The bars around each observation represent the 95% confidence interval and standard errors are clustered at city level.

Table A1: The Probability and Number Terrorist Attacks - Lead and Lag Coefficients

Variables	(1) Terror Dummy	(2) Number of Attacks Ln(1+N)
$Ramadan\ Quarter\ 0 \times Sunni_c$	0.00252	0.00232
	(0.00215)	(0.00203)
$Ramadan\ Quarter\ 1 \times Sunni_c$	0.00300	0.00122
	(0.00217)	(0.00221)
$Ramadan\ Quarter\ 2 \times Sunni_c$	-0.000539	-0.000141
	(0.00232)	(0.00230)
$Ramadan\ Quarter\ -1 \times Sunni_c \times Silver_t$	0.00255	0.00260
	(0.00303)	(0.00407)
$Ramadan\ Quarter\ 0 \times Silver_t \times Sunni_c$	0.00996***	0.00773*
	(0.00302)	(0.00415)
$Ramadan\ Quarter\ 1 \times Silver_t \times Sunni_c$	0.00761**	0.00618
	(0.00329)	(0.00466)
$Ramadan\ Quarter\ 2 \times Silver_t \times Sunni_c$	-0.000153	0.00202
	(0.00360)	(0.00483)
City FE	Yes	Yes
Quarter-Year FE	Yes	Yes
Obs.	148320	148320
Adj. R sq.	0.183	0.265
Mean Dep. Var.	0.0314	0.0311
S.D. Dep. Var.	0.175	0.198

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is a city c in quarter-year t. City and Quarter-Year fixed effects are present in all columns and standard errors are clustered at the city level. The dependent variables are: the probability of a terror attack in Column (1), Terror Dummy and the natural logarithm of the number of terrorist attacks in Column (2), Attacks $Ln(1+N)$. These are regressed over a dummy taking unit value in Sunni-majority cities, $Sunni_c$; the price of silver at the announcement of the Zakat threshold, $Silver_t$; a series of dummies taking unit value for the quarter before Ramadan (-1), Ramadan (0), one quarter after Ramadan (1) and two quarters after Ramadan (2). The omitted category is the quarter before Ramadan for Sunni-majority cities given an average price of silver. In order to simplify the interpretation of the coefficients, the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Appendix B - Non-Capital Intensive Attacks and Silver

Table B1: The Probability of Non-Capital Intensive Attacks and Silver

Variables	(1) Armed Assault Dummy	(2) Infra Attack Dummy	(3) Hijacking Dummy	(4) Hostage Taking Dummy	(5) Hostage Kidnapping Dummy
$Sunni_c \times$	0.000192	-0.000128	0.000004	-0.000109	-0.00108
$Silver_t$	(0.00154)	(0.000412)	(0.000003)	(9.16e-05)	(0.000944)
$Sunni_c \times$	-0.000415	0.000398	-6.71e-05	0.000117	-1.17e-05
$Ramadan_t$	(0.000976)	(0.000395)	(0.000108)	(0.000141)	(0.000594)
$Sunni_c \times$	0.00162	0.000215	8.27e-05	0.000168	0.000772
$Silver_t \times$	(0.00129)	(0.000550)	(0.000114)	(0.000140)	(0.000813)
$Ramadan_t$					
City FE	Yes	Yes	Yes	Yes	Yes
Quarter-Year FE	Yes	Yes	Yes	Yes	Yes
Obs.	148320	148320	148320	148320	148320
Adj. R sq.	0.115	0.0385	-0.000119	0.00242	0.0622
Mean Dep. Var.	0.0104	0.00140	0.000108	0.000162	0.00353
S.D. Dep. Var.	0.101	0.0373	0.0104	0.0127	0.0593

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is a city c in quarter-year t. City and Quarter-Year fixed effects are present in all columns and standard errors are clustered at the city level. The dependent variables are: the probability of a terror attack through an armed assault in Column (1), Armed Assault Dummy; the probability of a terror attack through an infrastructure attack in Column (2), Infra Attack Dummy; the probability of an hijacking attack in Column (3), Hijacking Dummy; the probability of an attack involving hostage-taking in Column (4), Hostage Taking Dummy; the probability of an attack involving hostage-kidnapping in Column (5), Hostage Kidnapping Dummy. These are regressed over a dummy taking unit value in Sunni-majority cities, $Sunni_c$; the price of silver at the announcement of the Zakat threshold, $Silver_t$; a dummy taking unit value for the quarter in which Ramadan takes place and the following quarter, $Ramadan_t$. In order to simplify the interpretation of the coefficients, the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table B2: The Number of Non-Capital Intensive Terrorist Attacks and Silver

Variables	(1) Ln(1+N) Armed Assault	(2) Ln(1+N) Infra Attack	(3) Ln(1+N) Hijacking	(4) Ln(1+N) Hostage Taking	(5) Ln(1+N) Hostage Kidnapping
$Sunni_c \times$	-0.000163	-8.68e-05	2.80e-05	-9.30e-05	-0.000794
$Silver_t$	(0.00191)	(0.000348)	(1.79e-05)	(7.02e-05)	(0.000838)
$Sunni_c \times$	-3.79e-05	0.000419	-4.65e-05	0.000103	-8.72e-05
$Ramadan_t$	(0.000788)	(0.000330)	(7.51e-05)	(0.000104)	(0.000468)
$Sunni_c \times$	0.00112	0.000339	5.73e-05	0.000134	0.000501
$Silver_t \times$	(0.00106)	(0.000439)	(7.87e-05)	(0.000101)	(0.000674)
$Ramadan_t$					
City FE	Yes	Yes	Yes	Yes	Yes
Quarter-Year FE FE	Yes	Yes	Yes	Yes	Yes
Obs.	148320	148320	148320	148320	148320
Adj. R sq.	0.225	0.0449	-0.000119	0.00213	0.0742
Mean Dep. Var.	0.00919	0.00111	7.48e-05	0.000117	0.00279
S.D. Dep. Var.	0.102	0.0311	0.00720	0.00935	0.0488

Notes: This table presents ordinary least squares (OLS) estimates, where the unit of observation is a city c in quarter-year t. City and Quarter-Year fixed effects are present in all columns and standard errors are clustered at the city level. The dependent variables are: the natural logarithm of the number of terror attacks through an armed assault in Column (1), $Ln(1+N)$ Armed Assault; the natural logarithm of the number of terror attacks through an infrastructure attack in Column (2), $Ln(1+N)$ Infra Attack; the natural logarithm of the number of hijacking attacks in Column (3), $Ln(1+N)$ Hijacking; the natural logarithm of the number attacks involving hostage-taking in Column (4), $Ln(1+N)$ Hostage Taking; the natural logarithm of the number of attacks involving hostage-kidnapping in Column (5), $Ln(1+N)$ Hostage Kidnapping. These are regressed over a dummy taking

unit value in Sunni-majority cities, $Sunni_c$; the price of silver at the announcement of the Zakat threshold, $Silver_t$; a dummy taking unit value for the quarter in which Ramadan takes place and the following quarter, $Ramadan_t$. In order to simplify the interpretation of the coefficients, the price of silver is standardized, hence I subtract the mean across all periods and divide by the standard deviation. The row Adj. R sq. shows the adjusted R^2 of these regressions, and the next two rows show the mean and standard deviation of the dependent variable, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Appendix C - Terrorist Organizations and Jihadist Platforms

This appendix describes two sources of data: the religious coding of the 20 terrorist organizations in Appendix C1 and the message boards used to measure the recruitment variable in Appendix C2.

Appendix C1 - Terrorist Organizations and Religious Coding

This section categorizes the terrorist organizations listed in the Global Terrorist Dataset (GTD). Each organization has been classified as Sunni-majority or not and the corresponding sources are reported. Because the GTD presents different terrorist groups that are part of larger scale organizations, I also present how terrorist organizations have been agglomerated.

Al-Intiqami al-Pakistani

This terrorist organization, alternatively referred to as Revenge of Jehadi, Revenge of the Pakistanis and Revenge of the People of Pakistan, is mainly known for its attack against a Christian school in Murree in 2003. Al-Intiqami al-Pakistani is a religious extremist organization which fosters resentment against western powers. According to The Guardian, the men belonging to Al-Intiqami al-Pakistani are also connected to Lashkar-e-Jhangvi, which is a terrorist organization promoting Sunni's dominance through the use of violence. Because of the close ties between Al-Intiqami al-Pakistani and Lashkar-e-Jhangvi, I identify the former one as a Sunni organization.

Sources:

https://terroristprofiles.wordpress.com/page/2/

https://www.nytimes.com/2002/08/07/world/after-pakistan-raid-3-mysterious-suicides.html

https://terroristprofiles.wordpress.com/2011/12/14/al-intiqami-al-pakistani/

https://www.theguardian.com/world/2002/aug/06/pakistan.rorymccarthy

Baloch Liberation Front

This terrorist organization is a political front and militant group founded by Jumma Khan Marri in 1964 in Damascus, and played an important role in the 1968-1980 insurgency in Pakistani Balochistan and Iranian Balochistan. Baloch Liberation Front's main aim throughout the years has been imposing Balochistan's independence in Pakistan through the wide-spread use of violence. Since the organization originated in Balochistan and maneuvered most of its attacks from Baloch areas, in which the population is for the most part Sunni, I have coded the organization as Sunni.

Sources:

http://web.stanford.edu/group/mappingmilitants/cgi-bin/groups/view/457

https://en.wikipedia.org/wiki/Baluch_Liberation_FrontComposition.

The following organizations have been agglomerated to Baloch Liberation Front

- Balochistan Liberation United Front
- Free Balochistan Army
- Lashkar-e-Balochistan
- Balochistan National Army
- Baloch Liberation Army (BLA)

Baloch Liberation Tigers

This terrorist organization is devoted to the promotion of Balochistan as an independence entity. The organization has striked most of its attacks in the areas around Quetta. Since the Baloch Liberation Tigers originated in Balochistan and, being Sunni Islam the most prominent religion in the province, this was coded as Sunni.

Sources:

http://www.satp.org/satporgtp/countries/pakistan/Balochistan/2014.htm

Baloch Waja Liberation Army

This terrorist organization is devoted to the promotion of Balochistan as an independence entity. Following the attacks in 2012, governamental agencies proscribed the movement. Since the Baloch Waja Liberation Army originated in Balochistan and, being Sunni Islam the most prominent religion in the province, this was coded as Sunni.

Sources:

http://www.satp.org/satporgtp/countries/pakistan/Balochistan/2014.htm

http://www.dopel.org/Baluchistan%20Waja%20Liberation%20Army%20(BWLA).htm

Fedayeen Imam Mahdi

The Imam Mahdi is considered by the Twelver Shia Muslims to be the ultimate savior of humankind and a leading religious figure who will bring peace and justice. Its figure is particularly revereed by Shia Muslims and Jamkaran Mosque in Qom (Iran) was built at the order of Muhammad al-Mahdi, known by Shia Muslims as Imam Mahdi. This terrorist organization is lead by Shia leaders and was involved in various incidents. The New York Times reports the organization as Shia. Since this organization is not affiliated with the Sunni stream of Islamism, I have not categorized it as Sunni.

Source:

https://www.nytimes.com/2003/10/08/world/world-briefing-asia-pakistan-violence-after-
html

Islamist Extremists

This group is composed of several unaffiliated attackers who identified with Barelvi and Deobandi beliefs. In spite of the fact that those attacks have not been claimed by a specific organization, I have categorized the group as Sunni because Barelvi and Deobandi are currents within Sunni Islam.

Sources:

https://en.wikipedia.org/wiki/Barelvi

https://en.wikipedia.org/wiki/Deobandi

Jaish Usama

Jaish Usama, also known as Jaish-e-Usama, is a terrorist organization devoted to oppose the presence of North Atlantic Treaty Organization (NATO) in Khyber. According to online sources the organization has ties with Taliban, which is a conglomerate of several terrorist organization of Sunni majority. Because of those aformentioned ties, I categorized Jaish Usama as a Sunni organization.

Sources:

https://nation.com.pk/05-Mar-2014/not-bound-to-follow-ceasefire-jaish-e-usama

https://www.highbeam.com/doc/1G1-360573709.html

Jaish as-Saiyouf (Army of Swords)

The Army of Swords is a terrorist organization primarily operating in Balochistan. It is famous for planning a bombing at a bazar in Loralai. Official sources report that the operation was motivated by women's un-Islamic behavior. Because the organization primarily operates in Balochistan, in which Sunni Muslims are the undisputed majority, this was categorized as Sunni.

Source:

http://public.tableau.com/views/GlobalTerrorismStaticDashboard/StaticDashboard?%3Aembed=y&%3AshowVizHome=no&%3AshowTabs=y&%3Adisplay_count=y&%3Adisplay_static_image=y

https://www.dawn.com/news/1088301

Jaish-e-Islam

This terrorist organization mainly operates in Balochistan and has perpetrated several attacks against Shia Muslims starting in 2012. According to the Global Terrorism Database, the organization operates in compliance with Sunni beliefs. Because of its actions against Shia Muslims, the geographic location of its operations and the reports provided by the Global Terrorism Database, this was categorized as Sunni.

Sources:

http://www.start.umd.edu/gtd/search/IncidentSummary.aspx?gtdid=201406080006

https://tribune.com.pk/story/719308/23-pilgrims-killed-in-taftan-bombing/

http://www.start.umd.edu/gtd/search/IncidentSummary.aspx?gtdid=201212300002

Jaish-e-Khorasan

This terrorist group was originally born in Khorasan, a region of Iran, but it has subsequently spread in neighboring Pakistan regions. The group has strong ties with Al-Qaeda and it operates in compliance with Salafist beliefs which greatly borrow from Sunni ideologies. Because of its ties with Al-Qaeda and its operation under the Salafist ethic code, this was coded as Sunni.

Sources:

https://en.wikipedia.org/wiki/Khorasan_group

https://en.wikipedia.org/wiki/Salafi_jihadism

Jaish-e-Mohammad

This terrorist group is a Deobandi Muslim jihadist organization, mainly operating in Kashmir. Multiple sources have confirmed Jaish-e-Mohammad's ties with Sunni organizations like the Pakistani Taliban and anti-Shia groups such as the Lashkar-e-Jhangvi, Sipah-e-Sahaba-e-Pakistan, and Al-Qaeda. Because of its adherence to Deobandi principles and its ties with Al-Qaeda, this was coded as Sunni.

Sources:

https://en.wikipedia.org/wiki/Jaish-e-Mohammed

http://web.stanford.edu/group/mappingmilitants/cgi-bin/groups/view/95

Lashkar-e-Taiba

This terrorist organization mainly operates in Punjab and received funding from Osama Bin Laden. The main aim of Lashkar-e-Taiba is to opposed Pakistan's ruling powers. The organization rose in the late 1980s as a militant wing of Markaz-ud-Dawa-wal-Irshad, an Islamist organization influenced by the Wahhābī sect of Sunni Islam. Because of its ties with Markaz-ud-Dawa-wal-Irshad and the support received by Bin Laden, this was coded as Sunni.

Sources:

https://en.wikipedia.org/wiki/Lashkar-e-Taiba

https://www.britannica.com/topic/Lashkar-e-Taiba

http://www.dopel.org/JuD.htmComposition.

The following organizations have been agglomerated to Lashkar-e-Taiba:

- Al-Mansoorian
- Harkatul Jihad-e-Islami

Majlis-e-Askari

This organization is allegedly connected to the Muttahida Majlis-e-Amal political party, which has proved to uphold Wahhabi believes. This group has been classified as Sunni-majority for two reasons: first, the news has reported connections between Majlis-e-Askari and Pakistani Talibans; second, the organization is supposedly supported by Muttahida Majlis-e-Amal, a Sunni party.

Sources:

https://tribune.com.pk/story/980401/cross-border-afghan-fire-kills-7-fc-troops/

http://test.outlookindia.com/newswire/story/seven-pak-soldiers-killed-in-cross-borde
918293

https://en.wikipedia.org/wiki/Muttahida_Majlis-e-Amal

Mutahida Majlis-e-Amal

This terrorist organization is a political alliance consisting of ultra–conservative, Islamist, religious, and far-right parties of Pakistan. Mutahida Majlis-e-Amal operates in compliance with principles belonging to Wahhabism, which is a current of Sunni Islamism. The political parties supporting this organization (Jamiat Ulema-e-Pakistan and Sami ul Haq Group) are of Sunni-majority. Because of its ties with Wahhabism and the endorsement received by Sunni parties, this organization was coded as Sunni.

Sources:

https://en.wikipedia.org/wiki/Muttahida_Majlis-e-Amal

https://en.wikipedia.org/wiki/Wahhabism

https://www.globalsecurity.org/military/world/pakistan/mma.htm

Muttahida Qami Movement

This terrorist organization is the operative fringe of Muttahida Qami Movement, a Pakistani political party. The aforementioned party has been recognized as a force capable of mobilizing riots in Pakistan. Amnesty International has accused the movement of supporting violence and fascism. Muttahida Qami Movement has claimed not to side with any specific religion or sect basing its beliefs on secularism and economic development. Because of refusal of political categorization, I have not identified this terrorist organization as Sunni.

Sources:

https://en.wikipedia.org/wiki/Muttahida_Qaumi_Movement

https://www.trackingterrorism.org/group/muttahida-qami-movement-mqm

https://www.theguardian.com/world/2007/jun/02/uk.pakistan

Composition. The following organizations have been agglomerated to Muttahida Qami Movement:

- Mohajir National Movement

Sindhu Desh Liberation Army

This terrorist organization strives to impose Sindh's separatism. The Sindhu Desh Liberation Army has started operating in 2003, with the aim of granting to the Sindh region total autonomy. Official law enforcement agencies in Pakistan recognize the movement as a terrorist group. This movement is not classified as Sunni for two reasons: first, Sindhu Desh Liberation Army's operates in Sindh, which is a province without a clear religious majority; second,

the movement is interested in promoting Sindh's independence and it is not concerned with establishing a religious supremacy in the region.

Source:

https://en.wikipedia.org/wiki/Sindhudesh_Liberation_Army

Composition. The following organizations have been agglomerated to Sindhu Desh Liberation Army:

- Sindh Liberation Front

Sipah-I-Mohammed

This movement was strong in various Shia communities in Pakistan, and in the majority Shia town of Thokar Niaz Beg ran a "virtual state within a state" in the 1990s. The organization was born in 1993 with the aim of countering anti-Shia actions in Punjab led by Sipah-e-Sahaba or Lashkar-e-Jhangvi. Because the group's main aim is to promote safeguard of Shia Muslims from attacks planned by Sunni organizations, this was classified as non-Sunni.

Sources:

https://en.wikipedia.org/wiki/Sipah-e-Muhammad_Pakistan

http://dopel.org/SEM.htm

Sunni Muslims

This organization is composed of various non-affiliated lone-wolves supporting Sunni Islamism. Because its actions were carried out in compliance with Sunni beliefs, we have categorized it as Sunni. The following organizations have been agglomerated to Sunni Muslims:

- Tawheedul Islam
- Tehrik-e-Tuhafaz (Pakistan)
- Brelvi Muslims
- Amr Bil Maroof Wa Nahi Anil Munkir
- Pakistan Muslim League (PML)

Tehrik-i-Taliban Pakistan

Tehrik-i-Taliban Pakistan (TTP), alternatively referred to as the Taliban, is a terrorist group organized as an umbrella organization of various militant groups based in the northwestern Federally Administered Tribal Areas along the Afghan border in Pakistan. The TTP has close ties with the Afghan Talibans, which is a terrorist group promoting Sunni dominance. The TTP believes in the Pashtunwali, a non-written ethical code belonging to Deobandi Muslims, making the TTP a Sunni organization.

Sources:

https://en.wikipedia.org/wiki/Tehrik-i-Taliban_Pakistan

http://www.start.umd.edu/baad/narratives/tehrik-i-taliban-pakistan-ttp#_edn15

https://ctc.usma.edu/a-profile-of-tehrik-i-taliban-pakistan/

Composition. The following organizations have been agglomerated to Tehrik-i-Taliban Pakistan:

- Afghan Guerrillas
- Al-Jihad
- Al-Nawaz
- Al-Qaida
- Ansar Wa Mohajir (Pakistan)
- Jamaat Tauhid Wal Jihad (Pakistan)
- Jamaat-ul-Ahrar - Lashkar-e-Islam (Pakistan)
- Lashkar-e-Omar
- Mujahideen Ansar
- Qari Kamran Group
- Tanzeem al-Islami al-Furqan
- Tehrik-e-Khilafat
- Tehrik-e-Nafaz-e-Shariat-e-Mohammadi
- Abdullah Azzam Brigades
- Jamaat Tauhid Wal Jihad (Pakistan)

Tribesmen

This organization is composed of an unidentified mixture of tribesmen, which practice indigenous religions other than Islam. Tribesmen mainly operates in the Federally Administrated Tribal Areas of Pakistan. Because Tribesmen's actions are inspired by religions other than Islam, I have not categorized the organization as Sunni-majority.

Composition. The following organizations have been agglomerated to Tribesmen:

- Mazari Tribesmen
- Ujjan Tribe

Appendix C2 - Description of Jihadi Message Boards

This appendix provides basic descriptions of the jihadist fora to create the Recruitment dataset. The message boards are hardly accessible and few characteristics for each message board are provided in the following paragraphs.

Ansar1

This is a jihadist message board administrated in English for which little information is currently provided. Ansar1 counts around 382 members, 11,244 different post threads and a total of 29,492 posts.

Gawaher

It is an English administrated forum of medium size. Gawaher is mainly dedicated to discussions on multifarious topics connected to Islam and Muslims. A considerable size of its

member are outright supporters of radical Islamic groups. The platform counts 9,269 members and 372,499 posts pertaining to 53,235 different threads.

Islamic Awakening

This platform has been closed down in 2013. The majority of its members lived in the UK and threads were discussed in English. At its closure, the forum counted 3,964 members, who posted 201,287 messages in a total of 32,879 threads.

Islamic Network

This is a small forum created to discuss various topics related to Islam. The topics range from theology to contemporary events and all the threads are administrated in English. Out of the 2,082 active members, there appears to be a concerning chunk openly expressing support for jihadist movements. The site counts 91,874 posts and 13,995 threads.

Myiwc

This is a small forum for Muslim people counting 756 members. On this platform, members have posted a total of 25,016 messages, all in English language, in 6,310 different threads. The topics discussed on Myiwc range from every day Muslim diet to more contentious ones regarding religious wars.

Turn To Islam

This English platform has a total of 10,858 members. The platforms' main purpose is to correct common misconceptions regarding Islam; however radical supporters may occasionally participate to discussions. Turn To Islam counts a total of 335,338 messages and 41,654 threads.

Ummah

This English platform is used to discuss topics such as Islamic life style and social issues. Ummah counts a total of 21,013, 1,491,957 posts and 91,527 threads.

Appendix D - Two Messages Graded as Recruitment

Message 1

In a conversation commenting the arrest of a member, the following appeared:

"*a*******m a***i g****1 if you need help im your brother and closer then you think. inshallah just ask and i will help you as best as i can inshallah, i must tell you i was with ******* a few days before he was arrested and he knew it was coming. he is doing ok now. bro there are a few brothers out there that are true to Allah and are very close to you.*"

Message 2

Another message with members discussing the joining of militants in Somalia

A***l K**i states: "*Somalia could actually be an ideal base for physical and weapons training... and from there one could join the brothers in the liberation of Mogadishu and from there move on to other Jihadi fronts*"

Other member: "*God help me for I am certain that this is the ideal alternative front to Afghanistan in producing terrorism and exporting it to the entire world*"

Others went on to discuss practical details, including how to get there.

Directed towards a militant Islamist website run by foreign jihadist in Somalia with helpful information.