

Military Service and Human Capital Accumulation: Evidence from Colonial Punjab

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1. Introduction

Military service is often claimed to promote social mobility and to offer rare educational opportunities to disadvantaged groups.¹ Due to the risk premium on military wages, the military typically hires low-skilled recruits and supports training on the job. In the context of the US armed forces, evidence suggests that disadvantaged groups benefit mildly from voluntary service (Angrist, 1998). However, very little evidence is available on how this finding translates to a developing country context. Nevertheless, if the returns to military service are decreasing in the average human capital of the population, one would expect these returns to be highest in developing economies. In spite of the central importance of military support and training to the relations between developing countries and the developed world, not much is known about the role that the military can play in economic development.

This paper offers one of the first attempts to investigate this important question. I will rely on the military recruitment surge in colonial Punjab during the First World War to estimate the impact of military recruitment on aggregate literacy over the period 1901-31. This paper answers two key questions. First, did military recruitment boost the literacy of recruited communities? Second, through which of three possible channels did military service affect literacy: direct skill acquisition by serving soldiers, increased demand for the education due to higher earnings, or preferential public spending on primary education?

This paper contributes to recent work on the effects of colonial institutions on economic development.² In this fast-growing literature, the role of the colonial armies has received little attention. Nevertheless, the colonial armies were one of the few colonial institutions that relied on large-scale, close collaboration between non-elite groups and the colonisers. A related contribution by Jha & Wilkinson (2010) argues that the fighting experience of Indian veterans facilitated the organisation of violence during the Partition of India (1949). This paper illustrates a more benign human capital impact of military recruitment: the spread of literacy.

The paper is organised as follows. First, I introduce the data set. Second, I present the empirical strategy. Third, I interpret the empirical results and I discuss theoretical mechanisms. Finally, I offer concluding remarks.

2. Data set

The First World War brought a dramatic increase in the recruitment of native soldiers by the Indian Army. Raw figures illustrate the enormous scale of this war-time recruitment effort: the number of Punjabi troops increased from 69,458 to 362,027 over the period 1910-19.³ The Indian Army served in France, Egypt and Mesopotamia and finished its First World War missions only in 1921.

Military recruitment patterns will be proxied by information on military casualties. This information is obtained from the 'Debt of Honour Register', a list of military casualties of the First World War.⁴ For 17,005 casualties in military roles, the place of origin could be matched to a district or princely state in Punjab. A name-based algorithm was then used to further split up casualties into two religious groups: Hindu-Sikhs or Muslims. Literacy and population details for the religious

¹ Khalidi (2001).

² See for example Acemoglu et al. (2001), Chaudhary (2010) and Iyer (2006).

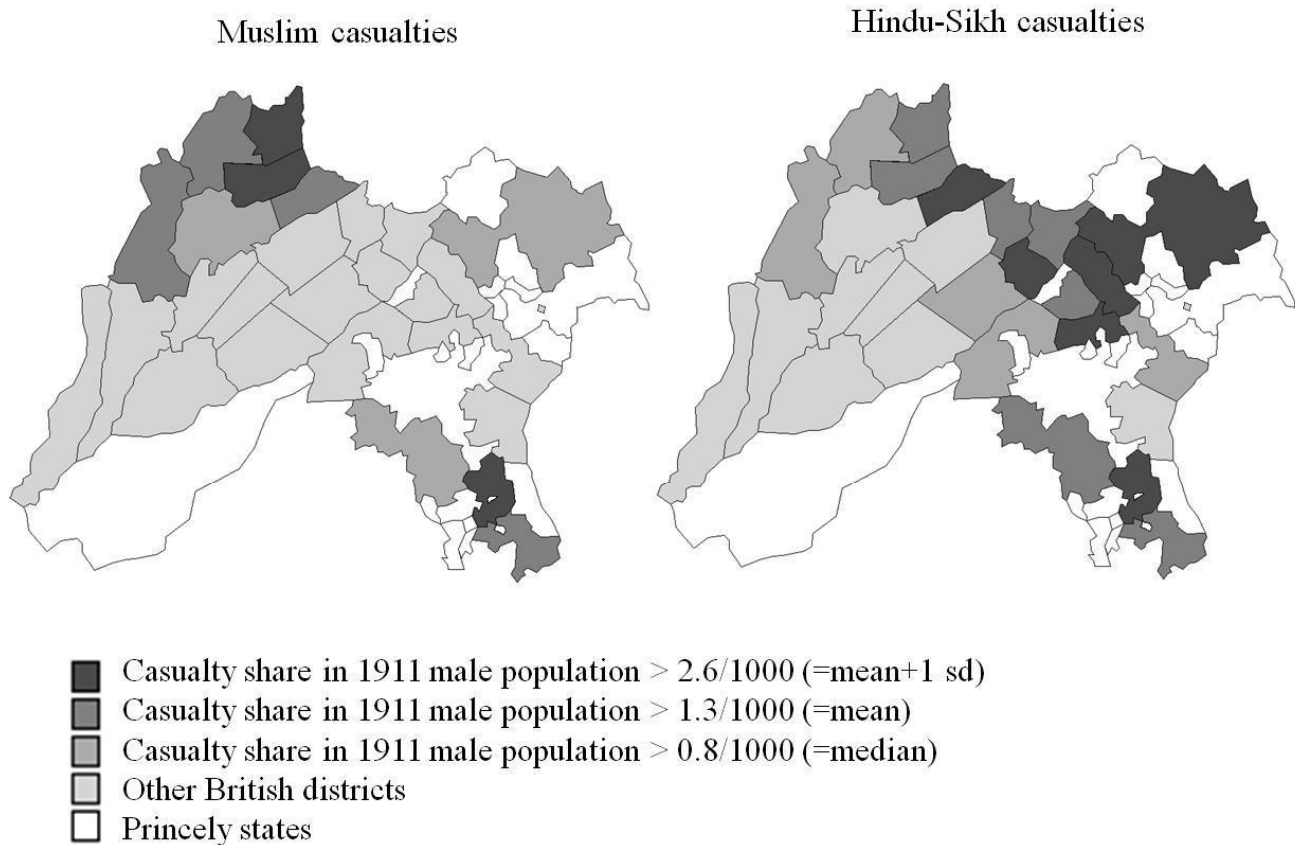
³ The total population of Punjab was about 20 million in 1911. Figures from Mazumder (2003, p. 18).

⁴ Administered by the Common Wealth War Graves Commission (CWGC), it contains information on 74,260 Indian military personnel who died in the First World War. For virtually all soldiers, the name, the rank, the regiment and the date of death are provided. For 68 per cent of entries, the name of the father and the district of birth have been recorded.

groups were collected at the district level from the Census of India for four years (1901, -11, -21, and -31). Nominal expenditures on education by the district boards were also collected for each of the four census years for the 28 British districts in Punjab.

Figure 1 maps the number of war deaths recorded in the CWGC register as a proportion of the male 1911 population in the 28 British districts. The death rates per district are shown separately for both religious communities (Muslim and Hindu-Sikh).⁵

Figure 1



Source: CWGC, own coding.

Table 1 provides summary statistics for the key variables of interest. As my analysis relies on the comparison of communities that were recruited with varying intensity, I provide separate summary statistics for ‘heavily’ and ‘lightly recruited’ districts. The raw numbers show that the increase in the literacy rate (1911-31) is significantly higher for heavily recruited communities. This finding will be further corroborated in the empirical analysis.

⁵ The princely states are not included in my analysis for reasons of comparability and data availability. See Iyer (2006) for an in depth discussion.

Table 1: Summary statistics

	Sample	Lightly recruited	Heavily recruited	P-value
District-religion level				
Male literacy rate 1911	0.11 (0.13)	0.10 (0.13)	0.12 (0.11)	0.57
Difference in literacy rate (1931-1911)	0.019 (0.054)	0.012 (0.038)	0.031 (0.031)	0.05
Casualty share	0.0013 (0.0015)	0.0004 (0.00041)	0.0030 (0.0014)	0.00
Observations	56	36	20	
District level				
Male literacy rate 1911	0.07 (0.04)	0.07 (0.04)	0.07 (0.02)	0.76
Casualty share	0.0015 (0.0014)	0.0006 (0.0005)	0.0030 (0.0011)	0.00
Primary education spending 1911 (Rs per male)	0.07 (0.04)	0.07 (0.04)	0.07 (0.02)	0.90
Observations	28	18	10	

Notes: District-religion level observations for two religious groups (Muslim or Hindu-Sikh) in 28 districts. District level observations are the totals for both religious groups in 28 districts. Heavily recruited groups/districts have recruitment above the relevant sample average. The table records sample averages and standard deviations (in parentheses). P-values are based on a t test on the equality of means for Lightly and heavily recruited groups/districts.

3. Empirical strategy

To estimate the effect of military recruitment on literacy I will rely on a continuous difference-in-difference approach. I compare male literacy rates in years before and after the First World War, between communities with different ratios of military war casualties. The corresponding econometric specification is:

$$\text{Log}(\text{literacy})_{r,d,t} = \sum_{\tau=1921,31} \beta_{\tau} * (\text{Casualties}_{r,d,1911}) * I(\tau = t) + \theta_{r,d} + \vartheta_{r,t} + \varepsilon_{i,t} \quad (1)$$

$\text{Log}(\text{Literacy})_{r,d,t}$ is the logarithm of the male literacy rate of religion r in district d in year t (1911, 1921, 1931).⁶ In certain specifications, the analysis will be conducted at the district level. $\text{Casualties}_{r,d,1911}$ measures the fraction of war deaths in proportion to the 1911 male population. β_{1921} and β_{1931} are the key parameters of interest. They measure the impact of the intensity of military recruitment, as proxied by the casualty share, on subsequent literacy rates. $\theta_{r,d}$ and $\vartheta_{r,t}$ are respectively district(-religion) and (religion-)year fixed effects. This specification accounts for any omitted variables at the district-religion level that do not change over time and time-varying determinants of literacy that are specific to one of the religious groups.⁷

For the above specification to yield causal estimates of the treatment effects β_{τ} , three assumptions need to be fulfilled:

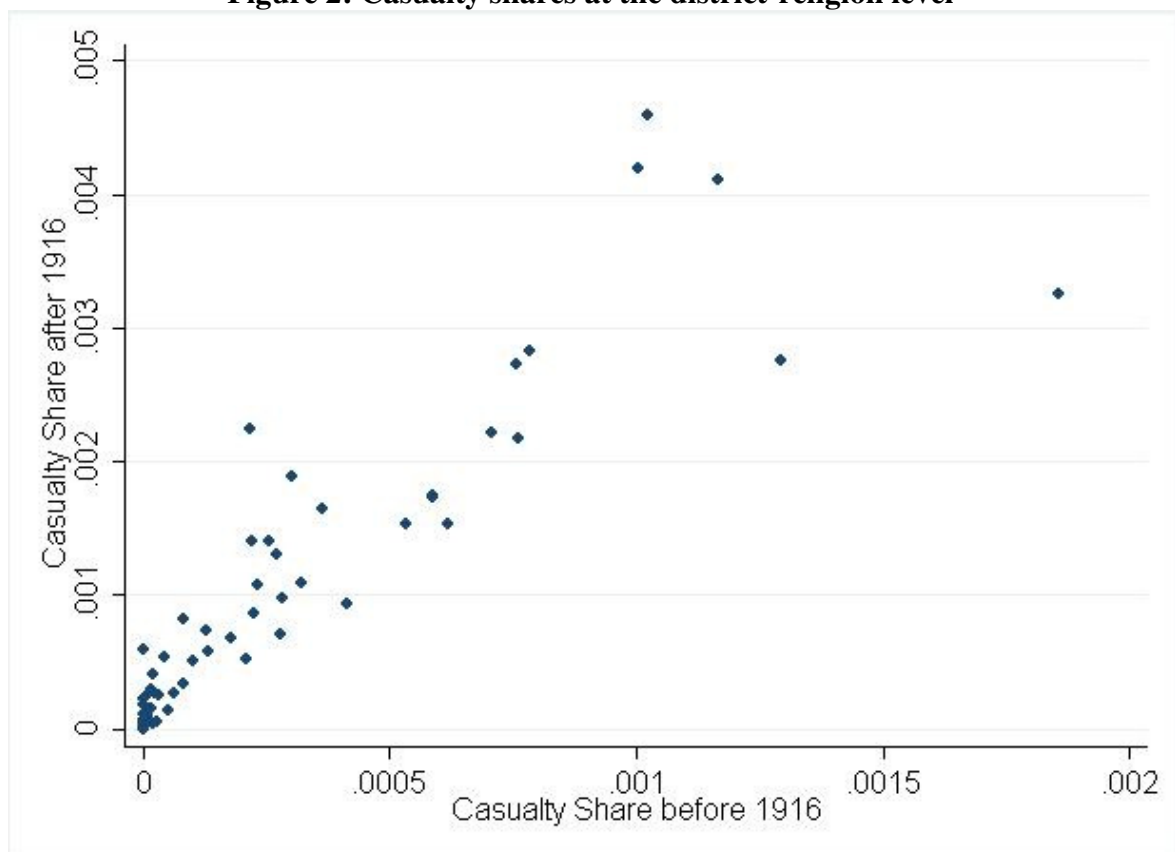
⁶ The logarithmic specification has the advantage of making the point estimates less dependent on observations with high average literacy rates.

⁷ Further robustness checks were carried out, such as the inclusion of time effects of baseline controls, time-varying control variables, district-year fixed effects, and the restriction to a subsample with stable borders. The main results do not change in these alternative specifications (Vanden Eynde, 2010).

1. The recruitment patterns of the Indian army did not change substantially over the course of the First World War and reflected the demand side constraints imposed by the British recruiters.
2. The selection of recruitment grounds was unrelated to the potential for literacy improvements between 1921 and 1931.
3. The measurement error induced by using war casualties as a proxy for recruitment is non-systematic and small.

Regarding the first assumption, the historical context provides evidence of the persistence of recruitment patterns. The recruitment policies in place during the First World War were established in the second half of the 19th century, when recruitment shifted towards the so-called ‘martial races’. The supposedly superior fighting skills of these people were deemed to be crucial for the Indian Army to withstand a Russian invasion of India. Recruitment handbooks provided religion-specific assessments of the ‘martialness’ of the population at the district or even village level.⁸ Subsequent recruitment policies helped to entrench the existing composition of the army. Recruitment officers mainly relied on serving soldiers to help them to identify good recruits in their home villages. The result of this policy was that recruitment patterns did not change substantially during the First World War.⁹

Figure 2: Casualty shares at the district-religion level



Source: CWGC, own coding.

In support of this hypothesis of entrenched recruitment patterns, I plot the war deaths before and after 1916 for each district-religion. I expect casualty numbers in the beginning of the war to reflect the pre-existing recruitment patterns. In contrast, the casualty numbers in a later stage of the war could reveal shifts in the recruitment pattern during the war. The linear pattern in figure 2

⁸ Bingley, (1897a, 1897b, 1899)

⁹ Cohen (1971, p. 69-73) notes that the recruiters “experimented” to some extent with previously unrecruited classes, but that these were closely related to existing serving groups who continued to provide the bulk of the army.

strongly supports the hypothesis that recruitment patterns at the district-religion level remained stable over the course of the war.

The second assumption paraphrases the common trend assumption. There is no historical evidence that the British targeted communities that had a higher potential for literacy improvements over the period 1911-31. More direct evidence will be provided by the estimation of a ‘pre-treatment’ effect that relies on observations between 1901 and 1911.

The third identifying assumption is that the error resulting from my proxy approach is orthogonal to the regressors. Comparisons of the death rates at the district level with recruitment data from independent historical sources yields very similar rankings of districts in terms of their importance as a recruitment ground. Also, the Indian Army deliberately sent representative units on its foreign missions. Finally, Indian soldiers could not rise to the rank of officer during their time at war, so that literate soldiers should not have faced different hazards in battle than illiterate soldiers.¹⁰

4. Results and mechanisms

The results from the first column of table 2 suggest that an increase in the casualty share by one per thousand of the male population is associated with an increase in the literacy rate by 4.6 per cent (proportional). This implies that for 10 additional recruits per thousand of the male population, the literacy rate increases by 2.2 per cent in 1931.¹¹ Evaluated at the sample mean, this corresponds to an increase of three additional literate males per thousand of the male population. Columns (2) and (3) show that this effect is entirely attributable to the group of over-20- year-olds. In column (4), the sample is restricted to allow for the estimation of a ‘pre-treatment effect’. The pre-treatment effect is estimated to be insignificant and close to zero, which addresses the concern that the casualty share could be picking up an ongoing trend. Column (5) confirms that the positive effect on the literacy rate is not driven by a decline in the size of the male population.

Table 2: Main results (district-religion level)

	Log(Male literacy rate)			Log(Male population)	
	All ages (1)	Over 20 (2)	Under20 (3)	All ages (4)	All ages (5)
Casualties ₁₉₁₁ *(year=1911)				2.47 (11.0)	
Casualties ₁₉₁₁ *(year=1921)	33.1** (16.1)	40.4** (15.3)	-7.52 (20.3)	32.3* (17.1)	12.9 (16.9)
Casualties ₁₉₁₁ *(year=1931)	46.5* (23.9)	49.6** (20.4)	21.5 (30.7)	40.6 (26.3)	10.1 (19.2)
Observations	168	168	168	208	168

*Notes: observations are at the district-religion level for three census years (1911-31). In column (4), twenty-six districts are included for four census years (1901-31). All regressions include district-religion fixed effects and religion-year effects. Standard errors are clustered at the district-religion level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

Table 3 employs the information on the expenditures on public education by the Punjabi district boards. Columns (1)-(3) confirm that the findings at the religious community level carry through to the district level. Column (4) shows that recruited districts did not attract more public investments in primary education.

¹⁰ The validity of this approach was further examined using the classifications of the recruitment handbooks as an IV for the casualty share (Vanden Eynde, 2010). Jha and Wilkinson (2010) also discuss the validity of the CWGC data at length.

¹¹ This calculation assumes equal probabilities of being recorded in the dataset and relies on aggregate recruitment figures.

Table 3: Main results (district level)

	Log(Male literacy rate)			Log(Primary education spending)
	All age groups (1)	Over 20 (2)	Under 20 (3)	(4)
Casualties ₁₉₁₁ *(year=1921)	50.1** (18.1)	59.6*** (18.5)	-4.30 (21.7)	-49.3* (26.2)
Casualties ₁₉₁₁ *(year=1931)	53.9* (27.1)	56.7* (28.0)	16.4 (31.1)	-40.4 (50.4)
Observations	84	84	84	84

Notes: observations are at the district level for three census years (1911,-21,-31). All regressions include district fixed effects and year effects. Standard errors are clustered at the district level.

These results also shed light on the mechanism that underlies the observed association between casualty rates and improvements in the literacy rate. It is striking that the impact is immediate (starting in 1921) and only affects the population over 20. As one expects demobilized soldiers to be included only in the group of over 20-year-olds, these results are consistent with direct skill acquisition by soldiers. Even though formal literacy training was limited during the First World War, several historical sources confirm that recruits would often pick up literacy skills whilst on service. The demand for literacy skills was boosted by the provision of a postal service on foreign missions, the strong interest in religious literature, the usefulness of literacy skills for military tasks and the opportunities for close contact with literate servicemen.¹² In contrast, my findings are not consistent with an income-driven demand shock for education. One would expect to see intergenerational spill-overs under this hypothesis, whereas the under-20-year-olds seem unaffected by recruitment.¹³ Finally, the results on education expenditures rule out a political economy channel, whereby the district boards invested preferentially in recruited communities. This finding may not be surprising given the reliance of the Indian army on specific communities for its recruitment needs: the British authorities had an interest in keeping the reservation wage in these districts sufficiently low.

5. Conclusion

This paper exploited the exogenous increase in military recruitment during the First World War to estimate the impact of recruitment on human capital accumulation. My results suggest that 10 additional recruits per thousand of the 1911 male population were on average associated with three more literate males per thousand in 1931. Further analysis suggests that this improvement in the human capital stock was mainly driven by direct skill acquisition by soldiers. Military recruitment does not seem to have raised the literacy rate of children. Moreover, no evidence could be found of preferential investment by the district authorities in heavily recruited districts. These results on intergenerational spill-overs and on public investments put bounds on the long-run distributional impact of military recruitment in this context. Nevertheless, direct skill acquisition and social mobility do not appear to have lost their relevance for individual military recruits, as may be suggested by the popularity of present-day recruitment rallies among India's disadvantaged communities.¹⁴

¹² See Khan (1932, p. 216), Censor of Indian Mails (1915) and Mazumder (2003, p. 38).

¹³ See Vanden Eynde (2010) for qualifications of this finding.

¹⁴ See Khalidi (2001).

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