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THE EFFECT OF CONFLICT ON LENDING: EVIDENCE FROM INDIAN BORDER AREAS

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Abstract

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The Effect of Conflict on Lending: Evidence from Indian Border Areas

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Abstract

We study the effect of armed conflict on loan officers and their actual lending decisions. Following mortar shelling of Indian border areas in the state of Jammu & Kashmir, we document that after repeated incidences of shelling the loan rates set by the loan officers exponentially increase. While the immediate effect may be driven by a rational response due to altering beliefs, the later rate hikes suggest an "overreaction". Our study reveals that the real costs of armed conflict through loan pricing are not trivial, and what we document is informative about liquidity shortfalls or credit spirals arising from non-conflictuous political, economic or pandemic shocks.

1 Introduction

Conflict can affect economic outcomes through the decisions of key individuals. However, observing these decisions and measuring such outcomes is not easy given the dangers present in a conflict zone and the resultant lack of data. Contrary to popular perception, the incidence of conflict in a particular region does not result in a complete shutdown of economic activity.

We would like to thank Toni Ahnert, Vimal Balasubramaniam, Emilia Garcia-Appendini, Kuchulain O'Flynn, Veronika Molnar (discussant), Jean Charles Rochet, Renuka Sane (discussant), Daniel Streiz, Susan Thomas, seminar participants at WU Wien, University of Zurich & ETH, KU Leuven and conference participants at the SFI Research Days (Gerzensee 2019), Emerging Markets Finance Conference (Mumbai 2019) and the American Finance Association PhD Poster Session (San Diego 2020) for their helpful comments and suggestions. We would also like to thank the organizers of the Swiss Winter Conference on Financial Intermediation (Lenzerheide 2020) and the Swiss Society for Financial Markets (Zurich 2020) (both cancelled due to COVID-19) for including our paper in the program. Mishra and Ongena gratefully acknowledge financial support from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme ERC ADG 2016 (No. 740272: lending). Corresponding authors' emails: mrinal.mishra@bf.uzh.ch and steven.ongena@bf.uzh.ch.

In fact, it is possible to visit these "hot" zones during fighting pauses to study the effects of conflict (Verwimp, Justino, and Brück (2019)). Life in conflict zones continues, albeit with a renegotiation of contracts to better reflect ground-level realities. However, most studies in the past have relied on ex-post survey data to assess these implications.

Our paper aims to quantify the effects of conflict in a lending context and the "premium" the involved agents attribute to the environment frictions arising there. Our contextualized setting and unique data allow us to measure this premium better than extant work for three reasons. First, we investigate the impact of contemporaneous and repeated incidences of conflict on a singular, simple yet pervasive business contract, i.e., the bank-to-business credit contract. These incidences occur within a relatively short time period; on average eight months after one another. This allows us to minimize the possible measurement bias arising due to inter-temporal nature of human recall where events that are more recent tend to get weighted more heavily (Bjork and Whitten (1974)). Indeed, the long look-back periods present in many conflict surveys may induce such errors of judgement, which we can avoid by using actual and contemporaneous information around frequently repeated incidences.

Second, our study covers an intense period of conflict, war-like almost, when a large number of people (living close to the border) decided even to leave their homes out of fear for their lives and for damage to their local communities. In contrast, many earlier studies on conflict often rely on incidences with limited or no damage. Finally, our usage of a region-level credit database allows us to directly estimate the ex-post outcomes. Conversely, other studies on conflict commonly only observe outcomes after conditioning affected individuals with a set of emotions bringing them "back in time" to the conflict situation.

Our estimates show that loan interest rates cumulatively increase by about 20 basis points (bps) across the sample period for branches located in areas affected by *shelling* with the effect intensifying across events. The increase for the first two events is about the same, i.e., 5.5 bps each, but we see a jump of about twice that for the third shelling incidence, i.e., 9 bps. While we observe a pronounced increase in the interest rates, there are only negligible changes in disbursed loan amounts. This concurrency of increases in loan rates and unchanged loan amounts suggest that both loan supply (effectuated by loan officers impacted by the shelling incidents) and loan demand changes. While we absorb much of the changes in demand effects through saturation with fixed effects, to account for shelling-specific demand effects we control for changes in local economic demand using the work demand pattern from the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) as a proxy. The MGNREGS is a demand driven social welfare scheme instituted by the Government of India where an individual can "demand" work from the concerned local authorities. A database of the number individuals who "demand" work under this scheme is drawn up at the village level on a monthly basis. We also use the level of bank deposits (available every quarter) as a control to absorb any effects that may be prevalent owing to the deposits channel (Drechsler, Savov, and Schnabl (2017)). This is possible because higher than average deposits could result in lower interest rates and (or) higher loan volume.

Our results inform us about both the immediate and delayed costs of conflict (observed over all the shelling incidents we observe) thus allowing us to understand the premium loan officers place on operating in conflict zones. Interestingly enough, the immediate short-run reaction of loan officers is similar to the reaction of loan officers in other areas that we can study that were continuously exposed to conflict. We, therefore label the latter response of loan officers to continuous exposure as a "long-run equilibrium response" to shelling. Indeed, the estimates of the difference between the immediate response and this long-run equilibrium response are not statistically distinguishable from zero. However, once the loan officers experience subsequent events, they charge higher interest rates compared to the long-run equilibrium levels. We estimate this overreaction to be about 6 to 8 bps above the equilibrium levels. While, our estimates also show that this reaction is delayed, negligible after the first event but increases in intensity after the second shelling incidence and persists well into the third event. Overall our estimates shows that operating in conflict zones entails a cost for financial institutions which impose higher interest rates both in the medium- and long run as a result.

The armed conflict we study is international in nature and involves India and Pakistan in the districts of Jammu, Samba and Kathua situated in the erstwhile Indian state of Jammu & Kashmir along the Radcliffe Line (International Border).[1] The inter-state conflict in these border districts manifests itself primarily through *shelling*, i.e., mortar gun firing across both sides of the border.[2]

There are specific reasons why we choose to focus on these three districts only. The erstwhile princely state of Jammu & Kashmir consists of many divisions and borders following August 1947 when the British decided to repudiate the administration of India and partition it into the sovereign states of India and Pakistan. As a result of the wars fought over it and its geographic position (between India, Pakistan and China), the state has seen sizeable territorial disputes between the three countries. Subsequently, most of the boundaries in the state are *de-facto*

[1]As of 31st October, 2019 the state of Jammu & Kashmir was reorganized and divided into the two separate federally administered territories of Jammu & Kashmir and Ladakh. No changes were made to the district boundaries.

[2]The border runs from the Line of Control (LoC), which separates Indian-administered Kashmir from Pakistani administered Kashmir, in the north, to the Zero Point between the Indian state of Gujarat and Sindh province of Pakistan, in the south.

and not formally agreed upon by either one of the countries. However, the portion of the international border, which separates these three districts on the Indian side and Pakistan, is the only boundary in the state which is *de-jure*, and an extension of the Radcliffe Line in Jammu & Kashmir.[3]

Hence, any aggression along the Radcliffe Line is considered a violation of international treaties. This is in stark contrast to the *de-facto* boundary between India and Pakistan in Jammu & Kashmir (colloquially referred to as the Line of Control) where mutual aggression has been the norm for many decades now. We use the *shelling* prone districts along this border as an estimate for the long-run equilibrium impact of shelling. As the events in these districts have persisted for decades, we presume that any effects observed in these districts will have completely accounted for the impact or incidence of shelling.

We use a staggered difference-in-differences methodology as our primary identification strategy. Our events correspond to those periods where shelling along the three border districts was so intense that it warranted a migration of the population. This distinction is important to make, as isolated incidents of shelling or small arms firing occur as well. The treatment group corresponds to those branches, which lie within 10 kilometres (km) of the international border where as the control group corresponds to those branches, which lie between 10 and 20 km from the international border. The choice of 10 km is dictated by a variety of measures. The range of the mortar guns is about 7 km where as the Indian government classifies residents dwelling within 6 km as "affected". We extend the classification, as it is plausible that people bank in branches which are a few kilometres outside the "affected" categorization. Moreover, our results are robust to the alteration of the cutoff for the treatment group for various values between 7.5 and 10 km.

Our work aligns with previous work on how experiences affect outcomes. Experiences play an instrumental role in shaping cognition and mental faculties. Additionally, our experiences are instrumental in determining prejudices and ex-post behaviour (Crandall and Eshleman (2003). An increasingly relevant and growing body of literature has sought to examine the role played by early-life experiences on risk taking by individuals. The studies have been wide ranging from risk taking by CEOs (Bernile, Bhagwat, and Rau (2016)) to investment in more conservative assets contingent on Great Depression (Malmendier and Nagel (2011)), early-life inflation experiences (Malmendier and Nagel (2015)) and effect of mass shootings on financial decisions (Balasubramaniam (2018)).

[3]The official boundary separating Indian and Pakistan which came into force on 17^{th} August, 1947.

Past work has tried to point the effect of conflict experience on risk taking. While Voors, Nillesen, Verwimp, Bulte, Lensink, and Van Soest (2012) show evidence from the Burundian civil war in favour of heightened risk taking even well after experiencing conflict; Callen, Isaqzadeh, Long, and Sprenger (2014) carry out a survey in Afghanistan and demonstrate that individuals prefer higher certainty equivalents, i.e., increased risk aversion, when primed to remember the violence experienced. However, Callen, Isaqzadeh, Long, and Sprenger (2014) prime subjects with fear, but this elicitation strategy may affect past recollections in a specific manner. On the other hand Voors, Nillesen, Verwimp, Bulte, Lensink, and Van Soest (2012) use a ten year interval (from 1993-2003) to determine their violence measures. It is possible that the individuals surveyed a few years later suffer from a *recency bias* (Kahana (2012)), i.e., they attribute higher weights to most recent outcomes. As a result, the outcomes could be driven by individuals whose experiences of violence are more concurrent as compared to their survey counterparts.

We also explore the channels which could be responsible for the observed outcomes. At first sight, it is possible to attribute these changes in the behaviour of the loan officers to altering risk preferences.[4] However, it is possible that the outcome could be due to a combination of (or effect in isolation) changing risk preferences or changes in beliefs about expected future default. Past literature on early-life as well as contemporary experiences tends to entirely attribute outcomes to altering preferences. We, on the other hand, provide suggestive empirical evidence that beliefs dominate the channel which results in the effects that we observe. Further, as robustness, we also control for generic variations in supply using % of lending target achieved. We attribute the results thus obtained to supply effects emanating from the incidents of shelling. As additional robustness, we also limit our sample to loan types which tend to be more affected by shelling and observe similar results. Our analysis also reveals a reallocation of lending towards safer loans which are less impacted by the shelling. Finally, we reject any possible political interventions that might be driving our results by limiting our sample to *close contest* assembly constituencies.[5]

While our results are primarily focused around conflict episodes, they can also be used to explore lending behaviour following more commonly observed political or economic shocks. As these events occur very close to one another, exploring the short-, medium- and long-term response of loan officers to these incidences could be instructive in understanding how credit

[4]We use the terms loan officers to signify a group of individuals working at a particular branch. However, many of these branches are fairly small and have just one person responsible for loan vetting, approval and handling.

[5]Where the difference in votes between the first and second placed candidate was less than the votes polled by the third placed candidate.

tightening works when they are faced with such shocks. In such circumstances, especially the excessive restricting of credit availability in the medium term by altering loan terms could accentuate downward spirals and credit freezes in environments which are already credit constrained.

Related Literature: This paper contributes to three different streams of literature. First, we contribute to the literature on micro-economic outcomes of conflict. Second, we also add to the literature which speaks to the effect of human experiences on decisions and outcomes. Finally, we also contribute to the larger literature in economics and finance on conflict.

Verwimp, Justino, and Brück (2019) elaborate in their editorial that conflict does not "mandate" a closure of all economic activity. Instead, according to the authors, contracts get renegotiated to reflect the social conditions prevalent during the times. As a result, studying the microeconomic foundations which cause such a change in behaviour becomes pertinent. Voors, Nillesen, Verwimp, Bulte, Lensink, and Van Soest (2012) conduct a field experiment in Burundi after the civil war among those who live in communities that had been violently attacked. They document that these individuals tend to be more selfless, risk-loving and impatient. However, they do not observe preferences and derive inferences about underlying preferences by observing behaviour. On the other hand, Callen, Isaqzadeh, Long, and Sprenger (2014) demonstrate that individuals that were present in areas exposed to violent (but eventually foiled) insurgent attacks when primed to recall their fears exhibit a preference for certainty. However, given their survey-based approach there may be situations in which the recall factor is not deterministic. Both these studies use survey data given the difficulty to obtain data in the conflict-ridden areas they focus on. On the other hand, we use the loans database of the largest bank in the region which adds to the external validity of our outcomes. Nonetheless, our results are more in line with Callen, Isaqzadeh, Long, and Sprenger (2014) as we find reallocation in lending volume to less risky loans, a kind of "flight to quality" following episodes of broad based conflict. Additionally, Jakiela and Ozier (2019) also explore individual risk preferences using the post-election conflict in Kenya in early 2008 as the violent backdrop. Past work on conflict has aimed to tie the outcomes with altering preferences. However, our results are seemingly driven by a change in beliefs which get updated gradually, as the loan officers experience the shelling incidents.

Of late, a new and emerging literature has tried to investigate the role played by past experiences on outcomes. Malmendier and Nagel (2011) and Malmendier and Nagel (2015) use experiences from the Great Depression and the high inflation years of the 1970s, respectively, to study the impact on individuals' asset allocation behaviour. Hanaoka, Shigeoka, and

Watanabe (2018) use the 2011 earthquake in Japan to investigate changes in risk preferences. They observe that men who experienced greater earthquake intensity became more tolerant to risk. Brown, Montalva, Thomas, and Velásquez (2018) observe opposite outcomes before and after the Mexican war on drugs. Specifically, they document a 5% increase in risk aversion compared to the average. Balasubramaniam (2018) studies the impact mass shootings and natural disasters have on subjective estimations of life probability by residents of Florida. Using bank robberies as a setting, Morales-Acevedo and Ongena (2020) show that loan officers who experience robberies tend to display avoidance behaviour due to several posttraumatic stress symptoms. Nguyen, Hagendorff, and Eshraghi (2017) go beyond the traditional life experiences channel and depict that cultural origins matter for corporate outcomes. They show that firms led by CEOs who are second- or third-generation immigrants have a 6.2% higher profitability compared to the average firm. Dessaint and Matray (2017) find that managerial behaviour becomes more risk averse when companies are situated in the neighbourhood of hurricane affected areas. Agarwal, Ghosh, and Zhao (2018) study the terrorist attack in Mumbai in 2008 and show that trading activity was affected primarily due to the deterioration in traders' cognitive abilities.[6] Fisman, Sarkar, Skrastins, and Vig (2018) also use outcome variables in a "banking" setting. They show how experience of communal riots prejudices loan officers by inducing taste-based discrimination in favour of certain groups (during loan disbursement). Most of the past research in this area relies on using early (or later) life experiences and demonstrating their subsequent impact on certain outcomes. However, we focus on the inter-temporal impact of repeated contemporaneous conflict experiences for loan officers whose outcomes are driven by change in beliefs and the potential medium-term over-reaction above a well established prior mean.

The wider literature on conflict has sought to tie a multitude of wide ranging macroeconomic outcomes to incidences of war or violence. The widely cited paper of Abadie and Gardeazabal (2003) is one of the first works on the economic costs associated with conflict. Using a "synthetic" control group they show that the GDP declined in Basque Country region due to terrorism. Verdickt (2018) shows that an increase in the ex-ante possibility of war or its actual occurrence results in decreased stock returns. Nunn and Qian (2014) demonstrate that increase in US food aid in recipient countries prolongs the duration of existing civil conflicts. In a similar vein, Crost, Felter, and Johnston (2014) elaborate that randomized access to development projects in Philippines increases the likelihood of being affected by conflict as insurgents fear increase in support for the government. Esteban, Mayoral, and Ray (2012) exhibit that

[6]The authors attribute this deterioration to fear and stress experienced after the terrorist attack.

a link exists between ethnic divisions and conflict. Dwarkasing (2014) also investigates the effect of war on lending outcomes, specifically the effect the American Civil War had on mortgage lending approval. Yanagizawa-Drott (2014) depicts the role of media in disseminating propaganda and intensifying conflict between the Hutu and Tutsi tribal groups in Rwanda.

The remainder of the paper is organized as follows. Section 2 describes the context for our study. Section 3 explains our stylized model based on Bayesian learning. Section 4 elucidates the data and identification strategy. Section 5 discusses the associated results. Section 6 tries to understand the possible mechanism driving our results. Section 7 elaborates on the robustness tests where as Section 8 concludes.

2 Background & Setting

The state of Jammu & Kashmir (J&K) was the northernmost province of the Republic of India with the Indian administered portion sharing its borders with Pakistan and China. The state has often been in the headlines owing to it being a flash point for much of the armed struggle between India and Pakistan.[7] The province has had a troubled history since 1947, the year when British India (also known colloquially as The British Raj or simply *The Raj*) was partitioned into India and Pakistan.[8] However, to establish our research context we would have to delve (a bit) deeper into the history of the region.

British India largely consisted of two major components – i) Areas directly administered by the British comprising about 60% of the land mass and ii) *Princely States* numbering 584 at the time of Indian independence in August, 1947 and comprising around 40 % of the total land area (Figure 1). These *princely states* were ruled by the native kings who had entered into treaties with the British and were not officially part of the British *Raj*. The erstwhile princely state of Jammu & Kashmir was one of the largest of these 584 agglomerations.

When India attained its independence in 1947, it was divided into the sovereign countries of India and Pakistan. Jammu & Kashmir chose to remain independent.[9] but this independence was short lived. The strategic position and demographics of Jammu & Kashmir culminated in a war between India and Pakistan. Once the war subsided, a ceasefire was declared with the LoC demarcating the boundary along which ceasefire occurred. The official status of this

[7]https://www.economist.com/asia/2019/02/21/india-vows-to-punish-pakistan-after-the-latest-terrorist-attack

[8]For a detailed time-line of the events since 1947, please refer to https://edition.cnn.com/2013/11/08/world/kashmir-fast-facts/index.html.

[9]Remaining independent was a choice which was offered to each of the 584 *princely states* The other choices they had was to join either India or Pakistan, something almost all of them except Jammu & Kashmir acquiesced to.

border remains unsettled even today and is a bone of contention for both India & Pakistan. As a result, the Line of Control (LoC) is the largest of the *de facto* boundaries in Jammu & Kashmir.[10]

Apart from the LoC, the Radcliffe Line was drawn to divide British India into the independent states of India and Pakistan in 1947. What is interesting is that in its present situation the state consists of two *de facto* boundaries, the Line of Control (LoC) and the Line of Actual Control (also known as the LAC),[11] and a *de jure* boundary, i.e., the Radcliffe Line (Figure 2). As the Radcliffe Line is an international border formally agreed upon by both countries, any hostilities across it are tantamount to an act of war.[12] We use the districts situated along this border for our analysis. While there was always the odd shelling incident or stray bullets fired by the military stationed on both sides of the border, the hostilities crept up after 2014 with sustained mortar firing. This firing can at times last for days at a stretch making the region resemble a proxy "war-zone".

It is instructive to point out that for administrative purposes, the state of Jammu & Kashmir in India was divided into three separate divisions, namely Jammu, Kashmir Valley and Ladakh.[13] This classification is germane for our analysis as the Radcliffe Line passes through the Jammu division only. The nature of conflict across the LoC is more structural and has persisted for close to 70 years now. As a result, cross border hostilities or large scale border skirmishes in districts along the LoC would not have the same unanticipated consequences as one would expect along the Radcliffe Line.

To perform our analysis, we require the precise dates of the occurrence of shelling in the areas adjoining the Radcliffe Line. The exact nature of these events is sporadic which makes proper documentation a challenge at times. We obtain our information on shelling incidents from the South Asian Terrorism Portal (SATP)[14]. While there have been reported and unreported instances of small arms firing or few shells being fired, we focus primarily on those incidents where the firing was so intense and damage so widespread that people had to be moved out of their homes. These large scale incidences took place starting in 2014 which coincides with our data availability from January 2011 to June 2017.

[10]The LoC was made a de-facto boundary from a ceasefire line as per the Shimla Agreement of 1971. For details, refer to https://www.mea.gov.in/bilateral-documents.htm?dtl/5541/Simla+Agreement.

[11]This border separates the state from China, primarily the portion annexed during the 1962 Indo-China war. This border too, is yet to be formally settled by both countries.

[12]The portion of the Radcliffe Line which passes across the Jammu division in India is colloquially referred to as the "IB" on the Indian side and "Working Boundary" on the Pakistani side.

[13]The state also enjoyed some autonomy in certain matters due to special provisions of the Indian constitution. However, these statutes which granted the autonomy ceased to exist as of 5th August, 2019. Also, as of 31st October, 2019 the state was reorganized and divided into the two separate federally administered territories of Jammu & Kashmir and Ladakh.

[14]http://www.satp.org/

When hostilities between both countries were in full swing, the border dwelling populace was shifted temporarily to relief camps in safer areas lying outside the range of the artillery guns until the shelling subsided. These incidents also saw temporary migration of border populations,[15] as depicted in Table 2.

We colloquially refer to mortar gun rounds as *shells*. The distance to which the damage can be effected can be varied by altering the angle at which the gun is fired. The rounds can be quite damaging especially as they explode into tiny fragments once they hit the ground. Our field visit to one of the border towns depicted that the shrapnel and exploding fragments cause damage to cattle, houses and vehicles (Figure A2). Frequently, they result in injury and sometimes even death, though such incidences are rare.[16] Unexploded or inert shells in agricultural farms also pose a life threat to people during the harvest period. Figure 3 shows an example of one of the mortar guns (120 millimeter) used by the security forces stationed at the Radcliffe Line.

3 Model

We present a stylized Bayesian Learning model on the lines of Pastor and Veronesi (2009) which explains the loan officer reaction in our setting. The model shows that the extent of interest rate updates depends not only on the size of the shock but also on the uncertainty regarding the interest rate parameter. We assume that the loan officer is uncertain about pricing the loan which we capture using the interest rate parameter, θ. Prior to observing any shelling incidents, the loan officer's prior beliefs about θ are normally distributed with mean θ_0 and variance σ_0^2.

The loan officer observes n independent shelling incidents which influence θ, where $s_t = \theta + \epsilon_t$ and ϵ_t is normally distributed with zero mean and constant variance σ^2. According to Pastor and Veronesi (2009), the posterior beliefs (mean and variance) of the agent can be stated as per Bayes' rule as:

$$\tilde{\theta}_t = \theta_{t-1} \frac{\frac{1}{\sigma_{t-1}^2}}{\frac{1}{\sigma_{t-1}^2} + \frac{1}{\sigma^2}} + s_t \frac{\frac{1}{\sigma^2}}{\frac{1}{\sigma_{t-1}^2} + \frac{1}{\sigma^2}} \tag{1}$$

[15]It is noteworthy to mention that there is anecdotal evidence to suggest that in some cases households migrated permanently to cities or towns away from the purported war zone after the shelling culminated.

[16]We would like to point out that while the damage to houses is significant, it does not result in widespread destruction observed in a full blown war, such as the one in Syria few years ago. Pictures available at https://www.theguardian.com/world/2016/dec/21/aleppo-syria-war-destruction-then-and-now-in-pictures

$$\tilde{\sigma_t}^2 = \frac{1}{\frac{1}{\sigma_{t-1}^2} + \frac{1}{\sigma^2}} \tag{2}$$

We can then compute the differential interest between two successive time periods, t and $t-1$ as:

$$\Delta\tilde{\theta}_t = \frac{\frac{\sigma_{t-1}^2}{\sigma^2}(s_t - \theta_{t-1})}{\frac{\sigma_{t-1}^2}{\sigma^2} + 1} \tag{3}$$

To carry out comparative statics, we take the derivative of $\Delta\tilde{\theta}_t$ w.r.t. the shock, s_t and the scaled variance, $\frac{\sigma_{t-1}^2}{\sigma^2}$. This yields:

$$\frac{\partial\Delta\tilde{\theta}_t}{\partial s_t} = \frac{\frac{\sigma_{t-1}^2}{\sigma^2}}{\frac{\sigma_{t-1}^2}{\sigma^2} + 1} \tag{4}$$

The RHS is positive for equation 4 which shows that the size of the update increases with the intensity of signal.

$$\frac{\partial\Delta\tilde{\theta}_t}{\partial(\frac{\sigma_{t-1}^2}{\sigma^2})} = \frac{s_t - \theta_{t-1}}{(\frac{\sigma_{t-1}^2}{\sigma^2} + 1)^2} \tag{5}$$

Equation 5 shows that $\Delta\tilde{\theta}_t$ increases in scaled variance, $\frac{\sigma_{t-1}^2}{\sigma^2}$. However, this is contingent on the shelling shock s_t being larger than the value of θ in the time period, $t-1$. It also informs us that even if this differential is small enough, the update can change significantly if the uncertainty increases.

Equation 3 gives us an insight to when the uncertainty around shelling peaks. We conjecture that the uncertainty is maximum when $t = 2$, i.e., after the second shelling event. This is understandable on an intuitive level as well. We simulate the model and its key parameters in Appendix A1. The loan officers might become more uncertain about the outcome after the first event itself. However, they might be prone to dismiss it as a one-off incident and this causes uncertainty to peak after the second event. Thereafter, as they observe more incidents, the uncertainty declines as they *learn* about the new normal and incorporate it into their beliefs. The above model allows us to derive key hypotheses which we test later using our empirical methodology.

$\mathbb{H}_1$: *Loan officers located in areas affected by shelling offer loans with higher interest rates to borrowers in the period ensuing right after the shelling incidents.*
$\mathbb{H}_2$: *Once loan officers adjust to the new normal, they progressively increase the loan pricing to factor in the uncertainty in interest rates due to shelling.*
$\mathbb{H}_3$: *The change in lending behaviour by loan officers situated in areas affected by shelling vis-a-vis unaffected areas can be attributed to their change in beliefs.*

4 Data & Identification Strategy

We obtain our loan-level data from the largest lender in the state of Jammu & Kashmir. The lender which provides us with the data is close to a monopolist in lending markets of this region. For example, in the financial year of 2017-18, the lending target allocated to them was 71.67% of the overall lending target in the state of Jammu & Kashmir[17]. The lender also has considerable geographical reach, accounting for 44.5% of the branches, 65.4% of the bank correspondents and 43.7% of the ATMs in the state as of 31st December, 2017.[18] Our procured dataset covers the period spanning from January 2011 - June 2017.

Information regarding the variables present in the data is depicted in Table 3 which shows summary statistics for loans initiated by affected and unaffected branches. We observe that the second row of Panel A, which calculates the logarithm of the interest rate, has a lower value for affected branches as compared to the unaffected branches. Similarly, the logarithm of the loan amounts and % loan collateralized have lower values for the affected areas. Any collateral is a variable which captures whether a loan had collateral put up against it at the time of disbursement. The variable does not change for either group.

To compute the distance of a branch from the border, we hand collect its geocode using Google Maps. Subsequently, we use this information to calculate the shortest distance of each branch from the border. We can observe in Panel B of Table 3 that a loan granted in the affected region has a mean distance of about 6.4 km from the border. This is well within the range of the mortar guns as depicted in Figure 3.

Apart from this, we also merge out data with supply targets (accorded at district and loan-type level) to arrive at our *supply slippage* variable. The details of this variable are explained in the later sections. We also observe that there is not much of a difference in supply slippage

[17]These lending targets are assigned by the state level bankers' committee to districts based on lending categories. Within a district, various branches from different reallocate the targets based on their capacity to lend.
[18]Bank correspondents or BCs act as branchless banking associates and are responsible for last mile delivery of banking services like account opening, deposits collection and payment services.

between the treated and control set of branches. Data for deposits at the centre-quarter level are obtained from the Reserve Bank of India's (RBI) website. The RBI has a number of centres in each district which aggregate the deposit and credit data for the branches in the vicinity and report to the central bank. We map each branch to the nearest centre to assign the level of deposits. The interesting part is that we are able to isolate almost entirely the deposits our bank. This is because the RBI collects data separately for public-sector (central government owned) and private-sector banks. For purposes of classification, our bank is classified as a private sector bank, even though a majority stake is owned by the state government. As other private banks have a negligible presence in the state,[19] we can almost entirely attribute the movement in deposits to our bank.

4.1 Work Demand Pattern Data

We also merge our dataset with other variables that are used to control for loan demand in our empirical specification, namely rural work demand at the sub-district level. We obtain data for the work demanded by the number of individuals in a given sub-district (which is a subdivision of a district made for administrative purposes) from the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) website. MGNREGS, which is sanctioned by the Indian Government, is the largest work-guarantee program in the world and it guarantees 100 days of wage employment (primarily unskilled manual work) per year to rural households. However, the interesting part is that the MGNREGS is a demand-driven social welfare scheme where an individual can "demand" work from the relevant authorities.

We use the MGNREGS website to hand collect the data for the work-demand pattern in each sub-district and for each month. We also map each branch to its closest sub-district using the geocodes for the branch and the sub-district. The work-demand pattern data counts the number of individuals every month who registered with the local government to demand unskilled employment. The MGNREGS is a fall-back employment source which acts as a means of insurance for the rural populace. The work demand has a cyclical pattern to it and it peaks when other employment alternatives are scarce or inadequate. As a result, it acts as strong explanatory variable for local economic demand (and as a corollary, loan demand). Past research has shown that the work demand maybe correlated with drought patterns and agricultural distress (S. Agarwal, Prasad, Sharma, and Tantri (2018)) which is dependent on the extent of monsoon rainfall. Hence, to prevent our data from capturing seasonal effects,

[19] As on December, 2017, 776 of the 927 bank branches operated by private sector banks in the state of Jammu & Kashmir belong to our bank.

we de-seasonalize the work-demand data using month fixed-effects and then use the residuals obtained from this exercise as our control for loan demand.

4.2 Primary Identification Strategy

We use a staggered difference-in-differences (DiD) as our primary empirical strategy. We limit our analysis to only those districts in the state of J&K which are situated along the Radcliffe Line. Within these districts, our treatment group consists of those branches that lie within the 10 km of the Radcliffe Line where as the control group consists of those branches which lie 10-20 km from the Radcliffe Line (Figure 4). The choice of employing a cutoff at 10 km is not random and is dictated by what the local authorities classify as areas affected by shelling. The local government routinely issues circulars and warnings to citizens residing in this belt within 10 km from the border. An example of such a circular is depicted in Figure A1. Additionally, the Indian parliament also passed a bill recently which allowed individuals living within 6 km of the Radcliffe Line to be eligible for reservation (3%) in appointment and promotions to state government posts, apart from admission to professional institutions.[20]

However, we extend the affected region to 10 km from the border. The reasons for doing so are:

i) The range of the mortar guns as depicted in Figure 3 is also about 7 km.

ii) We do not have access to the exact location of the borrower and hence use a bank branch as our primary locator.

iii) This allows us to include loans for those borrowers who might reside within 6 to 7 km from the border but bank within the 10 km zone. Moreover, the 0-6/7 km belt in the Jammu division is primarily agrarian and rural with low branch density.

iv) Branch density increases as one moves away from the border. As a result, it is quite plausible that a borrower residing just around 6 to 7 km from the border would prefer banking with a branch within 10 km from the border.

We use a window of $[t-3, t)$ months as our pre period and $[t+1, t+4)$ months after the event as our post period. A burn-in of one month after the event allows us to remove the effect of those loans which were contracted prior to the event but initiated right after. To test the effect of conflict on loan terms for loans initiated by branches in the affected areas, we estimate the following equation:

[20] https://www.prsindia.org/billtrack/jammu-and-kashmir-reservation-amendment-bill-2019

$$Interest\ Rate_{it} = \beta_0 + \beta_1 Treated_i \times Post_t + \beta_2 Treated_i + \beta_3 Post_t + X_{kt} + \eta_j + \gamma_t + \mu_k + \epsilon_{mt} \quad (1)$$

where *Interest Rate* denotes the logarithm of the interest rate for the disbursed loan. *Treated* is a dummy variable which equals 1 for loans given by all branches within 0-10 km of the Radcliffe Line where as it is 0 for loans given by all branches within 10-20 km of the Radcliffe Line. X is a vector of demand specific controls, η denotes district fixed effects, γ denotes time (quarter) fixed effects and μ denotes loan type fixed effects. District and time fixed effects allow us to absorb the time and district invariant portions of interest rate. As a result, this helps us to control demand across the districts. Loan type fixed effects allow us to compare within loan groups. This is pertinent as there are more than a hundred loan types in our data. Moreover, the importance of loan fixed effects stems from the fact that we cannot compare two different loan types as the terms and conditions offered on both might be significantly different. For example consumption loans and short-term credit lines might have very different orders of magnitude of interest rates and amounts.

An assessment of the news articles collected by the SATP portal reveals that shelling occurred around 5th Oct - 11th Oct 2014, 4th Jan - 5th Jan 2015, 26th Oct - 27th Oct 2015 and 23rd Oct - 1st Nov 2016. As the effects of dates and the subsequent effects of shelling could persist for more than a few days, we use a burn-in period of 1 month after the shelling subsided, i.e., we begin the post period 1 month after the last date of the shelling incident. This also allows us to control for any loans which had been contracted before the event period.

Evidently, our first and second events occur very close to each other, i.e., within the 3 month window. Hence, we collapse both events to a single event due to the possibility of confounding effects associated with one event's pre-period being the post-period for another event. For the final event ending on 1st Nov, 2016 the post period coincides with the demonetization event.[21] Thus, we begin the post period for the DiD specification from 1st Jan, 2017 which is after the demonetization exercise ended. We do this because the lending almost came to a standstill during this period as bank officials were involved in collecting banknotes and tallying deposits.

[21]This pertains to the period when the government ordained that 500 and 1,000 rupee notes would no longer be recognized as legal tender https://www.rbi.org.in/Scripts/NotificationUser.aspx?Id=10684&Mode=0.

4.3 Disentangling Demand from Supply

Separating the interest rate effects due to changes in loan demand or supply is germane to understanding the cause-effect relationship in our setting. This is the first step to disentangling the inter-temporal pattern of interest rates which in turn helps us to conclude whether the observed effects of shelling are temporary or permanent. For example, it is plausible that the interest rate increase is determined by either a supply decrease, a demand increase or both simultaneously. An increase in demand may be driven by the re-seeding of economic activity following the temporary shutdown in these areas. On the other hand, the decrease in supply may be due to a rational reaction by the loan officers.

Expecting future incidences of similar nature, the loan officers may increase the interest rate to account for any future losses or impairments on loans initiated to borrowers in this region. This outcome may be a rational one dictated by *learning about their environment*. On the other hand, it is also possible that these effects are more permanent and are necessitated by *changes in risk preferences* of the loan officers due to repeated occurrences of the shelling events. As the possible effects are supply driven, this begets the need to control for demand so that we may be able to understand the extent of the supply effect. While we use the usual gamut of fixed effects to control for generic demand effects, they are not sufficient to control for shelling-specific demand effects. As such, we control for hyper-local economic demand effects using the work demand pattern and also use the level of deposits as a control to counteract any lending effects that might be prevalent owing to the deposits channel (Drechsler, Savov, and Schnabl (2017)). Our conjecture that this is required due to demand and supply effects prevailing simultaneously is borne out by the fact that while interest rates increase as can be seen in Table 4, loan volume granted on the extensive remains statistically indistinguishable from zero as can be seen in Table 5. Usually, this the case only when demand and supply move simultaneously.

5 Results

5.1 Baseline Results

Table 4 shows how the interest rate varies for borrowers who took out loans from affected branches after the event. We convert the interest rate to its natural logarithm to avoid the preponderance of zeroes, if any. Our primary coefficient of interest is the DiD interaction term, *Affected*×*Post*. The dependent variables are depicted separately for each shelling event to understand how successive events impact the outcomes. The increase in interest rate for the first two events is approximately 0.55% where as for the third event it is about 0.8%. However, over the successive course of the three events, the cumulative increase is about 2% which amounts to an overall increase of around 20 bps assuming a mean interest rate of about 7%[22] (Table 4). Loan officers do not have too much slack to change the interest rate substantially given that there are specific guidelines in place for each type of loan. As a result, a loan officer can only vary the interest rates in a small range from the established guidelines.

One might argue that since these districts are located on the border, loan officers have been pricing the riskiness of loans in their decisions and thus what we observe is simply a *trend* effect. However, as we note from Table 4, the loading on the *Treated* variable is either insignificant or negative. This is opposite to what we observe for our main coefficient *Treated* × *Post* thus negating the hypothesis that these districts were risky throughout which resulted in higher interest rates. If anything, the interest rates were lower for these districts and we explore the reasons for the same in Table 12 in the section 7.3.

Additionally, we observe from Table 4 an increasing propensity for the interest rates to worsen for the borrowers over consecutive events. These results are also depicted graphically in Figure 6 which shows how the interest rates increase progressively over time for each shelling event. The first panel plots the DiD coefficients during and after each event by shifting the window of the "post" period by 1 month. Following this approach the post period moves from $[t+1, t+4)$ to $[t+6, t+9)$ except for the third event where we can shift by 2 months at most due to data availability. We overlay the connected plot with a best fit fractional polynomial curve which shows that the trend of the interest rates is upward sloping. We observe that the intensity of the reaction by the loan officers increases over time as the incidents repeat themselves.

The second panel mimics the first one in approach. However, in this case the first coefficient, i.e., for the post period from $[t+1, t+4)$ is depicted just prior to each event. The "delayed" reaction is estimated by averaging out DiD coefficients for post periods $[t+4, t+7)$ to $[t+6, t+9)$. As before, for the third event, we average all coefficients after the one with the post period $[t+1, t+4)$ due to data availability. We keep a difference of 3 months between the delayed and immediate reaction to isolate the effects as much as possible. The second panel shows us that for the first event, the delayed reaction is negligible or lower than the actual event. However, this is reversed for the second event where we observe a much larger delayed reaction.

If the reaction of the loan officers to shelling is rational and based only on the recent

[22] $(1.006^3 - 1) \times 7\%$

incidence, then the effects should be temporary and not persist once the shelling is over. This is because once a loan officer observes an incidence, she accounts for possible damages or destruction it might have caused and then incorporates this into the loan pricing immediately after the event. This is what we observe in the months after the first shelling event. However, in the period after the second event we see that the intensity (of increase in interest rates) increases steadily and eventually settles at a level higher than the starting point. This inter-temporal increase in interest rate after the second event cannot be attributed to a rational reaction alone. Instead, we conjecture that this could be due to an "overreaction" on the part of the loan officers after observing the second and thereafter, the third incident. This may be attributed this to higher uncertainty regarding the future outcomes of similar nature and the extent to which they could change lending and repayment patterns.

The best fit curve in both panels of Figure 6 makes for interesting revelations. It shows that the while the initial reaction is limited and temporary, over repeat incidences the reaction becomes more permanent and structural. Table 6 tries to estimate the extent of the overreaction by comparing later periods with the loan officers' reaction immediately after the shelling event. Essentially, we keep our research setting similar to equation 1 but only alter the definition of *Post*. The $[t+1, t+4)$ period (where t refers to when the shelling takes place) is when the*Post* dummy is set to 0 where as we set it to 1 for a three month window starting three, four and five months after the $t+1$ month. The DiD coefficient captures the extent of overreaction over and above the immediate rational reaction. The coefficients for the later periods after the second event and third shelling event (columns 6, 7 and 8) in Table 6 corroborate our graphical explanation apart from empirically establishing that the overreaction component is statistically significant.

5.2 Long Run Effects of Shelling

Our previous results depict the immediate or short-run effects of shelling. We now calibrate our results with the long-run impact of shelling to estimate whether the effects we observe are consistent with a rational response. There are a few districts in the Jammu division which lie on the *de-facto* border also known as the the Line of Control (LoC). As mentioned previously the LoC is a border which has not been formally agreed upon by both India and Pakistan and as a result, hostilities between the two countries along the border are commonplace. In fact, military aggression along the LoC has been the norm since 1947, the year which both countries became independent. As shelling incidences along the LoC are pretty common and have been so for nearly 70 years, the branches along the LoC serve as an estimate for the long-run equilibrium impact of shelling. We try and estimate to what extent the our results for incidents along the Radcliffe Line are comparable to those along the LoC.

If loan officers were rational, ex-ante, we would expect that assume that they exhibit a reaction which is in line with that along the LoC. To benchmark the difference between branches along both borders, we run a triple interaction with the results in Table 7. The empirical strategy is similar to Table 4 with the only difference being that we add an extra interaction term *International Border*, a dummy which equals 1 for branches located in districts along the Radcliffe Line and 0 for those located in districts along the LoC. We do not display all the interactions in the interest of brevity. We observe that the triple interaction term for the first event in column 1 is statistically insignificant. This is consistent with previous results that the loan officers' reaction after the first event is rational and in fact in line with the long run equilibrium. However, subsequent events upend this conclusion and we see that the immediate reaction after the second and third events (columns 2 and 3) is over and above the long run equilibrium value. Figure 7 plots the difference between the interest rate charged by loan officers in branches along the LoC and the Radcliffe Line. The depiction is similar to Figure 6, the only difference being that we add data points for the LoC. Figure 7 corroborates the results in Table 7. The fitted curve for the LoC remains mostly flat throughout the entire sample period. Moreover, as the incidences occur the gap between the International Border (Radcliffe Line) and LoC seems to grow larger.

Given our empirical results so far, we can estimate the overall shelling effect to be a combination of the following factors:

Shelling effect = Short-run rational reaction + Medium-term overreaction due to uncertainty + Long-run equilibrium effect

where Table 7 allows us to infer that the immediate reaction due to the shelling along the Radcliffe Line is larger than the long-run effect for similar areas prone to protracted conflict.

6 Analyses of the mechanism

6.1 Rational Response Due to Change in Beliefs

The previous results establish that our observed effect is supply driven. However, the extent of the effect depends on when it occurs, i.e., the number of the shelling event. Where as the effect after the first incident in Table 7 is hardly distinguishable from the long run effect, the same cannot be said of the two events which occurred thereafter. However, while these results inform us of the presence of an effect which supposedly stems from a rational response by the loan officers, we are unable to pinpoint the precise channel.

We hypothesize that the supply side rationale for the increase in interest rate for borrowers across the shelling events maybe attributed to *change in beliefs*. This is because a shelling incidence causes changes in probability of future expectations of loan default or impairment of loan value. This occurs due to better learning about the environment in which the loan officer operates. As a result, the loan officers may increase interest rates to account for any expected losses on their loan portfolio.

Hence, we try to understand whether our results are driven by learning about expected future outcomes. If this were true then the results we observe in Table 4 are driven by a rational response to the inter-temporal incidences of shelling that the loan officers observe. Ideally, if we were able to observe the expectations with respect to default or loan terms of the loan officers and compare the changes before and after the shelling episodes, we would be able to estimate the extent to which learning can play a role in altering loan terms and other outcomes. We design an empirical specification which allows us to measure the effect of learning on loan outcomes. The weighting function is estimated on the lines of Malmendier and Nagel (2011) which allows us to determine the weight for a given branch i at time t:

$$w_{it}(k,\lambda) = \frac{(age_{it} - k)^{\lambda}}{\sum_{k=1}^{30}(age_{it} - k)^{\lambda}} \tag{2}$$

where age denotes the age of the branch at the time of loan disbursement. The age is determined by subtracting the number of days between the disbursement of a given loan and the disbursement of the first loan by the branch. The intuition behind using the age is that the longer a branch has been around, the better its understanding of borrowers and hence its ability to *learn*. For a given branch i at time t, we consider a window of 30 previous loan observations and subtract the number of days k, between the age at a reference time t, and a loan disbursed within the 30 day window prior to the reference loan. The reference loan and subsequently the reference time t alters, as we loop over all the loans disbursed by a branch i.

λ is a parameter which Malmendier and Nagel (2011) estimate using maximum likelihood estimation. However, they state that the ballpark estimate of the same is about 1.5. We increment λ in steps of 0.5, from 1 to 3. However, as our results in Table 8 show, the outcomes do vary but are not dependent on the choice of λ. The choice of λ determines the shape of the weighting function. According to Malmendier and Nagel (2011), for $\lambda < 0$, past observations receive a higher weight than more recent observations. For $\lambda = 0$, both past and more recent observations are weighted equally, where as with $\lambda > 0$, recent observations are weighted more. Our interest is in how recent observations affect beliefs and thus we set $\lambda > 0$ for our regression specifications.

Subsequently, we determine the weighted shelling variable for a given time *t* as a multiplication of the shelling dummy and the weighting parameter:

$$Weighted\ Shelling_{it}(\lambda) = \sum_{k=1}^{30} w_{it}(k, \lambda)\ Shelling_{t-k} \tag{3}$$

For days when shelling occurs, the dummy, $Shelling_{t-k}$ is 1 where as when there is no such occurrence, the dummy is 0.01. The days when shelling occurs are far fewer than when it doesn't. As a result, using a non-zero dummy avoids the preponderance of zeros when computing $Weighted\ Shelling_{it}(\lambda)$. The intuition behind using the weighting parameter is that it allows us capture the lagged effect of the shelling incidence days well past the event. We assume that this persistence lasts around a month and diminishes in strength progressively, i.e., as we move away from the shelling event in the time dimension. We then interact *Weighted Shelling* with *Affected* branches to determine our coefficient of interest in Table 8. Our results show that the interest rates are higher for branches in affected areas when interacted with *Weighted Shelling*. This allows us to infer that shelling affects loan officers, who as a result alter interest rate outcomes. The intensity of the outcomes varies in time and is greater, the closer these are to the incident itself.

7 Further Analyses

7.1 Isolating Generic Supply Effects

On the supply side, we primarily investigate effects caused due to shelling. However, there might be other generic supply side effects interfering with our results. To control for the same, we estimate the following modified specification:

$$Interest\ Rate_{it} = \beta_0 + \beta_1 Treated_i \times Post_t + \beta_2 Treated_i + \beta_3 Post_t + \beta_4 Supply\ Slippage_{q-1} + X_{kt} + \eta_j + \gamma_t + \mu_k + \epsilon_{mt} \tag{4}$$

Treated is a dummy variable which equals 1 for loans given by all branches within 0-10 kilometres of the Radcliffe Line where as it is 0 for loans given by all branches within 10-20 kilometres of the Radcliffe Line. η denotes district fixed effects where as γ denotes time (quarter) fixed effects. μ denotes loan type fixed effects. Loan type fixed effects allows us to compare within loan groups. Lagged *Supply Slippage* is a term we observe at the district-loan category[23] level with a quarterly frequency. We estimate it for a given loan category, l for a quarter, q as follows:

$$Supply\ Slippage_{lq} = 1 - \frac{\sum_{i=1}^{n} Cumulative\ Loan\ Volume_{lq}}{Lending\ Volume\ Target_l} \tag{5}$$

where *Lending Volume Target* is the annual loan volume target for a loan category, l. n denotes the total no. of branches in the district.

The rationale behind using the *Supply Slippage* of the previous quarter as a control is that a greater chasm between the lending target (by loan volume) and cumulative achievement in the previous quarter may result in more aggressive loan disbursement policies employed by the branches to achieve the required numbers. On the other hand, if the target for a given loan category has been surpassed or is close to being surpassed, we can expect a more tepid supply side push. Table 9 shows the results obtained from fitting equation 4. Our primary coefficients of interest are the factor loadings on *Treated*×*Post* and *Supply Slippage*. We don't have results for the first shelling event as the *Supply Slippage* data does not cover that period. However, we do observe that including *Supply Slippage* does not affect the betas on the variable of interest, *Treated*×*Post*. Table 9 shows that the factor loading on Interest rate for *Treated*×*Post* remains significant even after we control for *Supply Slippage*. It is to be noted that we continue to control for demand using our set of controls and fixed effects. Specifically, our results are driven more by changes in supply due to shelling alone.

[23]Loan category is different from loan-type which we use as fixed effects in our equations. Loan categories are a coarse agglomeration of loan type. While we have more 100 different loan types, they are collapsed into 11 loan categories to allocate lending volume targets.

7.2 Investigating Loan Types Impaired by Shelling

7.2.1 Extensive Margin

The preponderance of shelling might result in reallocation to those loan types which are more robust to changes in local economic demand. However, we model this test on the lines of Callen, Isaqzadeh, Long, and Sprenger (2014) who attribute this reallocation to altering risk preferences captured through the change in certainty premium.

$$Certainty\ Premium = v(X|b)_c - v(X|b)_u \tag{4}$$

where $v(X|b)_c$ denotes the utility elicited from a sure payoff of X where as $v(X|b)_u$ is the utility derived from a gamble which has an expected value of X. The results are conditional upon the fact that the beliefs, b do not alter as we move from the the certain to the uncertain payoff. Given these pre-conditions, we would expect the *Certainty Premium* to increase as the risk aversion increases i.e, the utility derived from a sure payoff would gradually become higher than one derived from a gamble yielding the same expected value.

We cannot elicit the exact payoffs (whether they are sure or expected values) like Callen, Isaqzadeh, Long, and Sprenger (2014) due to the nature of the dataset. Nonetheless, if we approximate the above specification with respect to our setting, we can proxy $v(X|b)_c$ as the utility derived from safe loans i.e., those loan types which are unaffected by shelling where as $v(X|b)_u$would be the utility derived from risky loans, i.e., which are affected by the shelling events.[24] Ex-ante, we would expect shelling to increase the certainty premium as loan officers would prioritize safe loans over risky ones. Our results are depicted in Table 10 where Column 1 shows that the % volume of total lending accounted for by safer loans increases by around 11% after shelling for branches situated in the affected areas i.e., within 10 kms of the Radcliffe Line. There isn't a significant difference in the volume of risky loans in Column 2. Expectantly, the difference in % volume between safe and risky loans increases (Column 3) shows that there is a reallocation in lending in the affected ares from risky to safer loans. This reallocation amounts to 21.4% of the total lending volume. We control for time varying effects within a district (and thus demand) by including *District* × *Month* fixed effects. Hence, Table 10 shows that the loan officers tends to exhibit risk averse behaviour after the shelling events.

[24]Simplifying our exposition, $v(X)_u = (1-p).v(X)_c + p.0$ where p is the non-zero probability of default as a result of the shelling.

7.2.2 Intensive Margin

The results in Table 11 control for the effect of supply (other than shelling) and demand thereby depicting that our results are driven by supply changes due to shelling. However, there might still be concerns on the validity of the usage of *Supply Slippage* as a variable to control for supply-side effects. As an additional check, we re-run the specification for Table 4 by restricting ourselves to those loan types which have a larger propensity of being affected or impaired by shelling. These loan types are primarily auto loans, two wheeler loans, housing loans and agriculture loans of various types. On the other hand, we do not observe any change in the complementary group i.e., the group of loans which remain unaffected by shelling. We do not report the results for this test in the interest of brevity.

The results are depicted in Table 11 where we observe that the increase in interest rates is driven primarily by those loan types which tend to more impaired due to shelling. There is an increase[25] of about 0.8% in the interest rate after the first event, 1.355 %, after the second event and of about 0.5%, after the third event as noted in Columns 1, 4 and 7[26]. We do not see any significant effect on loan amount. As the increase in interest rate is not driven by a concomitant increase in amount, we can infer that demand effects are not in play when we whittle down our data to affected loan types. However, it is to be noted that Columns 3, 6 and 9 which demonstrate % loan collateralized follow a pattern similar to Table 4.

We carry out another set of analyses as robustness to gain further insights regarding our setting. We also investigate if our effects are exclusive to a particular geography and explore the political channel which could be influencing our results. The state government of Jammu & Kashmir has a majority shareholding in the bank (from which we obtain our data) with more than 50% of the shares.[27] Over the years, they have consolidated their stake by increasing it further. We also show how constructed loan variables respond to the shelling events apart from demonstrating the possibility of overreaction by the loan officers.

7.3 Effect of Political Intervention

We then try and investigate the possible effect of electoral politics on our results and whether it is be driven by political patronage or influence. It maybe possible that our observed effects are influenced by lending directed by the government to these border areas since they face financial

[25]This is the % change in the interest rate before and after the shelling for both treatment and control groups.

[26]$\exp\left(0.802 \times 10^{-2}\right) - 1$; $\exp\left(1.346 \times 10^{-2}\right) - 1$; $\exp\left(0.497 \times 10^{-2}\right) - 1$

[27]https://www.jkbank.com/pdfs/annrep/J-&-K-Bank-AR-2014.pdf.

distress and damage from shelling. To investigate this effect, we first select those assembly constituencies (in the districts along the Radcliffe Line) where there was a close contest in the 2014 state assembly elections held between November-December, 2014. We define a *Close contest* as one where the difference in votes between the first and second placed candidate was less than the votes polled by the third placed candidate. We obtain information on the voting percentages and votes polled from the IndiaVotes website.[28] Subsequently, we map bank branches to their relevant assembly constituencies using their geocodes (for the bank branches) and shapefiles (for the constituencies). This is done by plotting assembly constituency maps and placing the bank branches on these constituencies using GIS maps in R. We conjecture that the possibility of a close contest in these constituencies increases the chances of relief in the form of interest rate subventions especially by victorious politicians who might influence lending by the bank. This is plausible because victorious candidates might lobby with the government (which owns a majority stake) to ask for some concessions for the residents of their constituency.

The dummy variable *Close Contest* equals 1 for those branches which lie within those border constituencies which experienced a close electoral contest where as it equals 0 for those branches which lie within those constituencies which did not experience a close close contest (but still lie in the districts situated along the Radcliffe Line). Table 10 shows that the loan terms aren't significantly different for the two shelling events occurring after the state assembly elections. An exception is Column 1 which shows a drop in interest rate for these branches. It is plausible that the first shelling event after the elections results in these branches being directed to lower interest rates to aid the residents of the areas affected by shelling. However, this effect does not translate on to the third shelling event which occurs a couple of years after the elections. Nonetheless, the effect in Column 1 works in a direction opposite to our main results and is expected to make our results weaker, if at all.

7.4 Change in Borrower Pool

A notable concern one could express about our results is that the higher interest rate could be capturing not the shelling effect but instead be symptomatic of worsening borrower quality over the sample period. In other words, its possible that the results we observe are not reflective of the altering preferences and beliefs of the loan officers due to shelling. A generic worsening in borrower quality could also precipitate a similar supply side reaction by the loan officers. If this were true, we would observe an increase in both ex-ante and ex-post borrower risk measures

[28] http://www.indiavotes.com/.

over time.

We explore how ex-post risk changes for borrowers due to shelling. The first panel of Figure 8 shows the mean % of NPLs for loans originated before and after each shelling event for the treated group. The treated group has higher % of NPLs for the first event but there does not seem to be a definite upward trend over the course of the three events. This demonstrates that worsening borrower quality is not responsible for the loan officers' reaction. The results with NPLs could, however, be vitiated by the problem of right censoring. As it takes a while for banks to recognize NPLs, loans disbursed earlier in the sample period have a greater chance of turning into NPLs as compared to loans disbursed later in the sample period.

From the lower panel of Figure 8, we deduce that the ex-ante risk for loans in the treated group aren't significantly different from each other. To depict this, we plot the mean of the internal ratings for the treated groups for loans initiated before and after each of the shelling events. We find neglible differences in internal ratings for the treated group across all three events. This supports the claim that ex-ante, loan officers do not perceive a deterioration in borrower quality. Thus, using a combination of % of NPLs and internal ratings we ascertain that the borrower quality does not worsen after shelling. This adds merit to our hypothesis that the results we observe are not a reaction (by the loan officers) due to perceived change in borrower quality.

8 Conclusion

We analyze the altered response of loan officers to repeated episodes of observed conflict. We measure conflict episodes using incidents of *shelling*, i.e., mortar gun firing across the Radcliffe Line (international boundary between India and Pakistan). Our incidents are restricted to only those events where the damage was large enough to trigger migration of the border dwelling populace. To explore our hypotheses, we use a region-wise loan level database from the largest bank (in terms of lending volume and overall presence) in the state of Jammu & Kashmir in India. We use interest rates, i.e., changes on the intensive margin as our main outcome variable.

We observe that interest rates show a successive increase over each event following the shelling incidents. The loan amount on the extensive margin does not change appreciably and this coupled with an interest rate increase shows that both supply and demand change simultaneously. We control for economic effects on the demand side using changes in local work pattern. The work demand pattern is a demand focused rural employment guarantee program and, given the way it is structured, allows us to understand the extent of economic activity. The work demand pattern controls for both demand and supply focused economic effects and thus hence serves to weaken our results. Hence, our stated supply-driven results are understated to a certain degree. We then show that the change in interest rates is not only an adjustment to shelling-specific shocks but also responds (with a delayed effect) to an increase in uncertainty prevailing due to the shelling. We also explore the channels for this altered behaviour and demonstrate that this is primarily due to recast beliefs.

We also carry out a slew of additional tests which show that the loan officers re-allocate lending to safer loans which are less prone to be affected by shelling. We also investigate the possibility of political interference in the lending decisions in the affected areas. Since the bank was controlled by the state government (through a majority stake) during this period, it is plausible that lending gets re-directed to appease the constituents. We do observe that following close electoral contests, there is a greater propensity for the loan officers to offer lax terms. However, this effect runs in opposition to our primary effects and thus would lead us to report smaller estimates, if at all.

While we use a setting which corresponds to conflict, our results are also applicable in a general context of supply side credit tightening. We observe that when faced with economic or political shocks, banks tend to tighten credit, which could exacerbate credit or liquidity spirals on the downside. This calls for policy action to prevent or limit the intensity of such episodes. Investigating the intensity and timing of credit spirals propagated by the supply side could also be a topic of future research.

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Figure 1: **British Indian Empire, 1909**

The map below shows the territories of British India. Areas shaded in pink denote territories administered by the Government of India where as the areas shaded yellow depict the *princely states*. The boundaries did not alter significantly between 1909 and 1947, the year when India obtained independence.

Source: Oxford University Press, 1909. Scanned and reduced from personal copy by Fowler & Fowler, 5 August 2007. Author: Edinburgh Geographical Institute; J. G. Bartholomew and Sons

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Figure 2: **The (many) boundaries of the erstwhile princely state of Jammu & Kashmir**

The map below shows the present boundaries of the erswhile princely state of Jammu & Kashmir. The area shaded in green denotes territory administered by Pakistan where as the area shaded in yellow denotes territory administered by the Government of India. Areas in brown are under Chinese control. The red border marks the periphery of the undivided princely state.

Source: Geography and Map Division, Library of Congress. Washington, D.C. (http://hdl.loc.gov/loc.gmd/g7653j.ct001188)
Contributor: Central Intelligence Agency, Cartography Center. United States 2004

Figure 3: **Details of one of the mortar guns used by the security forces**
The figure below depicts the details of one of the mortar guns employed by the Pakistani army along its borders. The maximum range of the rounds fired is approximately 7 km.

Source: Ministry of Defence Production, Government of Pakistan.

Figure 4: **Position of Jammu, Samba and Kathua within the larger map of the erstwhile princely state of Jammu & Kashmir**
The figure below depicts the location of the three districts along the Radcliffe Line for the undivided state of Jammu & Kashmir. This map does not reflect the contemporary political boundaries which are depicted in Figure 2.

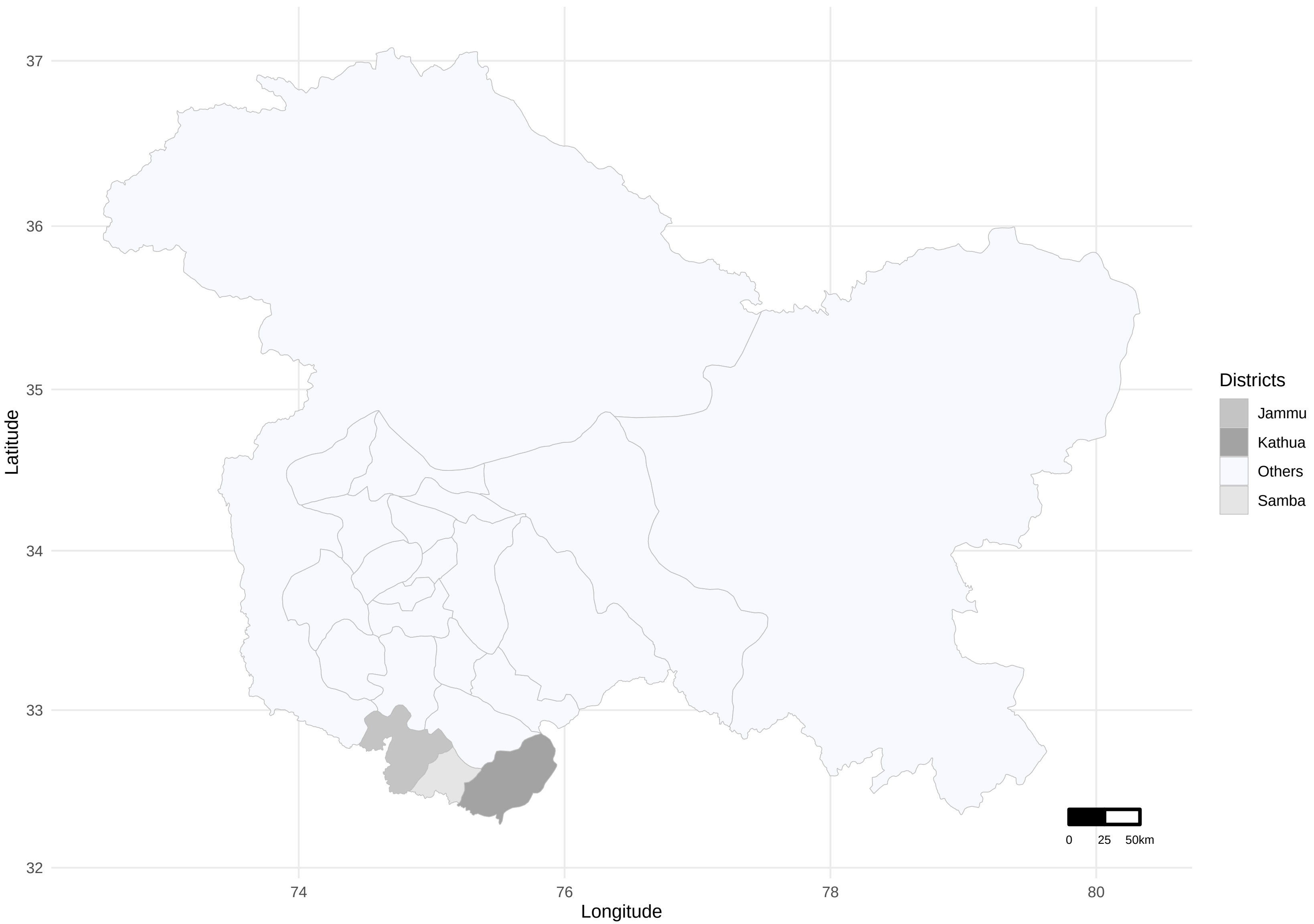


Figure 5: **Treated and control branches in the districts along the Radcliffe Line**

The figure below depicts the location of the treated and control branches in the three districts along the Radcliffe Line. The red circles depict the treated branches which are situated within 10 kilometres of the Radcliffe Line where as the green circles depict the control branches. The two green circles at the bottom depict branches that are on the state border within India and not along the Radcliffe Line.

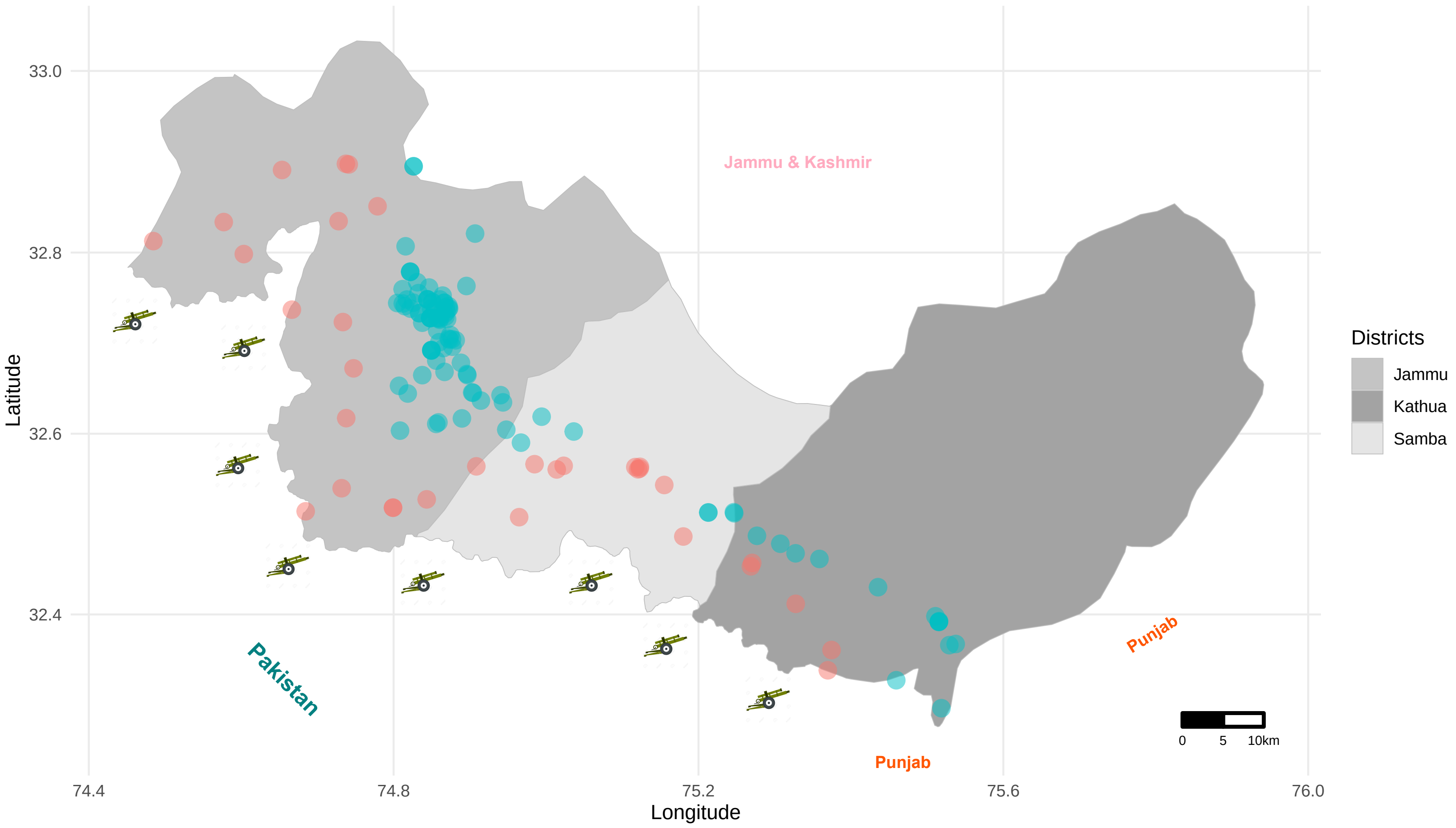
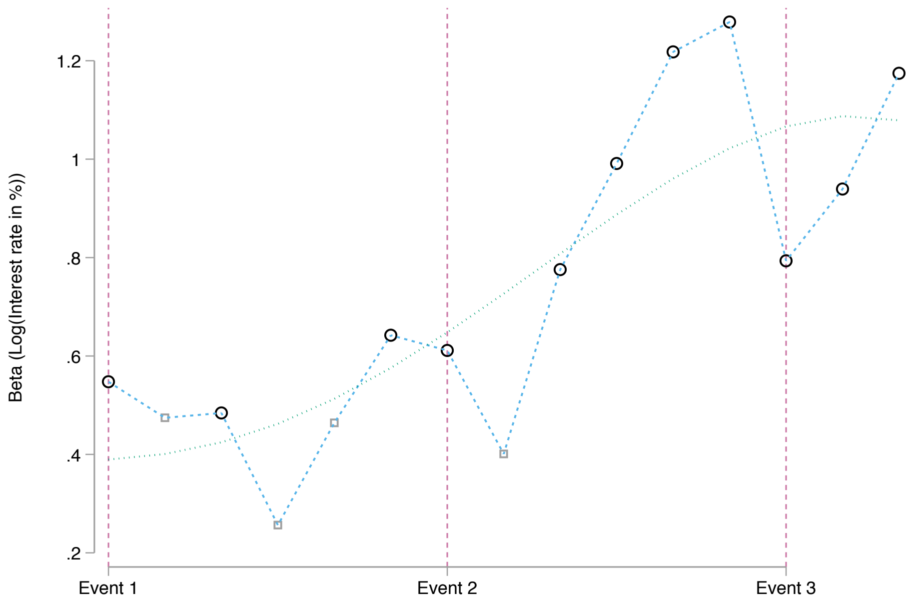


Figure 6: **Time varying Difference-in-Difference (DiD) coefficients for interest rate along the International Border**

The figures depict the DiD coefficients for interest rate over time starting from the first shelling event along the International Border (IB). The first figure in the panel shows the DiD coefficients for each event using a specification similar to our main regression equation. However, for each event we shift the post period starting from $[t+1, t+4)$ by one month to $[t+6, t+9)$ except for the third event where we can shift by 2 months at most due to data availability. The darker circles denote those DiD coefficients which are significant at the 95% confidence interval. We overlay the connected plot with a best fit fractional polynomial curve. The second figure denotes a similar graph as the first one. However, in this case the first coefficient, i.e., for the post period from $[t+1, t+4)$ is depicted just prior to each event. The "delayed" reaction is estimated by averaging out DiD coefficients for post periods $[t+4, t+7)$ to $[t+6, t+9)$. As before, for the third event, we average all coefficients after the one with the post period $[t+1, t+4)$ due to data availability. We again overlay the plot with a best fit fractional polynomial curve.

(a) Interest Rate



(b) Mean Interest Rate

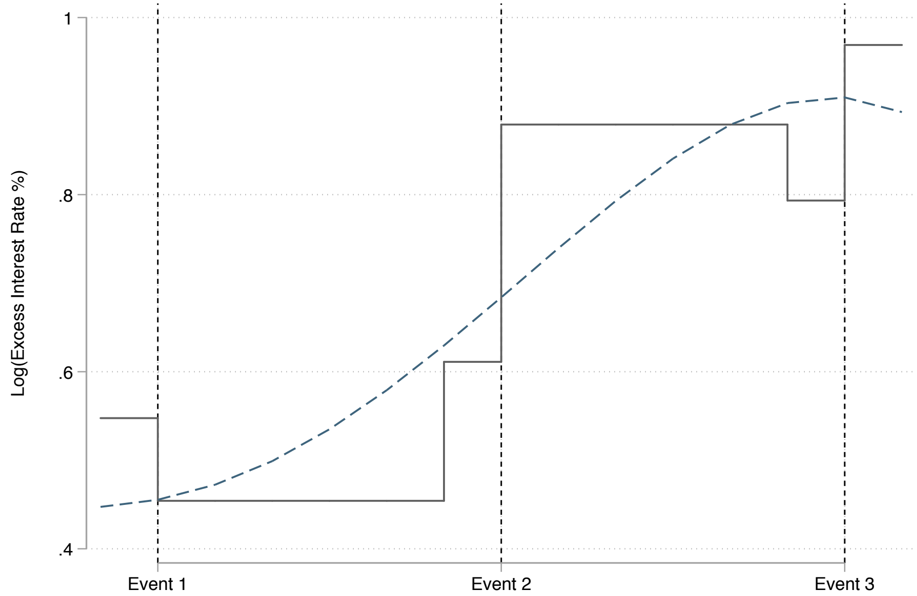
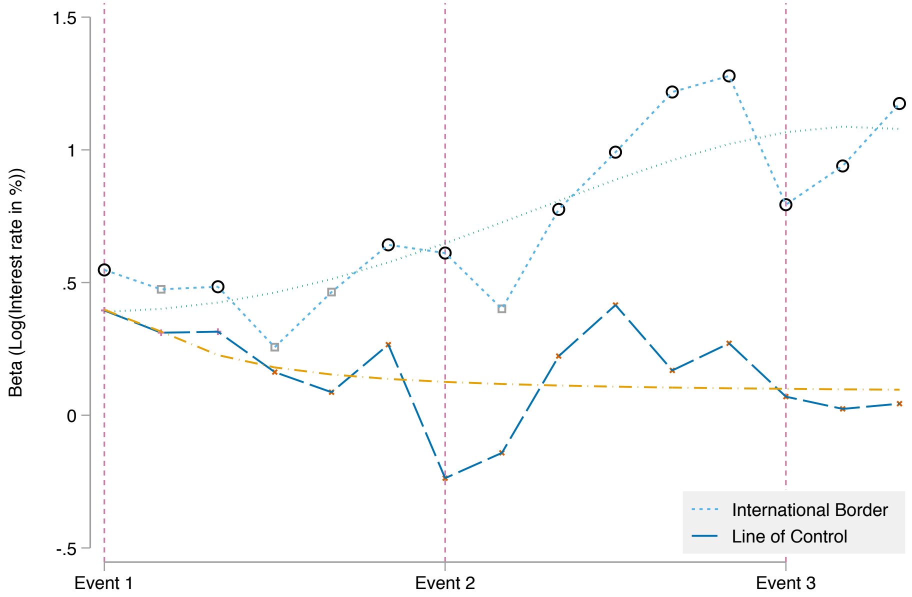


Figure 7: **Time varying Difference-in-Difference (DiD) coefficients for interest rate along the International Border & Line of Control.**
The figures depict the DiD coefficients for interest rate over time starting from the first shelling event along the Internatinal Border (IB). The first figure in the panel shows the DiD coefficients for each event using a specification similar to our main regression equation. However, for each event we shift the post period starting from $[t+1, t+4)$ by one month to $[t+6, t+9)$ except for the third event where we can shift by 2 months at most due to data availability. The darker circles denote those DiD coefficients which are significant at the 95% confidence interval. We overlay the connected plot with a best fit fractional polynomial curve. Similarly, we plot the DiD coefficients and best fit curve for the branches along the Line of Control. The second figure denotes a similar graph as the first one for branches along the International Border and the Line of Control. However, in this case the first coefficient, i.e., for the post period from $[t+1, t+4)$ is depicted just prior to each event. The "delayed" reaction is estimated by averaging out DiD coefficients for post periods $[t+4, t+7)$ to $[t+6, t+9)$. As before, for the third event, we average all coefficients after the one with the post period $[t+1, t+4)$ due to data availability. We again overlay the plot with a best fit fractional polynomial curve.

(a) Interest Rate



(b) Mean Interest Rate

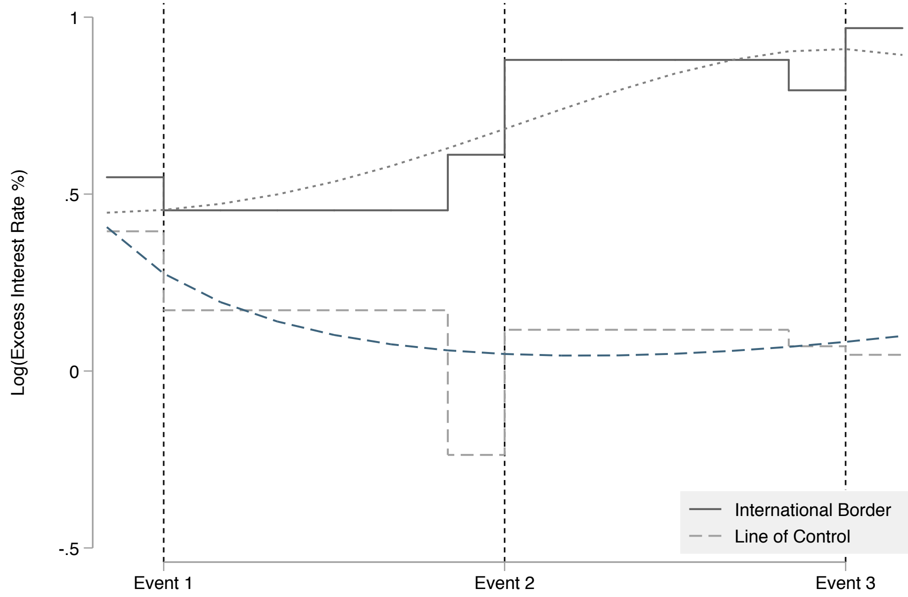
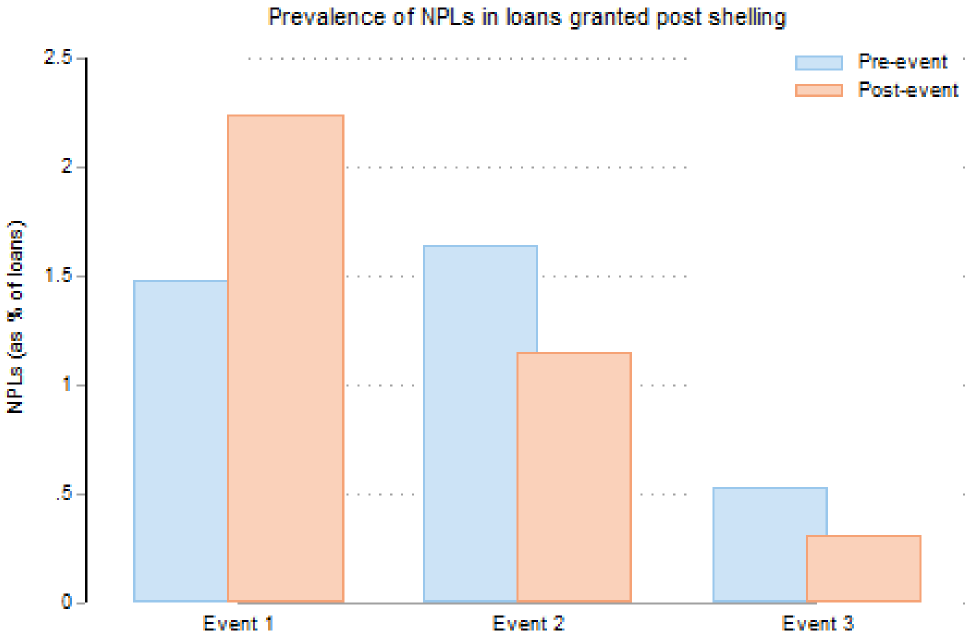


Figure 8: **Change in borrower quality before and after shelling**

(a) NPLs



(b) Internal Ratings

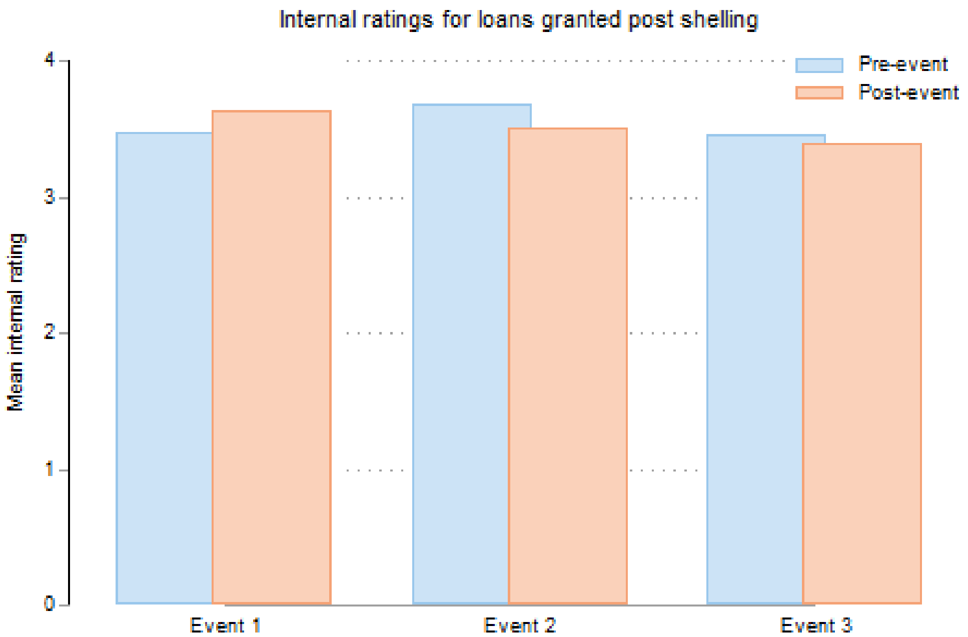


Table 1 Timeline of Events

October 2014	First major shelling incident in the border districts on the Indian side along the Radcliffe Line.
January 2015	Second major shelling incident in a space of three months.
January 2015	About 30,000 individuals displaced following the hostilities of the last three months.
October 2015	Re-occurrence of shelling in Samba and Kathua districts.
November 2015	Displacement of 3000 individuals as a result of the shelling.
October 2016	Shelling along the Radcliffe line leading to the migration of about 10,000 individuals from the border districts.
November 2016	Demonetization of high value currency notes (INR 500 and 1000) by the Reserve Bank of India.
October 2019	Bifurcation of the state of Jammu & Kashmir into the federally administered territories of Jammu & Kashmir and Ladakh.

Table 2 **Shelling events and affected population**

The table presents the dates of shelling, affected districts and number of people who were forced to migrate from their homes. The displaced population numbers are ballpark and have been obtained from a curation of newspaper articles on the South Asian Terrorism Portal (SATP) website via http://old.satp.org/satporgtp/countries/india/states/jandk/timeline/index.htm. The event in 2016 was the most long drawn and intense with the latter half of October, 2016 seeing 29 villages bombed by mortar guns.Event 1 is the amalgamation of 2 separate events occurring very close to each other; namely from 5th Oct, 2014 - 11th Oct, 2014 and 4th Jan, 2015 - 5th Jan, 2015 across Jammu, Samba and Kathua. The displaced population for these events was approximately 20,000 and 10,000 individuals respectively.

# Event	Shelling Date(s)	Affected Districts	Displaced population (approx.)
1	5th Oct, 2014 - 5th Jan, 2015	Jammu, Samba and Kathua	30,000
3	26th Oct, 2015 - 27th Oct, 2015	Samba and Kathua	3,000
4	2nd Oct, 2016 - 1st Nov, 2016	Jammu, Samba and Kathua	10,800

Table 3 **Summary Statistics**

This table presents summary statistics for selected loan, and branch specific variables for branches in both affected and unaffected areas. Our data covers the period from January 2011 to June 2016 where we subset to branches affected by shelling (0-10 km from the Radcliffe Line) and those unaffected by shelling (10-20 km from the Radcliffe Line). Loan amounts are expressed in Indian rupees (INR).

	(1) Affected branches			(2) Unaffected branches		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Panel A. Loan Terms and Lending Variables						
Interest rate (%)	50,334	7.03	4.81	137,318	6.94	5.84
Log(Interest rate)	37,523	2.20	0.30	85,215	2.38	0.28
Amount (INR)	50,367	145,057.73	270,709.17	137,376	220,498.55	367,869.95
Log(Amount)	31,908	11.41	1.70	81,833	12.19	1.36
% Loan collateralized	31,908	0.65	0.94	81,833	0.78	1.24
Loan maturity (months)	14,195	68.15	30.44	55,921	71.32	33.40
Any collateral (0/1)	50,367	0.29	0.46	137,376	0.28	0.45
Panel B. Branch Specific Variables						
Distance from Radcliffe Line (km)	50,367	6.41	2.29	137,376	16.17	2.63
Panel C. Sub-district Specific Variables						
Rural work demand(# persons)	30,600	435.80	402.69	111,385	607.16	400.83
Deseasonalized rural work demand(# persons)	30,600	-56.36	330.20	111,385	104.18	363.28
Panel D. District Specific Variables						
Deposit Level (INR Millions)	23,709	7936.56	22066.25	87,376	98273.42	61455.96
Change in Deposit Level (INR Millions)	22,598	366.80	978.72	83,558	3098.18	2828.46
Lagged supply slippage (%)	22,415	0.56	0.19	82,995	0.60	0.16

Table 4 Changes in interest rates for branches situated in areas affected by shelling

The table below presents difference-in-differences estimates for interest rate for loans initiated by branches close to the Radcliffe Line (International Border). The treatment group consists of all branches within 10 kilometres from the Radcliffe Line where as the control group consists of branches within the 10-20 kilometre range from the Radcliffe Line. *Affected* is a dummy variable which captures whether a branch was situated within 10 kilometres from the Radcliffe Line where as *Post* is a dummy which captures only those loans which were initiated within $[t+1, t+4)$ months after the shelling subsided. We use a burn in period of one month after the shelling to account for any loans that might have been contracted prior to the event. The analysis is limited to those shelling events where the damage was calamitous enough to warrant migration of border dwelling populations. We also consider only those districts of Jammu & Kashmir that share the Radcliffe Line (International Border) with Pakistan which was agreed upon during the partition of British India in 1947. We control for loan demand by proxying it with rural work demand and also control for the level of deposits. Standard errors are in parentheses and corrected for heteroskedasticity using White's methodology. *** p<0.01, ** p<0.05, * p<0.1.

	Log(Interest Rate)		
	(1) First Shelling Event	(2) Second Shelling Event	(3) Third Shelling Event
Affected×Post(10^{-2})	0.548**	0.554**	0.793***
	(0.271)	(0.252)	(0.144)
Affected(10^{-2})	−0.920***	−0.587***	−0.513***
	(0.179)	(0.215)	(0.111)
Post(10^{-2})	−0.848	−2.146***	−3.236***
	(0.638)	(0.226)	(0.082)
Rural Work Demand(# persons, 10^{-3})	−0.341	−0.438**	0.576***
	(0.239)	(0.219)	(0.122)
Deposit Level (INR Millions, 10^{-6})		1.425	−2.416***
		(1.589)	(0.771)
District fixed-effects	*Y*	*Y*	*Y*
Quarter fixed-effects	*Y*	*Y*	*Y*
Loan-type fixed-effects	*Y*	*Y*	*Y*
R^2	0.966	0.951	0.968
Observations	7,139	10,807	14,744

TABLE 5 **Changes in loan amount granted for branches situated in areas affected by shelling**

The table below presents difference-in-differences estimates for the total loan amount initiated by branches (per month) close to the Radcliffe Line (International Border). The treatment group consists of all branches within 10 kilometres from the Radcliffe Line where as the control group consists of branches within the 10-20 kilometre range from the Radcliffe Line. *Affected* is a dummy variable which captures whether a branch was situated within 10 kilometres from the Radcliffe Line where as *Post* is a dummy which captures only those loans which were initiated within $[t+1, t+4)$ months after the shelling subsided. We use a burn in period of one month after the shelling to account for any loans that might have been contracted prior to the event. The analysis is limited to those shelling events where the damage was calamitous enough to warrant migration of border dwelling populations. We also consider only those districts of Jammu & Kashmir that share the Radcliffe Line (International Border) with Pakistan which was agreed upon during the partition of British India in 1947. Standard errors are in parentheses and corrected for heteroskedasticity using White's methodology. *** p<0.01, ** p<0.05, * p<0.1.

	Log(Loan Amount)		
	(1) First Shelling Event	(2) Second Shelling Event	(3) Third Shelling Event
Affected×Post(10^{-2})	1.725	3.245	0.161
	(7.699)	(6.461)	(5.998)
Affected(10^{-2})	−12.293**	−8.768*	−16.082***
	(5.590)	(4.655)	(4.369)
Post(10^{-2})	37.184***	−3.867	17.865***
	(11.567)	(5.028)	(3.171)
District fixed-effects	*Y*	*Y*	*Y*
Quarter fixed-effects	*Y*	*Y*	*Y*
Loan-type fixed-effects	*Y*	*Y*	*Y*
R^2	0.522	0.619	0.561
Observations	3, 368	4, 239	5, 872

Table 6 **Overreaction in interest rates beyond the "post-shelling" period**

The table below presents difference-in-differences estimates for interest rate for loans initiated by branches close to the Radcliffe Line (International Border). The treatment group consists of all branches within 10 kilometres from the Radcliffe Line where as the control group consists of branches within the 10-20 kilometre range from the Radcliffe Line. *Affected* is a dummy variable which captures whether a branch was situated within 10 kilometres from the Radcliffe Line. To compare the interest rate values just after the shelling incidence to subsequent month, we use the $[t+1, t+4)$ months after the shelling subsided as the *Pre* period where as *Post* dummy captures those loans initiated three, four or five months after the $(t+1)$ month. Given the limited observations after the third shelling event, the *Post* period encapsulates one and two month after the $(t+1)$ month. The analysis is limited to those shelling events where the damage was calamitous enough to warrant migration of border dwelling populations. We also consider only those districts of Jammu & Kashmir that share the Radcliffe Line (International Border) with Pakistan which was agreed upon during the partition of British India in 1947. We control for loan demand by proxying it with rural work demand and also control for the level of deposits. Standard errors are in parentheses and corrected for heteroskedasticity using White's methodology. *** p<0.01, ** p<0.05, * p<0.1.

	Months after first shelling			Months after second shelling			Months after third shelling	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Three	Four	Five	Three	Four	Five	One	Two
Affected×Post(10^{-2})	−0.361	−0.139	0.100	0.374	0.048	0.561***	0.456*	0.523**
	(0.275)	(0.273)	(0.273)	(0.269)	(0.212)	(0.176)	(0.238)	(0.215)
Demand Controls	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
District fixed-effects	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
Quarter fixed-effects	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
Loan-type fixed-effects	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
R^2	0.962	0.963	0.961	0.952	0.956	0.957	0.965	0.965
Observations	7,745	7,995	8,342	11,209	12,975	14,758	7,487	7,487

Table 7 **Changes in interest rates for branches situated in areas affected by shelling (compared to the Line of Control)**

The table below presents triple difference estimates for interest rate for loans initiated by branches close to the Radcliffe Line (International Border). The treatment group consists of all branches in the Jammu division within 10 kilometres from the border where as the control group consists of branches in the Jammu division in the 10-20 kilometre range from the border. *Affected* is a dummy variable which captures whether a branch was situated within 10 kilometres from the border where as *Post* is a dummy which captures only those loans which were initiated within $[t+1, t+4)$ months after the shelling subsided. We use a burn in period of one month after the shelling to account for any loans that might have been contracted prior to the event. *International Border* is a dummy variable which equals 1 for those branches situated in the districts of Jammu & Kashmir that share the Radcliffe Line (International Border) with Pakistan where as it is zero for branches situated in districts along the Line of Control (de-facto border) in the Jammu division. The analysis is limited to those shelling events where the damage was calamitous enough to warrant migration of border dwelling populations. We do not report all the interaction terms for in the interest of brevity. Standard errors are in parentheses and corrected for heteroskedasticity using White's methodology. *** p<0.01, ** p<0.05, * p<0.1.

	Log(Interest Rate)		
	(1)	(2)	(3)
	First Shelling Event	Second Shelling Event	Third Shelling Event
Affected×Post×International Border(10^{-2})	0.373	0.713**	0.593**
	(0.298)	(0.334)	(0.265)
Affected×Post(10^{-2})	0.314**	−0.094	0.167
	(0.157)	(0.214)	(0.221)
Deposit Level (INR Millions, 10^{-6})		1.363	−1.971***
		(1.574)	(0.743)
District fixed-effects	*Y*	*Y*	*Y*
Quarter fixed-effects	*Y*	*Y*	*Y*
Loan-type fixed-effects	*Y*	*Y*	*Y*
R^2	0.978	0.963	0.972
Observations	10,157	14,275	19,611

TABLE 8 **Effect of learning on interest rate for branches situated in areas affected by shelling**

The table below presents difference-in-differences estimates for interest rates on loans initiated by branches close to the Radcliffe Line (International Border). The treatment group consists of all branches within 10 kilometres from the Radcliffe Line where as the control group consists of branches within the 10-20 kilometre range from the Radcliffe Line. *Affected* is a dummy variable which captures whether a branch was situated within 10 kilometres from the Radcliffe Line. The continuous variable *Weighted Shelling* uses time varying weights to capture the lingering effects of shelling after the culmination of the event. The parameter λ determines the shape of the weighting function. The results are robust to the selection of λ. The analysis is limited to those shelling events where the damage was calamitous enough to warrant migration of border dwelling populations. We also consider only those districts of Jammu & Kashmir that share the Radcliffe Line (International Border) with Pakistan which was agreed upon during the partition of British India in 1947. Standard errors are in parentheses and corrected for heteroskedasticity using White's methodology. *** p<0.01, ** p<0.05, * p<0.1.

	All Events - Log(Interest Rate)				
	(1)	(2)	(3)	(4)	(5)
	$\lambda = 1$	$\lambda = 1.5$	$\lambda = 2$	$\lambda = 2.5$	$\lambda = 3$
Affected×Weighted Shelling(10^{-2})	1.574**	1.576**	1.574**	1.569**	1.559**
	(0.616)	(0.616)	(0.616)	(0.616)	(0.615)
Affected(10^{-2})	−0.192	−0.293	−0.395	−0.495	−0.595
	(0.463)	(0.467)	(0.470)	(0.473)	(0.476)
Weighted Shelling(10^{-2})	−0.450***	−0.450***	−0.450***	−0.449***	−0.449***
	(0.072)	(0.072)	(0.072)	(0.072)	(0.072)
Demand Controls	*Y*	*Y*	*Y*	*Y*	*Y*
District fixed-effects	*Y*	*Y*	*Y*	*Y*	*Y*
Quarter fixed-effects	*Y*	*Y*	*Y*	*Y*	*Y*
Loan-type fixed-effects	*Y*	*Y*	*Y*	*Y*	*Y*
R^2	0.954	0.954	0.954	0.954	0.954
Observations	48,244	48,244	48,244	48,244	48,244

TABLE 9 **Changes in loan terms for branches situated in areas affected by shelling adjusting for generic credit supply effects**

The table below presents difference-in-differences estimates on interest rates for loans initiated by branches close to the Radcliffe Line (International Border) controlling for supply side effects. *Supply Slippage* is a variable which captures the % of lending volume target achieved in the prior quarter thus allowing us to absorb any effects emanating from supply. The treatment group consists of all branches within 10 kilometres from the Radcliffe Line where as the control group consists of branches within the 10-20 kilometre range from the Radcliffe Line. *Affected* is a dummy variable which captures whether a branch was situated within 10 kilometres from the Radcliffe Line where as *Post* is a dummy which captures only those loans which were initiated within $[t+1, t+4)$ months after the shelling subsided. We use a burn in period of one month after the shelling to account for any loans that might have been contracted prior to the event. The analysis is limited to those shelling events where the damage was calamitous enough to warrant migration of border dwelling populations. We also consider only those districts of Jammu & Kashmir that share the Radcliffe Line (International Border) with Pakistan which was agreed upon during the partition of British India in 1947. Standard errors are in parentheses and corrected for heteroskedasticity using White's methodology. *** p<0.01, ** p<0.05, * p<0.1.

	Log(Interest Rate)	
	(1) First Shelling Event	(2) Second Shelling Event
Affected×Post(10^{-2})	0.552**	0.786***
	(0.252)	(0.144)
Affected(10^{-2})	−0.586***	−0.503***
	(0.215)	(0.111)
Post(10^{-2})	−2.146***	−3.344***
	(0.226)	(0.106)
Rural Work Demand	−0.436**	0.586***
	(0.219)	(0.122)
Sum of Deposits	0.000	−0.000***
	(0.000)	(0.000)
Supply Slippage(%)	−0.090	0.458*
	(0.252)	(0.245)
District fixed-effects	*Y*	*Y*
Quarter fixed-effects	*Y*	*Y*
Loan-type fixed-effects	*Y*	*Y*
R^2	0.951	0.968
Observations	10,807	14,744

TABLE 10 **Reallocation in lending volume for branches situated in areas affected by shelling**

The table below presents the regression of % change in allocation across risky or safe loan types against a dummy variable, *Post* which is 1 for $[t+1, t+4)$ months after the shelling subsided and 0 for $[t-3, t)$ months before the shelling. We compute the total volume of loans initiated each month and then determine what % of the volume may be attributed to risky or safe loan types thus reducing our loan level data to a monthly level. We restrict the sample to loans initiated by branches close to the Radcliffe Line (International Border) i.e., within 10 kilometres from the Radcliffe Line. As before, the analysis is limited to those shelling events where the damage was calamitous enough to warrant migration of border dwelling populations. We also consider only those districts of Jammu & Kashmir that share the Radcliffe Line (International Border) with Pakistan which was agreed upon during the partition of British India in 1947. Standard errors are in parentheses and corrected for heteroskedasticity using White's methodology. *** p<0.01, ** p<0.05, * p<0.1.

	Safe loans	Risky loans	Safe - Risky
	(1)	(2)	(3)
Post	0.110***	−0.104	0.214**
	(0.036)	(0.082)	(0.089)
District × Time fixed-effects	*Y*	*Y*	*Y*
R^2	0.041	0.070	0.037
Observations	1,726	1,726	1,726

TABLE 11 **Changes in interest rates for loan types impaired by shelling**

The table below presents difference-in-differences estimates for the interest rate for loans initiated by branches close to the Radcliffe Line (International Border). The treatment group consists of all branches within 10 kilometres from the Radcliffe Line where as the control group consists of branches within the 10-20 kilometre range from the Radcliffe Line. We restrict the set of observations to only those loan types that have a greater tendency to be effected by the shelling events. *Affected* is a dummy variable which captures whether a branch was situated within 10 kilometres from the Radcliffe Line where as *Post* is a dummy which captures only those loans which were initiated within $[t+1, t+4)$ months after the shelling subsided. We use a burn in period of one month after the shelling to account for any loans that might have been contracted prior to the event. The analysis is limited to those shelling events where the damage was calamitous enough to warrant migration of border dwelling populations. We also consider only those districts of Jammu & Kashmir that share the Radcliffe Line (International Border) with Pakistan which was agreed upon during the partition of British India in 1947. Standard errors are in parentheses and corrected for heteroskedasticity using White's methodology. *** p<0.01, ** p<0.05, * p<0.1.

	Log(Interest Rate)		
	(1)	(2)	(3)
	First Shelling Event	Second Shelling Event	Third Shelling Event
Affected×Post(10^{-2})	0.735**	1.177***	0.552***
	(0.358)	(0.424)	(0.196)
Affected(10^{-2})	−0.659***	−0.482	−0.383**
	(0.190)	(0.373)	(0.157)
Post(10^{-2})	−1.143**	−0.783*	−2.168***
	(0.498)	(0.405)	(0.135)
Rural Work Demand(# persons, 10^{-3})	−0.646*	−0.650*	0.425***
	(0.373)	(0.358)	(0.150)
Deposit Level (INR Millions, 10^{-6})		−5.501*	−1.608
		(2.922)	(1.100)
District fixed-effects	*Y*	*Y*	*Y*
Quarter fixed-effects	*Y*	*Y*	*Y*
Loan-type fixed-effects	*Y*	*Y*	*Y*
R^2	0.955	0.911	0.957
Observations	3,463	4,155	6,612

Table 12 **Robustness: Change in interest rates for branches situated in close contest electoral constituencies and areas affected by shelling**

The table below presents difference-in-differences estimates for interest rate for loans initiated by branches close to the Radcliffe Line (International Border). The treatment group consists of all branches within 10 kilometres from the Radcliffe Line where as the control group consists of branches within the 10-20 kilometre range from the Radcliffe Line. *Close Contest* is a dummy variable which captures whether a branch was situated within 10 kilometres from the Radcliffe Line also lies in a close contest assembly constituency. We use results in state elections in late 2014 to determine these constituencies. A constituency is flagged as a *Close Contest* if the margin of victory is less than the number of votes polled by the candidate in the third place. *Post* is a dummy which captures only those loans which were initiated within $[t+1, t+4)$ months after the shelling subsided. We use a burn in period of one month after the shelling to account for any loans that might have been contracted prior to the event. The analysis is limited to those shelling events where the damage was calamitous enough to warrant migration of border dwelling populations. We also consider only those districts of Jammu & Kashmir that share the International border (Radcliffe Line) with Pakistan which was agreed upon during the partition of British India in 1947. Standard errors are in parentheses and corrected for heteroskedasticity using White's methodology. *** p<0.01, ** p<0.05, * p<0.1.

	Log(Interest Rate)	
	(1)	(2)
	Second Shelling Event	Third Shelling Event
Close Contest×(10^{-2})	−1.257***	−0.134
	(0.422)	(0.252)
Close Contest(10^{-2})	1.295***	0.032
	(0.333)	(0.178)
Post(10^{-2})	−1.571***	−2.423***
	(0.398)	(0.147)
Rural Work Demand(# persons, 10^{-3})	−0.178	0.775***
	(0.370)	(0.203)
Deposit Level (INR Millions), 10^{-6})	18.956***	−3.010
	(5.135)	(2.412)
District fixed-effects	*Y*	*Y*
Quarter fixed-effects	*Y*	*Y*
Loan-type fixed-effects	*Y*	*Y*
R^2	0.972	0.983
Observations	2,434	3,180

Appendix

Model Simulation Results

We simulate the model in Section 3 for 1000 instances and then take the mean of the values to show how the excess interest rate might evolve in a Bayesian setting. Figure S1 depicts our results for varying values of σ, the shelling uncertainty. We do observe that the outcome becomes more perturbed and takes longer to achieve steady state once σ increases. The excess interest rate follows a pattern similar to the empirical observations in our main figures, Figures 5 and 6. However, the upward adjustment to the interest rates and subsequent convergence is much more rapid in the simulated results below as compared to the empirical observations. Similar to the empirical results, we observe an medium run overreaction (the excess interest rate shoots above zero from events 4 to 8) and then subsequent reverses to a long run mean of zero.

Increasing the intensity of shelling uncertainty prolongs the convergence time as the standard deviation associated with the interest rate takes longer to drop to zero (Figure S2). Figure S2 shows that the standard deviation drops to zero first for lower values of σ. A low value of σ denotes lower shelling uncertainty and thus it takes the agent lesser number of iterations to learn about the distribution from past events. On the other hand, a high value of σ results in a longer convergence time due to elevated values of the standard deviation in the interest rate.

Figure S1

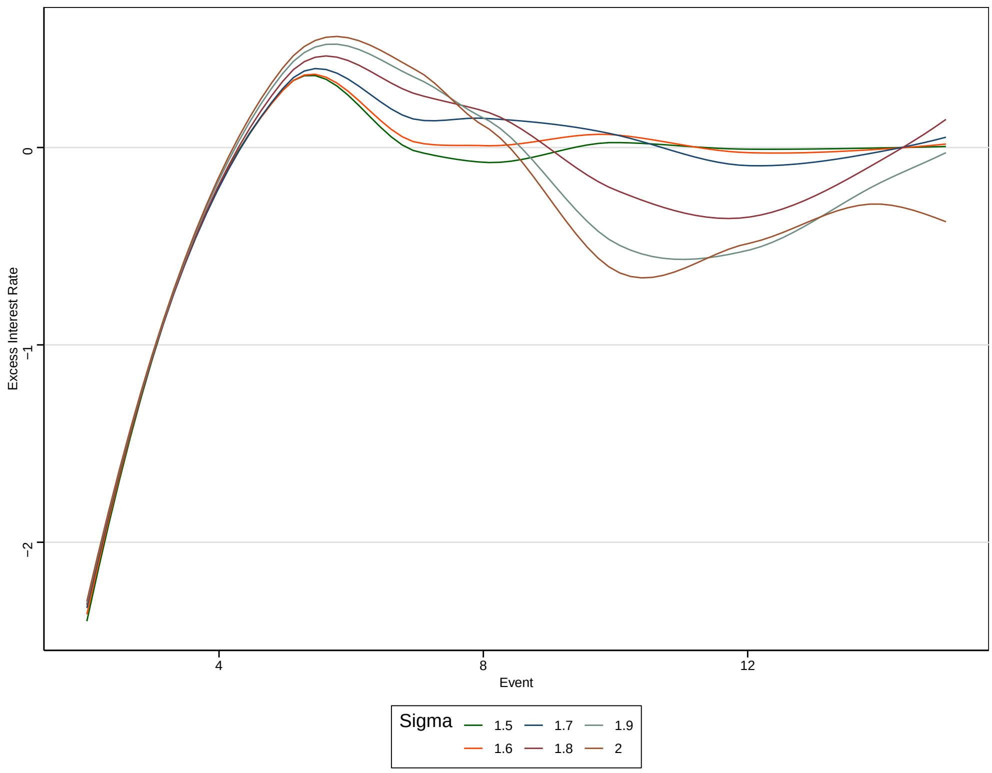
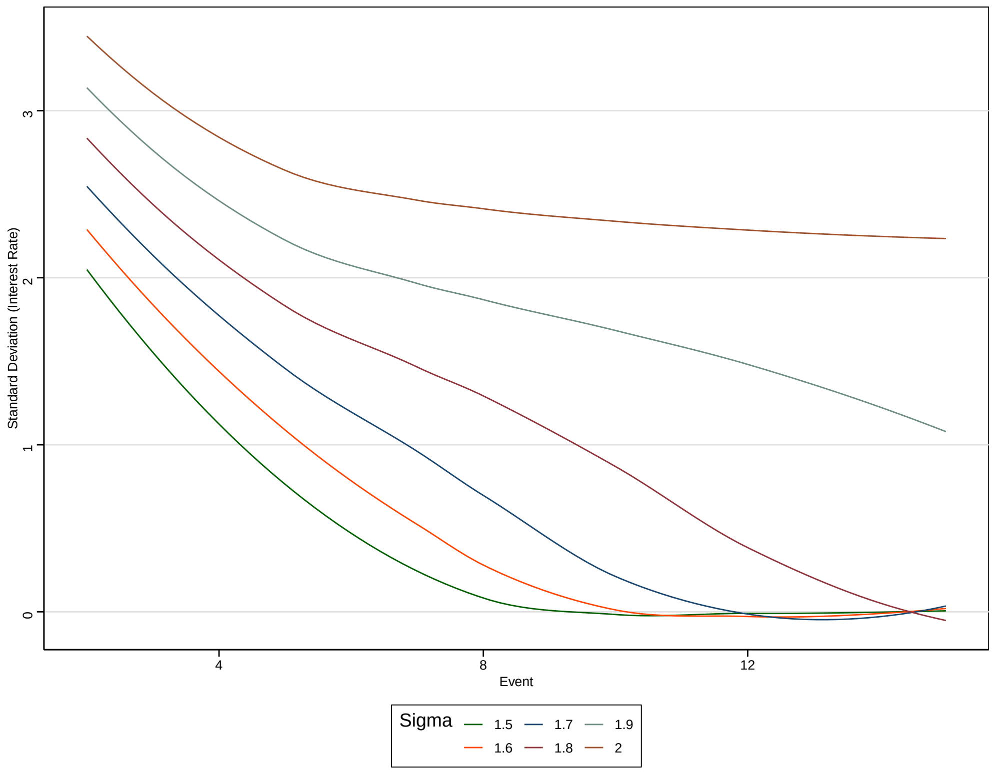
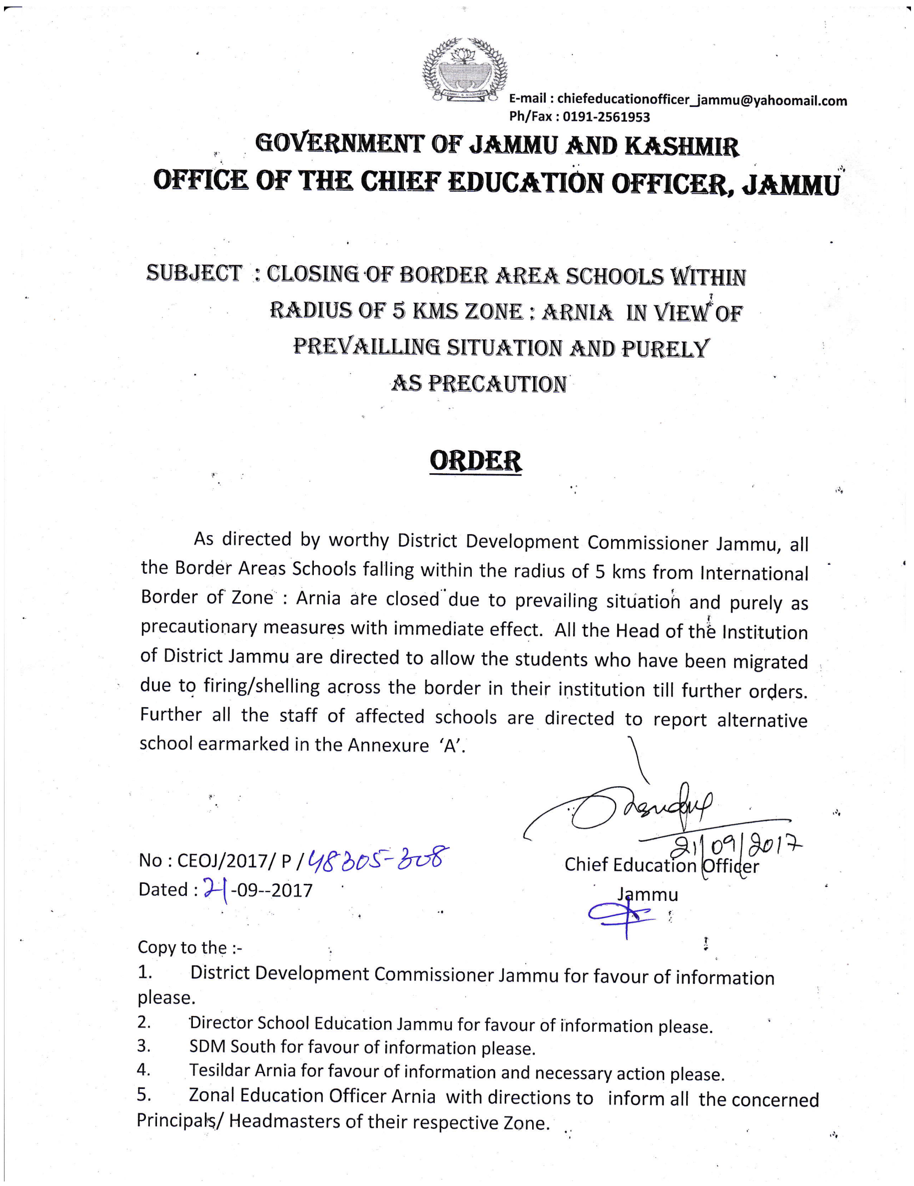


Figure S2



Standard Deviation (Interest Rate)
0
1
2
3
4
8
12
Event
Sigma
1.5
1.7
1.9
1.6
1.8
2

Figure A1: **Government circular on closure of schools due to shelling**
The exhibit below shows a circular issued by the district authorities instructing the closure of schools in the border areas.



E-mail : chiefeducationofficer_jammu@yahoomail.com
Ph/Fax : 0191-2561953

GOVERNMENT OF JAMMU AND KASHMIR
OFFICE OF THE CHIEF EDUCATION OFFICER, JAMMU

SUBJECT : CLOSING OF BORDER AREA SCHOOLS WITHIN RADIUS OF 5 KMS ZONE : ARNIA IN VIEW OF PREVAILLING SITUATION AND PURELY AS PRECAUTION

ORDER

As directed by worthy District Development Commissioner Jammu, all the Border Areas Schools falling within the radius of 5 kms from International Border of Zone : Arnia are closed due to prevailing situation and purely as precautionary measures with immediate effect. All the Head of the Institution of District Jammu are directed to allow the students who have been migrated due to firing/shelling across the border in their institution till further orders. Further all the staff of affected schools are directed to report alternative school earmarked in the Annexure 'A'.

21/09/2017

No : CEOJ/2017/ P / 48305-308
Dated : 21-09--2017

Chief Education Officer
Jammu

Copy to the :-
1. District Development Commissioner Jammu for favour of information please.
2. Director School Education Jammu for favour of information please.
3. SDM South for favour of information please.
4. Tesildar Arnia for favour of information and necessary action please.
5. Zonal Education Officer Arnia with directions to inform all the concerned Principals/ Headmasters of their respective Zone.

Figure A2: **Damages due to shelling**

The pictures below depict the damages caused by shelling to households situated along the Radcliffe Line. Clockwise from top left, we observed a damaged wall due to an exploded round. The next picture shows damage on the walls due to repeated firing. The pictures below show an *inert* or unexploded shell lodged into the wall and dead cattle dead owing to the shelling.

(a) Damaged House

(b) Damaged Walls

(c) Dead Cattle

(d) Inert Shell

Figure A3: **Parallel Trends**
The figure below show the parallel trend graphs for interest rate on each loan.

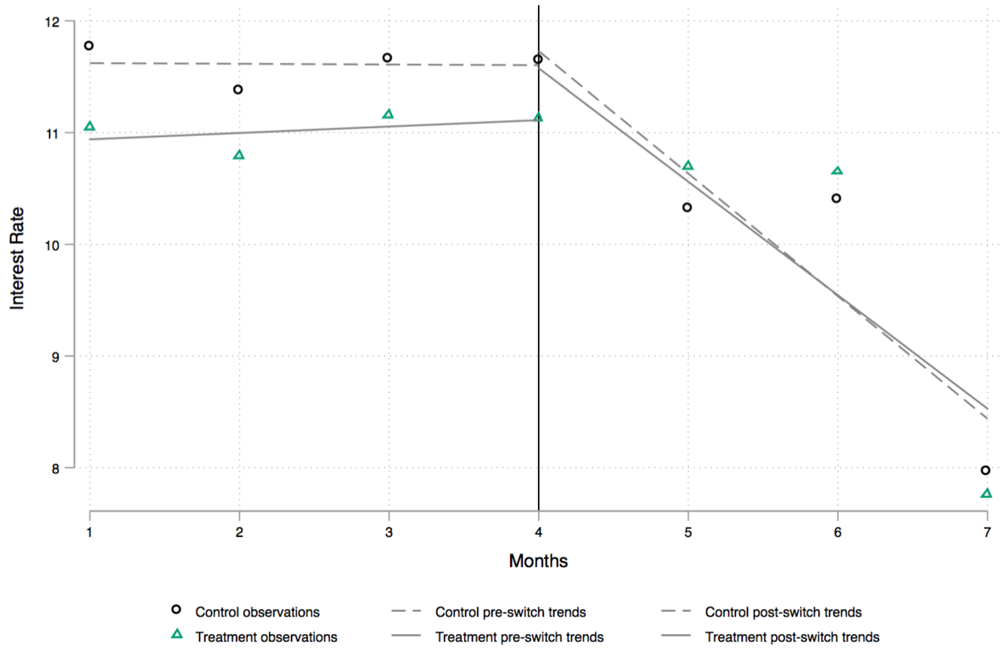


Table A1: **Separation of divisions and districts within the state of Jammu & Kashmir**
This table depicts the three divisions within the state of Jammu & Kashmir and the districts in each administrative division. The three districts of the Jammu division (in bold) are the ones we use for our analysis. Also, as of 31st October, 2019 the state of Jammu & Kashmir ceased to exist. It was subsequently reorganized and divided into the two separate federally administered territories of Jammu & Kashmir and Ladakh. However, there was no change in the district boundaries as a result of this exercise.

Division	**District**	**Area (sq. km)**	**Population (2011 Census)**
	Kathua	2,651	615,711
	Jammu	3,097	1,526,406
	Samba	904	318,611
	Udhampur	4,550	555,357
Jammu	Reasi	1,719	314,714
	Rajouri	2,630	619,266
	Poonch	1,674	476,820
	Doda	11,691	409,576
	Ramban	1,329	283,313
	Kishtwar	1,644	231,037
Total		26,293	5,350,811
	Anantnag	3,984	1,069,749
	Kulgam	1,067	423,181
	Pulwama	1,398	570,060
	Shopian	613	265,960
Kashmir Valley	Budgam	1,371	755,331
	Srinagar	2,228	1,250,173
	Ganderbal	259	297,003
	Bandipora	398	385,099
	Baramulla	4,588	1,015,503
	Kupwara	2,379	875,564
Total		15,948	6,907,622
	Kargil	14,036	143,388
Ladakh	Leh	45,110	147,104
Total		59,146	290,492

Table A2: **Robustness Tests: Changes in interest rate for branches situated in areas affected by shelling**
The table below presents difference-in-differences estimates for interest rate for loans initiated by branches close to the Radcliffe Line (International Border). The treatment group consists of all branches within 10 kilometres from the Radcliffe Line where as the control group consists of branches within the 10-20 kilometre range from the Radcliffe Line. *Affected* is a dummy variable which captures whether a branch was situated within 10 kilometres from the Radcliffe Line where as *Post* is a dummy which captures only those loans which were initiated within $[t+1, t+4)$ months after the shelling subsided. We use a burn in period of one month after the shelling to account for any loans that might have been contracted prior to the event. The analysis is limited to those shelling events where the damage was calamitous enough to warrant migration of border dwelling populations. We also consider only those districts of Jammu & Kashmir that share the Radcliffe Line (International Border) with Pakistan which was agreed upon during the partition of British India in 1947. We proxy loan demand with rural work demand and and also control for the level of deposits. Standard errors are in parentheses and corrected for heteroskedasticity using White's methodology. *** p<0.01, ** p<0.05, * p<0.1.

	First Shelling Event - Log(Interest Rate)				
	(1)	(2)	(3)	(4)	(5)
Affected×Post(10^{-2})	0.686***	0.502*	0.665**	0.594**	4.188**
	(0.254)	(0.269)	(0.267)	(0.267)	(1.742)
Affected(10^{-2})	−0.914***	−0.923***	−0.919***	−0.927***	−10.139***
	(0.179)	(0.179)	(0.177)	(0.177)	(1.200)
Post(10^{-2})	−1.004	−0.610***	−0.973	−0.634***	−0.214
	(0.627)	(0.154)	(0.634)	(0.153)	(0.779)
Rural Work Demand(# persons, 10^{-3})		−0.450**	−0.064	−0.232	7.238***
		(0.207)	(0.219)	(0.194)	(0.898)
District fixed-effects	*Y*	*Y*	*N*	*N*	*N*
Quarter fixed-effects	*Y*	*N*	*Y*	*N*	*N*
Loan-type fixed-effects	*Y*	*Y*	*Y*	*Y*	*N*
R^2	0.966	0.966	0.966	0.966	0.029
Observations	7,139	7,139	7,139	7,139	7,139

	Second Shelling Event - Log(Interest Rate)					
	(1)	(2)	(3)	(4)	(5)	(6)
Affected×Post(10^{-2})	0.638***	0.557**	0.515**	0.504**	0.471*	3.056**
	(0.247)	(0.252)	(0.253)	(0.253)	(0.254)	(1.327)
Affected(10^{-2})	−0.652***	−0.661***	−0.634***	−0.414**	−0.451**	−3.299***
	(0.194)	(0.194)	(0.217)	(0.208)	(0.211)	(1.160)
Post(10^{-2})	−2.258***	−2.156***	−3.867***	−2.120***	−3.865***	−0.987
	(0.217)	(0.227)	(0.152)	(0.226)	(0.151)	(0.619)
Rural Work Demand(# persons, 10^{-3})		−0.408*	−0.808***	−0.529**	−0.872***	−4.463***
		(0.217)	(0.215)	(0.219)	(0.213)	(1.020)
Deposit Level (INR Millions, 10^{-6})			1.203	3.585***	3.899***	69.410***
			(1.581)	(1.262)	(1.265)	(6.068)
District fixed-effects	*Y*	*Y*	*Y*	*N*	*N*	*N*
Quarter fixed-effects	*Y*	*Y*	*N*	*Y*	*N*	*N*
Loan-type fixed-effects	*Y*	*Y*	*Y*	*Y*	*Y*	*N*
R^2	0.951	0.951	0.951	0.951	0.951	0.025
Observations	10,803	10,803	10,803	10,803	10,803	10,807

	Third Shelling Event - Log(Interest Rate)					
	(1)	(2)	(3)	(4)	(5)	(6)
Affected×Post(10^{-2})	0.789***	0.803***	0.778***	0.780***	0.766***	2.605***
	(0.144)	(0.144)	(0.144)	(0.144)	(0.144)	(0.955)
Affected(10^{-2})	−0.437***	−0.390***	−0.512***	−0.433***	−0.434***	−3.081***
	(0.102)	(0.102)	(0.111)	(0.108)	(0.108)	(0.772)
Post(10^{-2})	−3.236***	−3.252***	−3.095***	−3.231***	−3.098***	−6.961***
	(0.082)	(0.083)	(0.078)	(0.082)	(0.078)	(0.385)
Rural Work Demand(# persons, 10^{-3})		0.511***	0.466***	0.373***	0.275**	−2.240***
		(0.119)	(0.119)	(0.115)	(0.112)	(0.679)
Deposit Level (INR Millions, 10^{-6})			−2.424***	−1.699***	−1.661***	44.848***
			(0.771)	(0.586)	(0.586)	(3.229)
District fixed-effects	*Y*	*Y*	*Y*	*N*	*N*	*N*
Quarter fixed-effects	*Y*	*Y*	*N*	*Y*	*N*	*N*
Loan-type fixed-effects	*Y*	*Y*	*Y*	*Y*	*Y*	*N*
R^2	0.968	0.968	0.968	0.968	0.968	0.043
Observations	14,744	14,744	14,744	14,744	14,744	14,744

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Table A3: **Changes in interest rate for branches situated in areas affected by shelling (adjusting for change in deposits)**

The table below presents difference-in-differences estimates for interest rate for loans initiated by branches close to the Radcliffe Line (International Border). The third event occurs around the same period as the demonetization exercise. Banks received a positive funding shock as a large amounts of deposits entered the banking system. It is plausible that the deposits were channeled towards lending pushing lending rates down. Hence, we control for change in deposits as it could explains the interest rates charged by the banks. The treatment group consists of all branches within 10 kilometres from the Radcliffe Line where as the control group consists of branches within the 10-20 kilometre range from the Radcliffe Line. *Affected* is a dummy variable which captures whether a branch was situated within 10 kilometres from the Radcliffe Line where as *Post* is a dummy which captures only those loans which were initiated within $[t+1, t+4)$ months after the shelling subsided. We use a burn in period of one month after the shelling to account for any loans that might have been contracted prior to the event. The analysis is limited to those shelling events where the damage was calamitous enough to warrant migration of border dwelling populations. We also consider only those districts of Jammu & Kashmir that share the Radcliffe Line (International Border) with Pakistan which was agreed upon during the partition of British India in 1947. We proxy loan demand with rural work demand and and also control for the level of deposits. Standard errors are in parentheses and corrected for heteroskedasticity using White's methodology. *** p<0.01, ** p<0.05, * p<0.1.

	Third Shelling Event - Log(Interest Rate)			
	(1)	(2)	(3)	(4)
Affected×Post(10^{-2})	0.803***	0.864***	0.822***	0.832***
	(0.144)	(0.145)	(0.145)	(0.145)
Affected(10^{-2})	−0.390***	−0.549***	−0.424***	−0.476***
	(0.102)	(0.108)	(0.109)	(0.107)
Post(10^{-2})	−3.252***	−3.180***	−3.242***	−3.162***
	(0.083)	(0.080)	(0.083)	(0.080)
Rural Work Demand(# persons, 10^{-3})	0.511***	0.572***	0.388***	0.358***
	(0.119)	(0.123)	(0.116)	(0.115)
Change in Deposit Level (INR Millions, 10^{-6})		−80.495***	−41.914***	−62.077***
		(17.427)	(15.826)	(14.593)
District fixed-effects	*Y*	*Y*	*N*	*N*
Quarter fixed-effects	*Y*	*N*	*Y*	*N*
Loan-type fixed-effects	*Y*	*Y*	*Y*	*Y*
R^2	0.968	0.968	0.968	0.968
Observations	14,744	14,744	14,744	14,744