Ideas and Combat Motivation:
Propaganda and German Soldiers' Performance in World War II

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Abstract

Why do soldiers fight? Contemporary scholars claim that monitoring, material rewards, and punishment of soldiers are insufficient to explain combat motivation in wartime. Yet, accounts stressing the importance of ideological motivation are problematic because ideas are difficult to operationalize and measure. To solve this, we use extensive information on individual combat performance from German World War Two service records to produce observable measures of combat motivation: decorations and punishments. We combine this with exposure to Nazi radio propaganda as a conditionally exogenous measure of the influence of Nazi ideas upon individual soldiers. Given non-universal coverage of radio towers, and that most radio towers were constructed before the Nazi's rise to power, exposure to radio broadcasts are plausibly exogenous after controlling for locational and socio–economic factors. We find robust evidence that soldiers with higher exposure to Nazi propaganda are more likely to receive decorations and less likely to receive punishments.

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1 Introduction

It is difficult to understand why soldiers should be prepared to risk life and limb in battle, all other things equal. Even if a soldier fully understands and believes in the goal for which they fight, their contribution is likely to have zero effect on a war's outcome. Given the probability of injury or death, the rational course of action would be to flee rather than to fight. Getting soldiers to fight in war is thus a collective action problem where the costs of contributing are unusually high. Although physical coercion can change this incentive structure, it is not always a practical option for military commanders and can generate perverse incentives of its own.

Classical political philosophers considered non–material factors to be crucial in motivating men to fight and die in war. In the 6th century B.C.E., for instance, the Chinese philosopher Sun Tzu noted that a nation's *tao* was an essential ingredient of its strength, as 'it brings the people's way of thinking in line with their superiors. Hence you can send them to their deaths or let them live, and they will have no misgivings one way or the other' (Sun, 1994). In the *Prince*, Machiavelli championed the use of a citizen militia for the Italian city states, as he believed they would be more motivated to fight for their home than mercenaries (Machiavelli, 1975).

Modern social science has generated numerous explanations for combat motivation in wartime. Typically scholars have either stressed ideational motivations (e.g. nationalism, religion, political ideology or ethnic loyalty) or individual personal ties ('primary unit cohesion') as the primary reason for combat motivation. However, both explanations have shortcomings. Ideational explanations are difficult to test since they are hard to operationalize and measure, while explanations based on personal ties have evidentiary problems and are often theoretically indeterminate.

This paper proposes a solution to these problems. We use a dataset of 18,535 German Army service records from World War Two (Rass and Rohrkamp, 2007) to test for the impact of exposure to Nazi propaganda on fighting motivation. The documents contain extensive information on individual soldiers' backgrounds including their place of birth along with their service history of all punishments incurred, combat decorations won, and wounds suffered. In order to isolate the

effect of exposure to Nazi ideas, we use a measure of exposure to Nazi radio broadcasts. In the pre–television age, radio was the primary form of mass media communication and therefore the main avenue for authoritarian regimes to transmit their ideology to the citizenry (Adena et al., 2015). Nazi Germany was especially active in using radio propaganda to widen and deepen the acceptance of Nazism amongst the German population.

Importantly, given the imperfect technology of the time, radio coverage was not universal across Germany, varying due to transmitter locations which were chosen by independent radio broadcasters prior to Hitler's rise to power. This provides quasi-exogenous variation on how much a soldier was exposed to radio propaganda based upon where a soldier was born. Economists have used exposure to radio broadcasts before as an quasi–exogenous instrument for the transmission of political propaganda in other contexts– for example on the Nazi vote share in 1933 (Adena et al., 2015) and mass killings of Tutsis during the Rwandan genocide (Yanagizawa-Drott, 2014). Using a the distance to the closest radio tower from a soldier's birthplace as a proxy for exposure to Nazi radio propaganda, we find exposure to Nazi propaganda increases the likelihood that a soldier will be more decorated and less likely the soldier will be punished for insubordination. We argue this is evidence that ideas are a powerful tool to motivate soldiers in combat.

Our findings are important for a number of reasons. State survival and strength depends upon military capability, but this capability depends upon soldiers' willingness to make the ultimate sacrifice. As Biddle (2010) has argued, modern warfare entails the greater use of dispersion and concealment, thus lowering the ability of states to monitor their soldiers. It follows that it should be harder for states to motivate soldiers through externally imposed sanctions and rewards. For non–state actors, which often do not have access to the coercive apparatus of a modern state and have even less ability to monitor their footsoldiers, intrinsic motivation is even more important. Yet our findings are also interesting for political scientists in non–security fields. As Costa and Kahn (2010) have argued, understanding why soldiers fight can shed light on why individuals might choose to contribute to collective goods in peacetime situations too. The issue of combat motivation should therefore be of interest to students of collective action problems in other settings, whether

it be participation in protest, voting, tax compliance, microfinance initiatives or infrastructure provision, among others (Costa and Kahn, 2010; Castillo, 2014).

2 Literature Review

Military power plays a crucial role in realist theories of international relations (Mearsheimer, 2001; Waltz, 2010), and most international relations theorists agree it is important under a wide range of circumstances (Wendt, 1999). However, while military power could not exist without the willingness of individual soldiers to fight, international relations theorists have paid little attention to combat motivation (Reiter and Stam, 2002; Castillo, 2014). Even Stephen Biddle (2010), who notes that raw material capability is an inadequate measure of military power, offers only speculation as to why individual soldiers would lay down their lives in war. Yet Biddle's work also shows why combat motivation is so important in modern warfare. According to his concept of the 'modern system', soldiers in modern conventional warfare must employ extensive dispersion and concealment to protect themselves from enemy firepower. Yet while this allows them to hide from the enemy, it also makes it harder for their own superiors to monitor their behaviour. The harder it is to monitor what soldiers are doing, the harder it is in turn to use material incentives such as financial payments or physical coercion to motivate them.

Few analysts take the view that material incentives alone can account for the motivation to fight in modern warfare. In his explanation for the system of purchasing commissions in early modern European armies, Douglas Allen (2011) states that 'payments through prizes were used in an attempt to offset the private incentive to avoid engaging the enemy'. However, Allen also notes that modern armies rely more on 'loyalty and national pride' (Allen, 2011). Brennan and Tullock (1982)'s rational choice account of military tactics was criticized for adhering to a purely material conception of combat motivation (Jackson, 1987), but the authors explicitly foreswore such an interpretation and stressed that non–material factors could well partially account for combat motivation (Brennan, 1987). Indeed, there are a number of empirical reasons to doubt

purely materialist theories. For one, financial prizes and bonuses for fighting are not a major part of modern military compensation schemes (Allen, 2011). In previous historical eras when mercenary warfare was more common (such as the Italian Renaissance), the nature of combat was very different to that observed in the modern era. Twentieth century style sustained bloodlettings were reportedly rare as mercenaries strove to minimize personal risk and focused on capturing enemies for ransom rather than killing them (Keegan, 2011; Frey and Buhofer, 1988).

On the other side of the coin, theories of combat motivation based on coercion have also been unpopular. Many historians have noted the importance of coercion in keeping soldiers fighting in numerous specific contexts– for instance, the Soviet Red Army of World War Two (Glantz, 2005). Others have noted motivational problems plagued armies which were unable to rely on harsh punishments (French, 1998). However, again, the problem lies in the historical record. The United States, for example, has executed precisely one soldier for cowardice since 1941 (Glass, 2013), but the majority of American soldiers (including draftees) have continued to fight regardless. Similarly, the Viet Cong are understood to have employed little phyisical coercion (Donnell, Pauker and Zasloff, 1965). By contrast, the Iraqi Army under Saddam Hussein maintained ruthless discipline but experienced mass surrenders and desertions (Talmadge, 2015; Sassoon, 2011). There is, in short, substantial variation in willingness to fight that cannot be explained by physical coercion. Moreover, physical coercion can generate perverse incentives. Evidence from the Red Army and various Arab militaries suggests that it is a double–edged sword. It can encourage soldiers to stand and fight but also to provide misleading information to their superiors about the battlefield situation and to stick rigidly to orders and avoid taking risks or showing initiative (Glantz, 2005; Talmadge, 2015). Moreover, as Benabou and Tirole have pointed out with respect to civilian organizations, excessive reliance on extrinsic motivation (either punishment or reward) can 'crowd out' 'intrinsic motivation' (i.e. agents' desire to do their job for its own sake) as it reveals a lack of trust on the part of the principal (Bénabou and Tirole, 2005).

Instead, many modern social scientists have stressed personal social networks as a key to fighting motivation. Shils and Janowitz (1948) first developed the theory of 'primary unit cohesion'

in their 1949 study of German fighting motivation, based on post–war interviews. They stressed that German soldiers fought, not for Nazi ideology, but in order to avoid losing face with their comrades. Other mid–twentieth century studies based on the British or American militaries of the world wars came to similar conclusions. Stouffer noted the importance of the presence of a comrade in improving morale (Stouffer, 1949), while Baynes pointed to enlisted ranks' desire to maintain the respect of non–commissioned and junior officers as a key motivator (Baynes, 1967). More recently Costa and Kahn (2010)'s econometric study of US Civil War Union Army service records found that soldiers fought with higher motivation when placed in units with comrades of a similar ethnic background to their own, suggesting that they were more able to identify with and thus to fight for co–ethnics (Costa and Kahn, 2010).

Social network based theories of combat motivation can, however, be challenged on both empirical and theoretical grounds. Theoretically, social network–based accounts are indeterminate. They explain why soldiers could cooperate with each other, but not why they would cooperate with each other in fighting rather than deserting, surrendering or mutinying. Indeed, Peter Bearman (1991)'s study of the Confederate Army in the US Civil War showed that soldiers with strong ties to each other were more likely to desert together than to fight together. Empirically, historical studies have shown that the rate of losses in the most intense combat periods of the World Wars was such that longstanding primary units like those described by Shils and Janowitz simply could not have survived– yet armies went on fighting nonetheless. In a case study of one US and one German infantry division in 1944, Robert Rush (2015) has suggested that the American 'individual replacement system', which replaced individual losses one by one, was more effective in generating fighting motivation than the German unit replacement system, which sought to preserve the integrity of small groups by replacing military units in their entirety.

Given the substantial variation in combat performance which cannot be explained either by material rewards or immediate social networks, many political scientists have looked to ideational factors. In the study of rebel organizations, Jeremy Weinstein (2006) claimed that groups which operate under conditions of resource scarcity will be more disciplined as they are compelled to rely

on ideological appeals rather than material gain for recruitment. Similarly, Beber and Blattman claimed that rebel organizations prefer to recruit child soldiers, in spite of their lower levels of military skill, because they are easier to indoctrinate and hence require fewer rewards (Beber and Blattman, 2013). In conventional warfare, Barry Posen (1993) argued that the nationalism which modern states inculcate in their citizens is a crucial component of fighting motivation, a claim also made by Dan Reiter (2007) with respect to post–Meiji restoration Japan in particular. Reiter also claimed that democratic values can provide the motivation for soldiers from democratic armies to fight. Jasen Castillo (2014), for his part, claimed that ideology is key. He noted that armies such as those of Nazi Germany or North Vietnam which are imbued with a strong political ideology will be able to continue fighting in the face of severe reversals.

Qualitative accounts of this sort, however, entail problems of their own. Individual accounts (for example from letters or diaries) of combat motivation suffer from problems of selection bias and possibly also of preference falsification (Kuran, 1997). Individuals who choose to record an account of their fighting motivation may be untypical of the broader population of soldiers in terms of their ideological commitment. Moreover, in societies with widespread military censorship and punishment for political dissent, soldiers may have incentives to exaggerate the extent to which they are motivated by the ruling regime's ideology. Finally, qualitative accounts may be hampered by unmotivated biases on the part of the researcher. Unusual cases may be given too much weight precisely because they are memorable (Tversky and Kahneman, 1973), or researchers may overgeneralize from a small sample of written material (Tversky and Kahneman, 1971).

Recognizing this, researchers have increasingly employed quantitative research designs to measure and test ideational theories of combat motivation. Keith Darden (2013), for example, used a natural experiment whereby two otherwise identical East Slavic populations were assigned to the Austrian or Hungarian rule in 1867 to show how early socialization into one national identity affected choice of sides between the Nazis and Soviets in World War Two. Jason Lyall used a dataset to argue that regimes which systematically exclude ethnic groups are more likely to suffer from mass desertion in wartime (Lyall, 2014).

This paper aims to build on and improve this strain of research. Lyall himself notes that 'cross–national data provides only a clumsy means for investigating a dynamic process that unfolds over time at the battle, not the war level' (Lyall, 2014). State leaders do not select themselves randomly into wars (Fearon, 1994). This leaves open the possibility that unobservable sources of selection may confound attempts to draw valid causal inferences. By examining the link between exposure to ideas at the level of the individual soldier, therefore, this paper seeks to complement the macro–level work of Lyall and Darden. This dataset in this paper consists of soldiers from the same country, fighting in the same war, and so more closely satisfies the assumption of unit homogeneity.

3 Historical Background– Radio in Nazi Germany

We argue that soldiers who believe in the Nazi cause will make more motivated soldiers. To measure soldiers' ideological motivation, we rely on their exposure to radio broadcasts, which were highly politicized after Hitler's rise to power. Nazi propaganda chief Joseph Goebbels saw radio as the principal means by which the Nazi message could be spread throughout Germany. "I hold radio to be the most modern and the most important instrument of mass influence that exists anywhere", he noted (Welch, 2014). The Nazis moved to establish their control over radio shortly after Hitler came to power in January 1933. Within weeks, 10 out of the 11 heads of Germany's regional broadcasting services had been replaced with loyal Nazis. 'Politically unreliable' workers were also replaced further down the chain (Adena et al., 2015).

Nazi radio propaganda consisted of a number of elements. Pro–Nazi news broadcasts were one means. Radio was also the primary medium across which Hitler's (and other senior Nazis' such as Goebbels') speeches were communicated to the nation. Between his taking the office of Chancellor in January and the quasi–free election of March 1933, for instance, German radio broadcast 16 of Hitler's speeches (Adena et al., 2015). In addition, German radio broadcast the numerous national events (*'Stunde der Nation'*) which the Nazis created in order to foster a sense

of national unity, including the Potsdam Service of Thanksgiving and the *Parteitage* (colloqially known as the Nuremburg rallies) (Welch, 2014). Goebbels described these broadcasts as the moment at which 'hundreds of thousands will decide to follow Hitler, and fight in his spirit for the revival of the nation' (Welch, 2014). German radio under Hitler was not exclusively devoted to producing propaganda. In 1944, of 190 broadcast hours per week, 71 were devoted to popular music, 55 to general entertainment, 24 to classical music, 5 to 'words and music', 3 to 'culture' and 32 to politics (Evans, 2006). However, importantly for our purposes, given the Nazi's strict control over radio's messaging there is little other than political propaganda which would be relevant to an individuals' motivation to fight.

It is clear that Nazi's saw radio propaganda as a means to motivate soldiers for the Third Reich. As Clemens Zimmermann points out, one of the goals of Nazi propaganda was 'the training of the younger generation into iron–hard Spartans' (Zimmermann, 2006). Nazi propaganda was to produce obedient soldiers for the war to expand their territory in the East (Evans, 2005). Therefore, we expect soldiers who were highly exposed to these radio broadcasts to be more ideological and more motivated soldiers.

4 Hypotheses

We argue that more ideological soldiers will be more motivated soldiers. We propose two measures of combat motivation, to form the basis of our empirical tests of the effects of propaganda– combat decorations and disciplinary record.

Modern combat decorations emerged from the period of the Napoleonic wars and are explicitly intended to reward soldiers for acts of bravery (Kellett, 2013). For instance, the World War Two German Iron Cross was awarded for 'special bravery in the face of the enemy and exceptional leadership' (*Reichsgesetzblatt*, 1939). Soldiers who have been motivated to fight by Nazi radio propaganda should be more likely to win more and better combat decorations for two reasons. First, as they should be more ideologically motivated to fight, they should display the type of 'special

bravery' which would lead to the conferral of such an award and second, as they should perceive the Nazi regime to be more legitimate they should also value Nazi–bestowed awards more highly.

Hypothesis 1 *Soldiers with high exposure to propaganda before enlisting will win more and higher combat decorations for valor compared to soldiers with low exposure to propaganda*

Indoctrinated soldiers should also have a better disciplinary record than soldiers who are not indoctrinated. Military commanders, historians and social scientists alike view an individuals' disciplinary records as a good indicator of combat motivation (Henderson, 1985; Watson, 1997; Fennell, 2011). Military commanders view the rise of disciplinary infractions as an indicator of the collapse of military fighting power. For instance, military analysts saw the rise of small scale insubordination, petty crime, and drug abuse as an indicator of the US Army's waning will to fight in Vietnam (Daddis, 2011; Henderson, 1985). Meanwhile social scientists, like Costa and Kahn (2010)'s study of the US Civil War, look at desertion as a fundamental measure of soldier motivation. Therefore, if indoctrinated soldiers are more motivated soldiers, we expect soldiers who have been motivated to fight by Nazi radio propaganda to be less insubordinate.

Hypothesis 2 *Soldiers with high exposure to propaganda before enlisting will suffer fewer and less severe punishments for insubordination compared to soldiers with low exposure to propaganda*

5 Data

The data for our analysis is derived from digitized German Army service records from World War Two by a team of economic historians from the University of Aachen under Professor Christoph Rass (Rass and Rohrkamp, 2007).[1] The dataset is based on service records held at the German Federal Archives. Although many of these documents were destroyed by bombing and combat during the war, 10 million remain, mostly for soldiers coming from the modern German Bundesland of Nordrhein-Westfalen.[2] The service records contain several individual characteristics

[1] The project, funded by the German Research Foundation, ran from 2004 to 2007

[2] *Wehrkreis IV* in the German mobilization system

such as date and place of birth, social class, and level of education. Using this as a base, the Wehrmacht's personnel department added information about individuals' performance in combat and service history, including punishments received for infractions of military discipline, medals awarded, wounds, and whether the individual was killed in action or taken prisoner by the Allies.

Using these original paper sources, Rass and his team combined four samples for a total of 18,535 digitized records. They created two service branch based samples based on random sampling of individuals who had served in the Waffen–SS and the Luftwaffe. In addition, they created two regional samples consisting of individuals who enlisted at the recruiting stations in Aachen-Düren and Eupen–Malmedy. For the Army, they created a unit–based sample by selecting 68 companies recruited in *Wehrkreis IV* which were designed to be representative of the German Army as a whole in terms of the proportion of different service arms (infantry, armour, signals, etc). For each of the companies, they chose individuals whose service records were complete and who had served at least one day in that company.

Of course, as Rass himself notes, the dataset has its limitations. It is not a probability sample of all military age German males. The possibility of selection bias cannot be entirely ruled out for our analysis. However, Rass's selection criteria make it unlikely. First, Germany instituted the draft starting in 1935. Therefore, with rare exemptions only for war critical skills or medical problems, soldiers were chosen at random for conscription into the armed services, thus limiting the problem of selection bias. Second, it is unclear how the destruction of records through bombing, for instance, could be related to the causal relationship at hand between propaganda and combat performance. The difference between a service record which survived and one which was destroyed in a bombing raid– given the inaccuracy of aerial bombardment at the time– would have been related mostly to wind trajectories and the physical layout of record storage facilities. Third, *Wehrkreis IV*, from which most records are sampled, was both the biggest recruiting district for the Wehrmacht during the war and, by Rass's account, the most demographically representative of Nazi Germany, including its levels of electoral support for the Nazis prior to their rise to power. Thus while the Aachen data is imperfect when compared to modern data collected under peacetime

conditions, it nonetheless offers one of the most detailed sources available for gauging the effects of propaganda on individual combat performance in wartime.

To geolocate the soldiers, Rass' dataset offers two locations regarding their birthplace for almost all soldiers: the soldier's birth town and that town's larger administrative unit. We took these locales, manually amended cities that changed their name (such as Danzig which is now Gdańsk), and used GoogleMaps' API to obtain a longitude and latitude for each of our soldiers. We used the more precise birthplace first, and the administrative location if the soldier's birthplace was unavailable. This gave us a geocoded dataset of approximately 17,400 soldiers. The majority of our sample hails from the Nordrhein-Westfalen region of Germany, due to the sampling procedure described above and due to it being the most populated portion of Germany.

Integral to our analysis is the geolocation of soldiers and their relationship to the radio towers of Nazi Germany. We created our radio tower data from Brudnjak (2010), who compiled primary source documents about radio towers in Germany. For each location, we geocoded the tower through GoogleMaps. While many of the transmitter stations morphed throughout the 1930s, their location mainly stayed the same. For instance, a wooden tower would be erected, fall down in a storm, and then two new towers with an antenna hanging between them would be built in its place. Further, as technology improved, taller towers would be built in the same city and the radio transmitter would be transferred to the taller tower for better radio coverage. To give an example of the geographic coverage of soldiers and radio towers we present Figure 1 which shows a map of a subset of the soldiers, represented by the orange crosses, and the radio towers in Germany, represented by the black dots.[3]

Importantly for our study, the locations of the radio towers were mainly built before Hitler came to power in 1933. According to Brudnjak's records only five of the twenty eight locations that had radio towers within our sample received radio towers after or during 1933. This alleviates concerns that radio towers were placed in regions correlated with Nazi support, something that would bias our results. While it is true that large cities, like Berlin, Frankfurt, or Munich, had

[3]A more complete map of the radio towers can be found on Figure 5

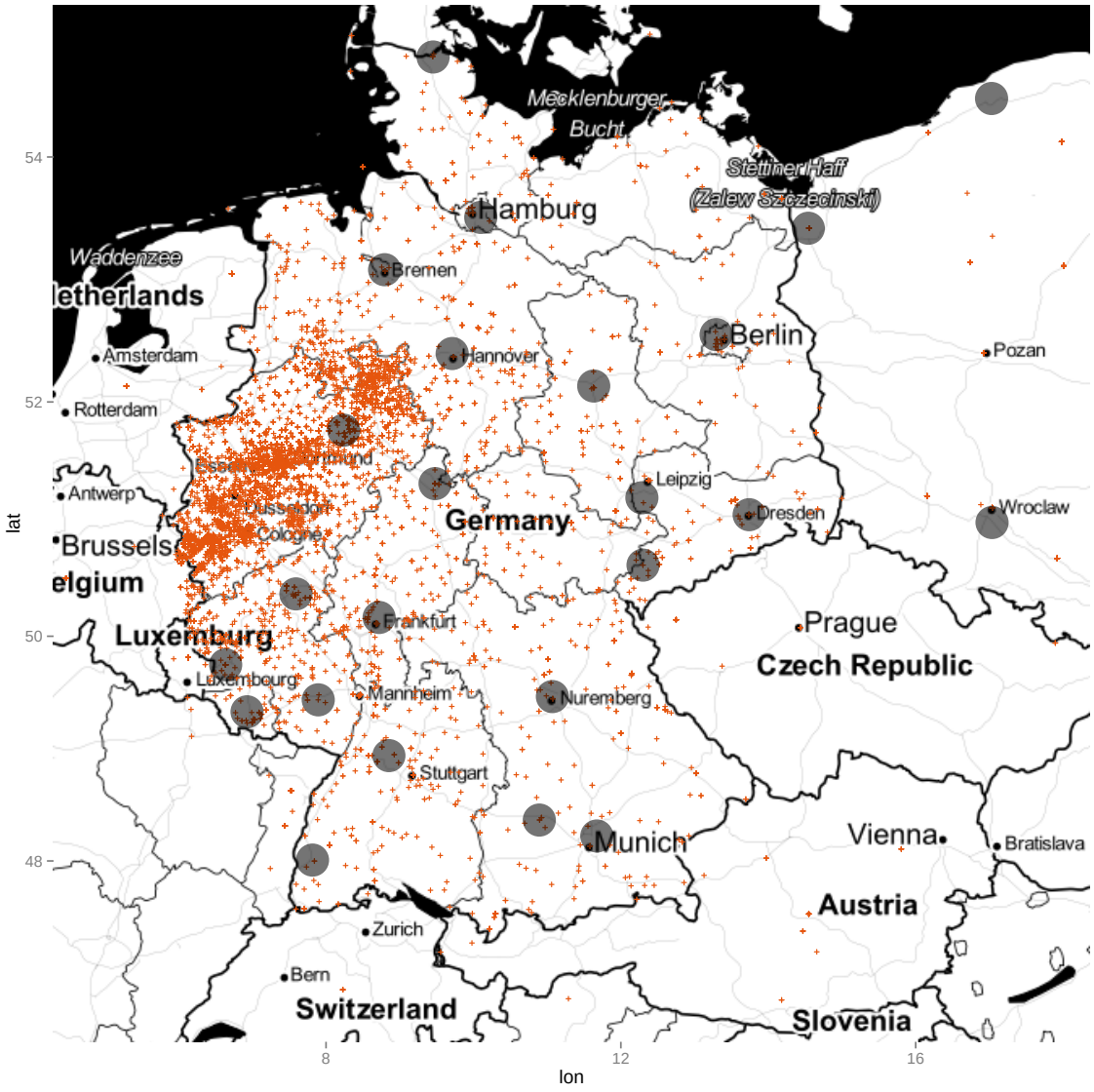


Figure 1: German Soldiers & Radio Towers

radio towers placed in their city centers, many of the radio towers were located in much smaller cities such as Langenberg, Flensburg, or Saarbrucken. Importantly for our project, there was no radio tower located within the large cities of Köln, Düsseldorf, Essen, or Dortmund.[4] Since the majority of our sample was born in the Nordrhein-Westfalen region, the most soldiers in our sample are closest to a tower either in Langenburg or Trier. Information about the radio towers can be found on Table 6 in the Appendix.

[4]There was a radio tower in Köln before Hitler came to power, but Brudnjak's records show this tower was decommissioned in 1932

To construct a measure of radio propaganda exposure, we calculate the distance between the soldier's birthplace to the closest radio tower. Since most radio towers were built before Hitler's rise to power, the closest radio tower is constant for 99% of our sample. This distance ranges from just over 0 kilometers at the minimum to the maximum of about 10,000 kilometers for soldiers born outside of the country. Since over 99% of our sample were less than 200 km away from the closest radio tower, we restrict our sample to only these soldiers, although our findings is robust for several different distance cutoffs.

One might assume that listening to a radio station is a binary outcome: either you hear a broadcast or you cannot. In truth radio reception is better conceptualized as a continuous loss of clarity, For example, a radio station slowly fading to static while driving away from a metropolitan area. As the distance increases, the probability that a listener will be able to hear the station decreases until finally the station is just white noise. Therefore there is no absolute "cut-off" point at which radio stations cannot be heard. Only a probability that a listener will be able to tune into a given broadcast. This probability depends upon a few characteristics: the power of the transmission, the sensitivity of the receiver, and, importantly for our analysis, distance between the transmitter and the receiver. We use distance between the transmission towers and the soldiers for our analysis and only assume that the probability of listening to the radio decreases over space, i.e. soldiers born closer to a radio tower are more likely to be exposed to Nazi broadcasts than soldiers born farther away.

For our mechanism of radio propaganda to be valid, we have a few underlying assumptions. First we assume distance from radio towers decreases the probability that soldiers receive propaganda messages before enlisting in the army. There are two caveats that might undercut this assumption: 1) radio was not the only method of indoctrination, and 2) radio coverage was good enough that distance from radio towers does not correspond to decreased listenership. For the first argument: while it is certain that the Third Reich had other methods of indoctrination for citizens outside of radio, such as the Hitler Youth, it is important to note that exposure to radio broadcasts occur with exogenous variation across space. Therefore soldiers with good radio

reception are getting doubly exposed towards Nazi ideology while the others are just getting a single dose.[5] As for the second argument: as with any experimental treatment and control groups, when the treatment crosses into the control groups this biases our finding towards zero. However, this bias works against our finding, effectively making it a tougher test to find any differentiation.

The second, and largest, assumption we make is that soldiers resided within their birthplace until they joined for the war. We use the longitude and latitude of a soldier's birthplace to calculate their exposure of propaganda, and therefore it is the cornerstone of our analysis. While it is true German within-country migration was high in the 19th century, within-country migration fell sharply due to the Wall Street Crash of 1929 (Hochstadt, 1999). Further, we only need be concerned about migration that would bias our sample towards indoctrination. For example, if Nazi supporters moved towards places with radio towers (such as Berlin) while anti-Nazi citizens moved away from radio towers, this would be cause our estimates to be biased. However, this is unlikely since the main reason for within-country migration was economic opportunity (Hochstadt, 1999). Since richer areas were more likely to have better radio reception, we should expect that some soldiers that were incorrectly coded as being exposed to little radio propaganda actually moved to areas with higher exposure. If this is occurring, it would effectively give an unobserved treatment to our control group, making it more difficult for us to find an effect.

Finally, we recognize that indoctrination is determined by two factors: the probability of listening to propaganda messages and the length of exposure to propaganda messages. We only focus on our proxy for exposure to propaganda by using our distance measurement from the closest radio tower. For the second factor, the longer a soldier is exposed to propaganda the more likely we expect they will be indoctrinated. Since we focus on Nazi propaganda from radio broadcasts after Hitler's rise to power, we assume that the length of exposure to propaganda is calculated by the time after Hitler's rise to power to the date that the soldier joins the Army. Using this time dimension in analysis is problematic since it is nearly perfectly correlated with the year the solider joined the army. When soldiers join the army, in turn, is also highly correlated with

[5]A possible problem would be if the Nazis deliberately increased recruitment efforts for the Hitler Youth in areas where the radio signal strength was weak, but this would bias against finding significant treatment effects

other unobservables such as the situation of the war when soldiers joined the army. For example, soldiers are exposed to more Nazi propaganda due to joining the army later in the war but they also have less time to win medals or be punished and fight in different conditions. This makes it near impossible to differentiate the effects of length of exposure from those specific wartime characteristics. Therefore, to isolate the effect of exposure to propaganda, all model specifications use enlistment-year fixed effects to only look at the variation within each cohort of exposure level.

6 Analysis

If indoctrinated solders are more motivated soldiers they will receive more accolades and be punished less. We test our hypothesis on three different factors: performing with valor in combat, punishment for insubordination, and being a POW. Indoctrinated soldiers also ought to be less likely to be POWs since they would rather die for the cause than surrender. One potential confounding factor could be that indoctrinated soldiers are more likely to be frontline troops than non-indoctrinated soldiers. This might lead to an artificial increase in decorations, while simultaneously leading to decreased insubordination. Therefore, we also test our hypothesis on two placebo tests: injuries/fatalities. If our hypothesis is correct, then there should be no difference in the rate of deaths or injuries for indoctrinated or non-indoctrinated soldiers.

We use several different types of dependent variables within our analysis. For decorations we use three different specifications of soldier valor, all revolving around whether the soldier received a medal for merit in battle. There is a concern that medals might be dispensed not in an objective way, but rather in a way tied to a soldier's allegiance to the Nazi political party. In order to mitigate this we omit campaign medals and non-combatant decorations from consideration, even though they were rated highly in the Wehrmacht's order of merit, and focus on medals that were focused on bravery in combat. We code this in three ways: a binary variable for whether the soldier was ever decorated with a medal, a count variable for the number of medals the soldier received, and an ordinal variable for the highest medal the soldier obtained while in the army.

Likewise, we code punishments in the same three ways: a binary variable for whether the soldier was ever punished at all, a count variable for the number of punishments, and an ordinal variable for the highest severity of punishment that the soldier received.[6] Finally we code a binary variable for whether a soldier was a POW or not, whether the soldier was killed in action, or whether the soldier ever was wounded.

Of course there are several variables that need to be accounted for when trying to identify performance. Radio exposure is also likely to be a function of population density, education, and income– the former because radio transmitters should be built closer to the biggest potential audiences and the latter because people with higher education and incomes should be more likely to have radio receivers. These variables could also correlate with combat motivation, so we create three control variables to proxy for them.

To proxy for social class, we create an ordinal variable based on Mühlberger 1991's categorization of occupational categories in Weimar and Nazi Germany. Weimar censuses grouped individuals according to five occupational categories– domestic servants, unskilled workers, skilled workers, white collar employees and self–employed/senior civil servants. Mühlberger collapsed the domestic servant and unskilled worker categories together to create a four point scale. We created the social class variable by engaging a native German speaking researcher to match the occupations listed in the Aachen data to Mühlberger's categories. The resultant variable ranges from one, a domestic servant or unskilled worker, to four, a self–employed or senior public official. Second, to proxy for human capital, we create a variable based upon the highest level of education attained by the soldier. The variable varies from one, a soldier who only completed elementary school, to four, a soldier who was in the university. Lastly, to proxy for population density we created an urban dummy variable if an individual came from one of the towns (or a suburb thereof) identified by the standard contemporary German reference work– Herder's *Welt und Wirtschaftsatlas* – as having a population of 100,000 or more.

[6]Details on the creation of the variables can be found in the Supplementary Appendix.

We also care about things that might make a soldier take more risky actions in battle or be more likely to be insubordinate. Therefore we account for the age, marital status, and whether the soldier was Catholic. We control for age by looking at how old the soldier was when they join the army relative to 18. Soldiers that are younger might be more inexperienced, but they also might be more compliant than older soldiers. Likewise, married soldiers might be less likely to risk their life for the cause if they have something to go home to. Finally, the Catholic Church was against the Nazi regime and therefore Catholic soldiers might be less likely to be willing to die for the cause. We also include two individual measures that might affect soldier performance the relative height and weight of soldiers compared to the mean sample. These serve as rough proxies for the physical aptitude of the soldiers. Lastly, we try to account for underlying Nazi support in the soldier's birthplace. To do this we use the vote share of the Nazi party in the locale the soldiers were born from O'Loughlin (2002).

As mentioned above, a major confounding factor is when a soldier joined the army. Soldiers joining the army in 1944 face a much different war than soldiers joining in 1936. Therefore for all of our specifications we control for enlistment-year fixed effects. This allows us to analyze the differences between soldiers in the same enlistment year, providing a look at the effect of propaganda exposure across soldiers fighting within the same "type" of war.

6.1 Results

To preview our results, we find that soldiers with increased exposure to radio broadcasts are more motivated soldiers. We consistently find that distance from radio towers decreases the probability that soldiers will be decorated and increases the probability of insubordination. This also holds for the number of medals and punishments a soldier received: soldiers farther away from radio towers receive less medals and more punishments. We also find evidence that soldiers farther away from radio towers are more likely to become POW's than soldiers closer to radio towers. However, this result is tenuous since it is not robust to some alternative specifications. Lastly, in line with our

Table 1: Radio Tower Distance and Soldier Decorations

	Dependent variable:					
	Soldier is Decorated		High Decoration		# of Decorations	
	(Logit)		(Logit)		(Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (km)	−0.004***	−0.003***	−0.004***	−0.004***	−0.003***	−0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Nazi Vote Share	−0.002	−0.004	0.004	0.002	0.002	−0.000
	(0.002)	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)
Soldier from Urban Area	−0.076	−0.145*	−0.092	−0.201*	−0.070	−0.117*
	(0.058)	(0.073)	(0.076)	(0.097)	(0.042)	(0.049)
Age When Joining Army (relative to 18)	−0.073***	−0.077***	−0.118***	−0.124***	−0.067***	−0.071***
	(0.004)	(0.006)	(0.006)	(0.009)	(0.003)	(0.004)
(Intercept)	1.004***	0.907***	−0.425***	−0.538***	0.814***	0.657***
	(0.083)	(0.124)	(0.098)	(0.153)	(0.057)	(0.079)
Individual Controls		✓		✓		✓
Enlistment Year Fixed Effects	✓	✓	✓	✓	✓	✓
Likelihood-ratio	2309.070	2314.421	1318.097	1386.463	2888.198	3055.865
Log-likelihood	−7893.520	−5482.836	−5265.540	−3586.708	−16007.831	−11321.489
Deviance	15787.039	10965.673	10531.079	7173.416	11709.023	8684.372
AIC	15817.039	11007.673	10561.079	7215.416	32047.662	22686.978
BIC	15929.840	11159.105	10673.880	7366.848	32167.983	22845.620
# of Soldiers	13630	10007	13630	10007	13630	10007

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2: Radio Tower Distance and Soldier Punishment

	Dependent variable:					
	Soldier is Punished		Severe Punishment		# of Punishments	
	(Logit)		(Logit)		(Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (km)	0.002**	0.003**	0.003	0.006	0.003***	0.004***
	(0.001)	(0.001)	(0.003)	(0.003)	(0.001)	(0.001)
Nazi Vote Share	0.005	0.006	−0.001	−0.001	0.005	0.007
	(0.003)	(0.003)	(0.010)	(0.011)	(0.003)	(0.004)
Soldier from Urban Area	0.223**	0.230**	0.140	0.164	0.214**	0.127
	(0.072)	(0.087)	(0.239)	(0.282)	(0.078)	(0.093)
Age When Joining Army (relative to 18)	−0.087***	−0.096***	−0.075***	−0.063*	−0.095***	−0.098***
	(0.006)	(0.008)	(0.020)	(0.027)	(0.006)	(0.008)
(Intercept)	−1.070***	−0.804***	−3.577***	−3.750***	−0.718***	−0.261
	(0.101)	(0.152)	(0.317)	(0.480)	(0.111)	(0.160)
Individual Controls		✓		✓		✓
Enlistment Year Fixed Effects	✓	✓	✓	✓	✓	✓
Likelihood-ratio	688.097	627.417	72.123	71.533	743.464	688.089
Log-likelihood	−5320.313	−3911.047	−780.509	−583.246	−7855.954	−5816.848
Deviance	10640.626	7822.095	1561.018	1166.492	5689.047	4283.219
AIC	10670.626	7864.095	1591.018	1208.492	15743.907	11677.696
BIC	10783.427	8015.526	1703.818	1359.924	15864.228	11836.339
# of Soldiers	13630	10007	13630	10007	13630	10007

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Radio Tower Distance and Other Factors

	Dependent variable:							
	Soldier is Wounded		# of Wounds		Soldier is KIA		Soldier is POW	
	(Logit)		(Negative Binomial)		(Logit)		(Logit)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance from Closest Radio Tower (km)	−0.002	−0.001	−0.000	−0.000	0.001	0.001	0.003*	0.003+
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Nazi Vote Share	−0.000	−0.004	−0.002	−0.004	−0.009**	−0.009*	0.007	0.005
	(0.003)	(0.004)	(0.002)	(0.002)	(0.003)	(0.004)	(0.005)	(0.006)
Soldier from Urban Area	0.130	0.126	0.095	0.097	−0.090	−0.068	0.158	0.156
	(0.081)	(0.097)	(0.052)	(0.063)	(0.078)	(0.094)	(0.127)	(0.154)
Age When Joining Army (relative to 18)	−0.050***	−0.073***	−0.042***	−0.059***	−0.060***	−0.045***	−0.043***	−0.068***
	(0.006)	(0.008)	(0.003)	(0.005)	(0.005)	(0.007)	(0.009)	(0.014)
(Intercept)	−1.421***	−1.274***	−0.213**	−0.070	−1.283***	−1.073***	−3.547***	−3.965***
	(0.114)	(0.168)	(0.074)	(0.109)	(0.106)	(0.156)	(0.206)	(0.296)
Other Individual Controls		✓		✓		✓		✓
Enlistment Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Likelihood-ratio	460.181	363.518	799.698	641.453	355.287	243.508	46.015	51.651
Log-likelihood	−4523.567	−3334.114	−12009.568	−8818.708	−5370.615	−3890.614	−2306.595	−1647.539
Deviance	9047.133	6668.229	9482.502	6930.980	10741.229	7781.228	4613.189	3295.077
AIC	9077.133	6708.229	24051.136	17679.417	10771.229	7823.228	4643.189	3337.077
BIC	9189.934	6852.450	24171.456	17830.848	10884.030	7974.660	4755.990	3488.509
# of Soldiers	13630	10007	13630	10007	13630	10007	13630	10007

Standard errors in parentheses

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

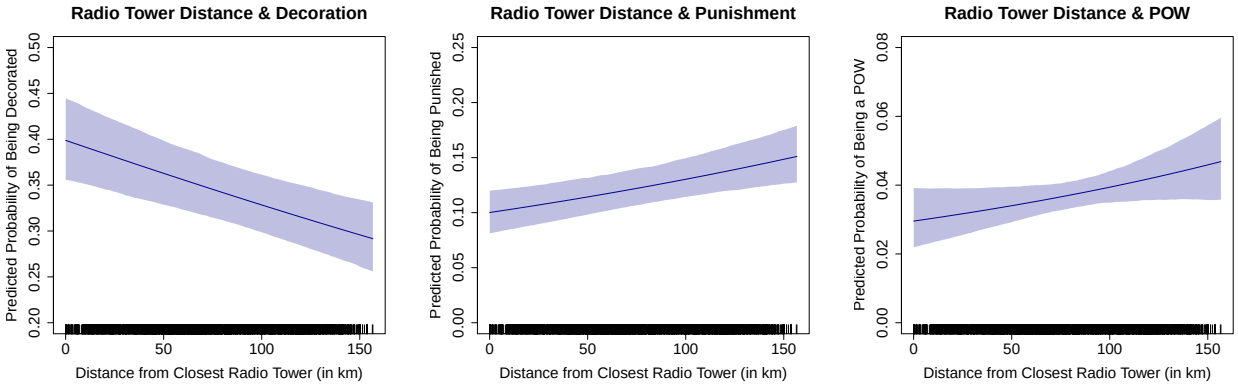
expectations, we also find that the distance to the closest radio tower has non-significant effects on combat injuries or deaths.

Table 1 shows the relationship between our proxy for indoctrination, distance to radio towers, and soldier's being decorated for valor. We operationalize valor in three different ways: whether a soldier was decorated, whether a soldier was given a high decoration, and the number of decorations given to the soldier. In all of our regressions we find that the soldier's distance from the closest radio transmitter is negatively related to receiving a decoration for valor. This means that soldier's born closer to radio transmitters are more likely to be decorated and have more medals than soldier's born farther away from radio towers. Further, the soldier's closer to radio towers was also more likely to be decorated for extraordinary combat performance.

Table 2 shows the relationship between our proxy for indoctrination, distance to radio towers, and soldier insubordination. Just as with decorations, we operationalize insubordination in three different ways: whether a soldier was punished, whether a soldier was given a severe punishment, and the number punishments a soldier received. As models (1), (2), (5), and (6) show, distance from the closest radio tower negatively affects both the likelihood that soldiers will be punished and the number of punishments the soldier receives. This is in line with However, we do not find any relationship between the distance from the closest radio tower and severe punishments.

Finally, we test if indoctrination is associated with soldiers being less likely to be POWs. These results can be found in models (7) and (8) of Table 3. Consistent with our other results we find that soldiers farther away from the closest radio tower are more likely to become a POW, lending support to the notion that indoctrinated soldiers would rather die than be captured. However, as we will see in the robustness checks section, this result is not as robust as our findings with decorations and punishments.

To show the substantive effect of distance for our main explanatory variables, we look at the post-estimated predicted probability for three of our main variables: a soldier being decorated,



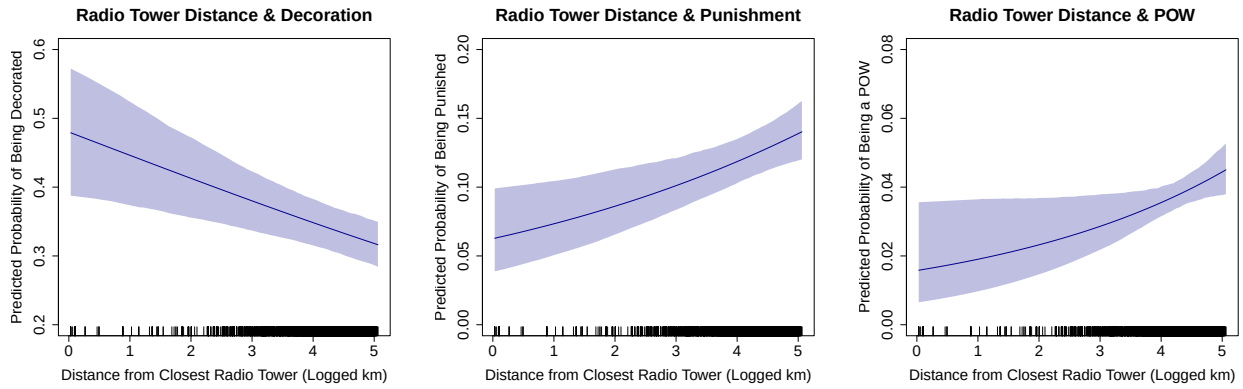
(a) Being Decorated (b) Being Punished (c) Being a POW

Figure 2: Post-Estimated Predicted Probability of Distance to Closest Radio Tower on POW, Decorations, & Punishments

a soldier being punished, and a soldier being a POW.[7] Figure 2 shows each of these results over the range of distances in our sample. As we can see from Figure 2(a), the predicted probability of receiving a medal decreases as the distance to the closest tower increases. The effects are fairly substantial. If we compare a soldier born 100km away from the closest radio tower compared to being born right next to a radio tower, their chances of receiving a medal would fall from 39% to 33%, corresponding to an approximate 17% decrease overall in predicted probability. Meanwhile the predicted probability of receiving a punishment for that same soldier would increase from 10% to 13%, corresponding to a 28% increase in overall increase in predicted probability. The probability of being a POW is extremely low across all soldiers, however, a soldier being born 100km away from the closest radio tower compared to born right next to a radio tower would increase their predicted probability from 3% to almost 4%, which is a 35% overall increase.

We also run similar models testing if soldiers were wounded or killed in action as placebo tests. If soldiers are randomly distributed across the army, then we should not expect soldiers to die or be wounded at different rates no matter their birthplace. Therefore we should expect that our proxy for exposure to radio broadcasts, distance to the closest radio tower, to have no relationship on wounds or deaths of soldiers. This is exactly what we see in Table 3. Here we

[7]To derive these figures, we use the fully specified models corresponding to the relevant dependent variable in Tables 1, 2, and 3.



(a) Being Decorated (b) Being Punished (c) Being a POW

Figure 3: Post-Estimated Predicted Probability of Logged Distance to Closest Radio Tower on POW, Decorations, & Punishments

see that distance to the closest radio tower is not related to whether a soldier gets wounded, the number of wounds a soldier receives, or whether soldiers are killed in action.

To address other potential concerns about our data, we run several other model specifications to see if our results hold.[8] One possible concern is that we proxy for radio exposure with a linear conceptualization of distance. To check that our finding is not due to a particular conceptualization of distance, we rerun our tests using two non-linear conceptualizations of distance: logged distance and categorical distance (close, medium, and far). For both conceptualizations we find results that mimic our original results. Soldiers who were born farther away radio towers are more likely to earn medals and less likely to be punished. Figure 3 shows how logged distance and predicted outcomes of decorations, punishments, and POWs mirror the results from linearized distance.

A potential confounder to our analysis is that soldiers are not uniformly exposed to the battlefield. Different companies within the army are exposed to different amounts of combat. Soldiers enlisted in the military police, for example, are exposed to different circumstances than soldiers who are in Panzer divisions. To account for these differences, we gather information about what company a solider was first assigned. Unfortunately, this information is unavailable for roughly half of the soldiers in our sample, which is why we excluded it from our primary

[8]Tables containing the full results for these model specifications can be found in the Supplementary Appendix, and for the interest of space we simply report our findings.

analysis. Rerunning our main analysis using fixed effects at the division and company level, our findings for decorations and punishments are largely the same: exposure to radio propaganda is correlated with an increased probably of a soldier being decorated and a decreased probability of being punished. Likewise, we find no relationship between radio exposure and wounds or whether a soldier is killed in battle. However, our finding that increased radio exposure is associated with a decreased probability that a soldier will become a POW disappears.

Another possible concern with our analysis is the geographic location of soldiers we use to conduct our analysis. Two issues might cause a problem with our analysis. First, soldiers who are farther than 200 km away from radio towers might reside outside of German borders such as France or Austria. These soldiers might not be exposed to the same level of propaganda as soldiers who are 200 km away from a radio tower but still reside within the German borders. The second concern is that due to Rass' ability to collect Nazi soldier documents, our sample is mostly capturing Nordrhein-Westfalen and little else. Therefore we rerun our analysis first only using soldiers who were born in mainland Germany and second only using soldiers born within Nordrhein-Westfalen. In both of these subsamples our results are largely consistent.

A final concern is that our analysis might be misspecified due to soldiers clustering in space. We try to account for some of the spatial variation by including geographic variables such as Nazi vote share, however this may not be enough. Therefore we rerun our analysis and cluster the standard errors by the closest radio tower to the soldiers.[9] On the whole, the results are in line with our main findings. Decorations and distance to the closest radio tower remains significant across almost all specifications. Punishments fair a little worse. The fully specified model of whether a soldier receives a severe punishment and whether a soldier receives any punishment at all remain significant. Our placebo tests mostly mirror those of our main results. The one exception is that distance from the closest radio tower is negatively correlated with wounds and

[9]Note that clustering standard errors with a small number of clusters can be problematic. In our case the effective number of clusters is very small since there are less than 30 radio towers and a majority of our sample resides within two clusters.

positively correlated with a soldier being killed in action. However, just as in our main findings, the statistical significance of the placebo tests are highly dependent upon model specification.

7 Robustness Tests

We run two robustness checks to verify our findings. First we include a simulated omitted variable in order to test the robustness of our main findings in the face of omitted variable bias. Second, since there is little theoretical prior for control variables for individual combat motivation, we include an extreme bounds analysis to test the robustness of our main findings in the face of uncertain model specification. We include full analysis of these robustness checks in our Supplemental Appendix while providing the highlights of the results here.

7.1 Sensitivity Analysis: Simulation of Unobserved Omitted Variable

As with any study claiming causality, omitted variable bias is of central concern to our analysis. In our study we do our best to control for as many important channels that could effect our causal mechanism. However, there is always a possibility we missed a variable correlated with *both* our dependent variable and independent variable of interest, thus confounding our results. The question then becomes: how would this unobserved variable effect our results? What would happen to our measure for propaganda? Would it no longer be significant?

To address this question we turn to simulations to preform a sensitivity analysis on unobserved omitted variable bias. We simulate an unobserved omitted variable and vary its correlation with a soldier's distance to the closest radio tower *and* our various dependent variables of interest and then include it within thousands of new regressions to see how it affects the significance of our estimate of our distance variable.[10] We present our findings graphically in Figure 4 which show the results for these regressions. The x-axis varies from -1 to 1 and represents the correlation between the unobserved variable and our main variable of interest: a soldier's distance to the

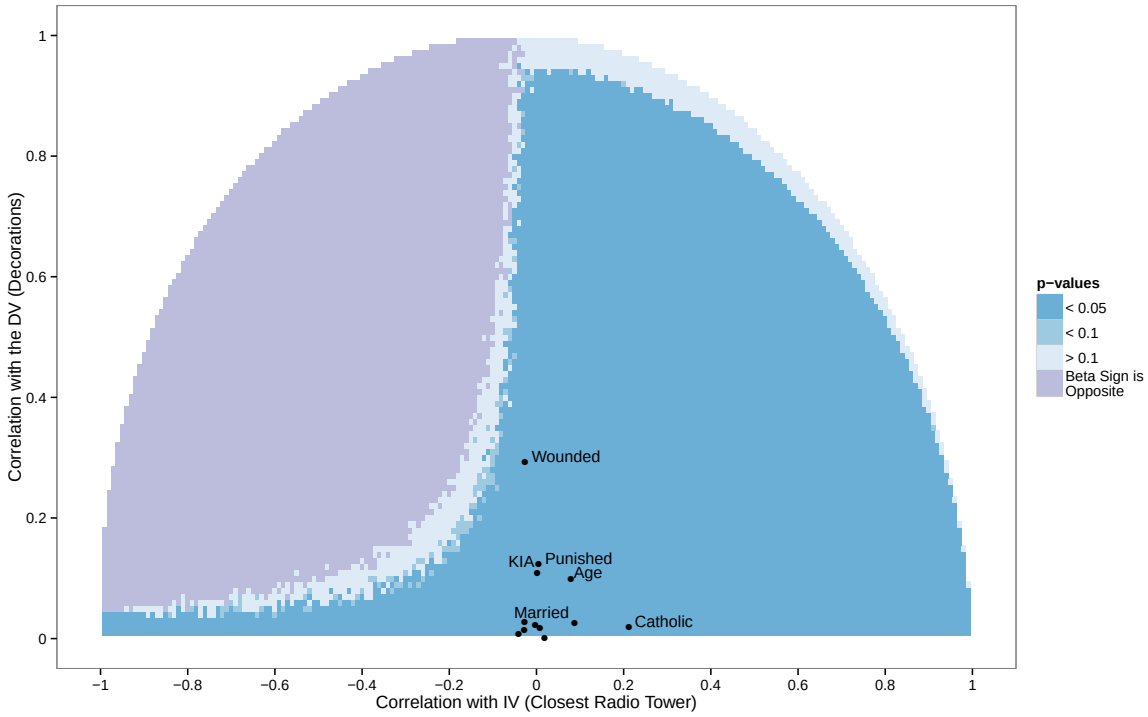
[10]Further explanation about the sensitivity analysis can be found in the supplementary materials

closest radio tower. The y-axis represents the correlation between the unobserved variable and our outcomes of interest: decorations and punishments. Each grid represents the p-value for our proxy for propaganda after including our simulated unobserved omitted variable in our fully-specified regression models. When grids are dark blue it means the proxy for propaganda was found to be significant at the 0.05 level or lower, while the lighter colors show significance at the 0.1 level or not significant at all. White grids mean that the joint correlation between the distance and the DV for the simulated unobserved variable was not possible. Purple grids mean that the sign of the coefficient flips, thus finding the opposite effect than originally observed.

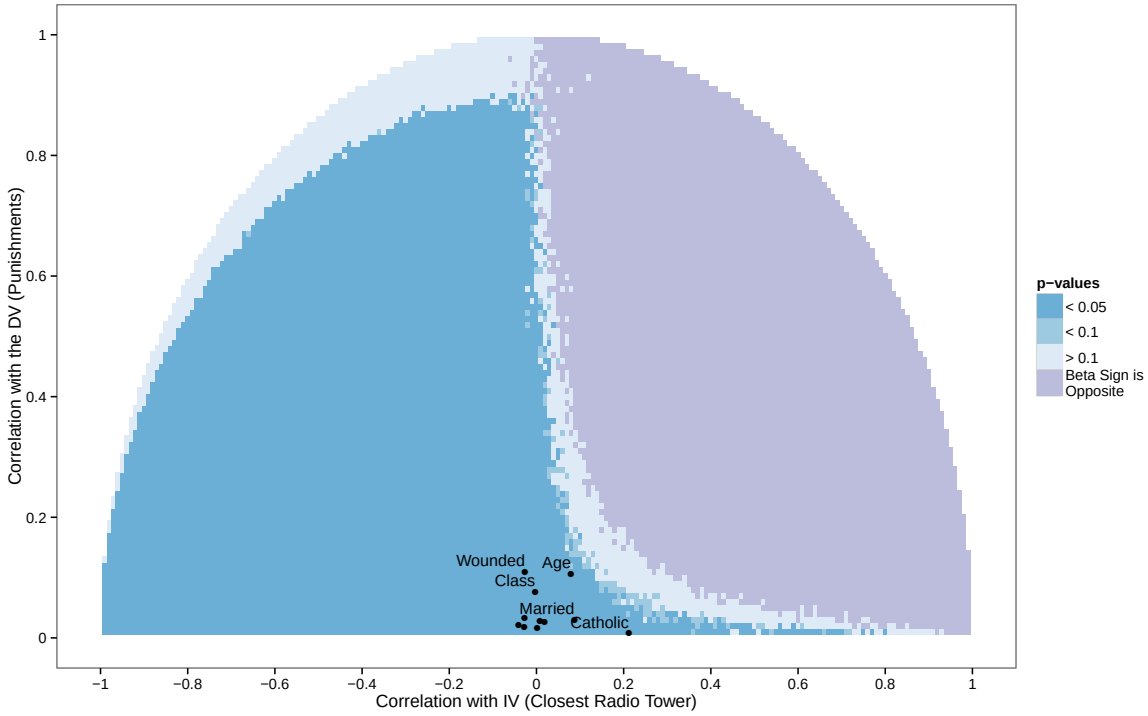
We find that distance to closest radio tower is fairly robust to unobserved omitted variables for decorations and punishments, but less so for POW. We present our results for decorations and punishments on Figure 4 and relegate analysis for POWs to the Supplementary Appendix. Figure 4(a) shows, our proxy for propaganda (distance from the closest radio tower) remains significant across most levels of omitted variable bias. Figure 4(b) shows how an unobserved variable effects the relationship between the soldier's distance to closest radio tower and whether a soldier was punished. Here the amount of space where the relationship between distance and punishments is robust is smaller than for decorations. However, the majority of correlations between distance and punishments are still robust to different levels of unobserved omitted variables.

To aid in interpretation, we plot various control variables as a guidepost for the correlation between distance and decorations. Most variables are uncorrelated with both distance to a radio tower and whether a soldier is decorated or punished. This is intuitive due to these variables being largely exogenous to most individual characteristics of soldiers. These represent the best guess for other unobserved variables given the universe of our sample. From these we can create anchor points to judge the likelihood of the correlation of an unobserved variable.

What is the likelihood of an unobserved variable being simultaneously highly correlated with our variable of interest and the dependent variable? For decorations, one control variable stands out to its relation to decorations: whether a soldier was wounded. Being wounded is highly correlated with receiving a decoration. This is obvious, since soldiers who are exhibiting valor are



(a) Decorations



(b) Punishments

Figure 4: Sensitivity Analysis for an Unobserved Omitted Variable: Distance to Closest Radio Tower

more likely to get wounded and therefore more likely to be decorated. It is unlikely, however, that there are other variables that are highly correlated with decorations in the same way. There are few control variables that are highly correlated with either distance or punishment. All of this shows that the relationship between the closest radio tower and two of our main variables of interest, decorations and punishments, is fairly robust to different levels of unobserved omitted variables.

7.2 Extreme Bounds Analysis

In cases where there is no strong theoretical prior for control variables, there is a worry that researchers can pick a certain combinations of variables that give an "artificially" statistically significant outcome. To avoid this, and to test the robustness of our main explanatory variable, we employ Extreme Bounds Analysis (EBA), a global sensitivity analysis that evaluates the coefficients of interest for every combination of plausible control variables (Levine and Renelt, 1992; Sala-i Martin, 1997).[11] The strength of EBA is its ability to test the significance of a key independent variable in the face of uncertainty about the inclusion of control variables.[12]

Overall our findings from the EBA are extremely robust. We test seven dependent variables using the EBA: decorated, number of medals, punishment, number of punishments, and whether a soldier is a POW, wounded, or killed in action. Most of the EBA results are congruent with our regression results above. For decorations, radio distance was positive and significant at the 95% level for every model specification. Similarly for punishments, radio distance was negative and significant at the 95% level for every model specification. For POW, every model specification was positive, however not all were significant at the 95% level.[13] Lastly, our two placebo variables, wounds and killed in action, are not robust. All of this provides confidence that our results are not merely a byproduct of a certain combination of control variables.

[11] We run 8192 separate regressions for each dependent variable other than wounded, which has 2048 regressions.
[12] Full results from our Extreme Bounds Analysis can be found within the Supplementary Appendix.
[13] This fails Levine and Renelt's strict test of robustness, but it passes Sala-i Martin's cdf(0) test.

8 Conclusions

This paper has presented evidence that ideas can motivate soldiers to fight. Exposure to Nazi radio propaganda prior to enlistment is associated with a significant reduction in soldiers' risk of punishment and an increase in the probability that a soldier is decorated for valor. This provides solid evidence that ideas matter for combat performance, a theory which was plausible and popular but was unsubstantiated for lack of a sound measurement and identification strategy. Our findings suggest that much understanding can be gained in international relations and security studies by following American and comparative politics in simply developing more refined measures and tests of ideational variables.

Yet there are limitations to our findings, which in turn suggest avenues for future research. As our study only looked at one case, it only represents a 'proof of concept' that ideas *can* motivate individuals to fight. It does not say how important ideas are relative to other factors or specify the conditions under which ideas will be more or less likely to matter. This implies the following possibilities for future research.

First, it is plausible to suggest that the impact of ideas may be contingent on regime type. Nazi Germany established a state monopoly of the mass media and banned the expression of non–Nazi viewpoints. A state in which individuals have more access to information contradicting official propaganda may not be able to call on such reserves of commitment from its soldiers, as many Allied leaders feared at the time (Danchev and Alanbrooke, 2001).

Second, it is likely that some types of ideas may lend themselves to combat motivation more easily than others. Nazi ideology, which glorified conformity and war and discouraged questioning, may have been more likely to motivate men to fight than liberal democracy, which prizes individual rights and skeptical inquiry. Contemporary ideologies such as militant Islamism may hold a similar advantage. One interesting and important avenue for future research lies in examining the types of messages which liberal democratic societies can craft which could produce comparable reserves of commitment and self–sacrifice if necessary. Both of these points suggest that in many important

ways autocracies and illiberal ideologies have an advantage over democracies in some aspects of war fighting.

At the same time, it is possible that the proliferation of media sources in the modern world, even in many non–democratic countries, makes it harder to maintain a Nazi–like monopoly of the media and so to inculcate political ideas for which one would kill or die. While the spectre of 'online radicalization' has gained much attention, the proportion of young Western Muslims who have actually gone to fight for ISIS is low. Moreover, studies of such radicalization suggest that it requires potential recruits to cut themselves off from alternative sources of information (Pape and Feldman, 2010). If a more diffuse global media environment makes it harder for extremist ideologies to motivate people to kill and die, then this has hopeful connotations for global security.

Finally, future research could examine how radicalization processes can be reversed. In modern Germany, Nazi ideology has the allegiance of only a tiny minority of the population (as does militant nationalism in modern day Japan). To what extent is this due to Allied counter–propaganda efforts after the war, as opposed to the economic success of post–war Germany and the 'performance legitimacy' this is alleged to have lent the democratic system? Lessons from this episode could aid policymakers in combatting the extremist messages which endanger the contemporary world.

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9 Appendix

9.1 Figures

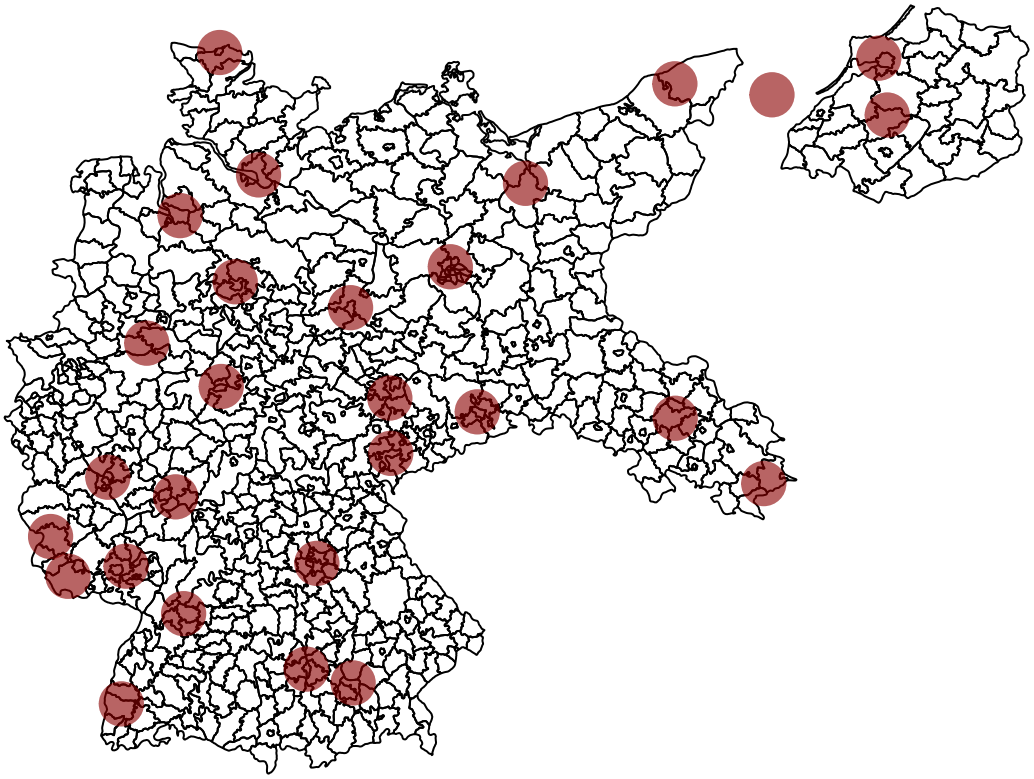

Figure 5: Radio Towers in Germany

9.2 Summary Statistics

Table 4: Summary Statistics for Key Variables

		N	Mean	St. Dev.	Min	Max
Main IV	Distance from Closest Radio Tower (km)	15,390	81.567	34.960	0.031	189.402
Continuous	Nazi Vote Share	16,378	15.958	8.181	1.010	49.950
	Muster Age (relative to 18)	14,734	4.691	6.355	−6.638	26.386
	Height (relative to mean)	15,412	0	0.064	−0.306	0.284
	Weight (relative to mean)	15,209	0	8.272	−33.111	80.889
Ordinal	Economic Class	13,648	2.131	0.736	1	4
	Human Capital	12,282	1.465	0.983	1	6
Binary	Catholic	18,537	0.517	0.500	0	1
	Married	18,537	0.358	0.479	0	1
	Urban	18,537	0.123	0.329	0	1
	Wounded	18,537	0.101	0.302	0	1
	KIA	18,536	0.126	0.332	0	1
	Decorated	18,537	0.366	0.482	0	1
	POW	18,537	0.040	0.197	0	1
	Punished	18,537	0.132	0.339	0	1

Table 5: Correlation Matrix for Key Variables

	Closest Radio Tower	Nazi Vote	Class	Catholic	Age	Married	Urban	H. Cap	Wounded	KIA	Decorated	POW
Nazi Vote	-0.04***											
Class	0.00	0.00										
Catholic	0.21***	-0.13***	-0.01									
Age	0.08***	-0.02*	0.23***	0.04***								
Married	0.09***	-0.02	0.13***	0.02**	0.60***							
Urban	0.01	-0.06***	0.04***	-0.02*	0.03**	0.05***						
Human Capital	0.02*	0.00	0.23***	-0.03***	-0.04***	-0.06***	0.04***					
Wounded	-0.03**	0.00	-0.04***	-0.03***	-0.04***	0.01	0.02*	-0.01				
KIA	0.00	-0.02*	-0.05***	-0.02**	-0.07***	-0.06***	0.00	0.00	0.06***			
Decorated	-0.05***	0.01	-0.02**	-0.07***	-0.10***	0.03***	0.02*	0.00	0.29***	0.11***		
POW	0.02*	0.01	0.00	-0.01	-0.04***	-0.01	0.01	0.02*	0.01	-0.07***	0.01	
Punished	0.00	0.02**	-0.08***	-0.03***	-0.11***	-0.03***	0.03***	-0.03**	0.11***	0.02*	0.12***	0.00

Table 6: Nazi Radio Towers: Descriptive Information

City	Longitude	Latitude	First Year of Radio Tower	Last Year of Radio Tower	Current State
Augsburg	10.8936	48.3700	1927	1935	Bayern
Berlin	13.2923	52.5593	1923	1945	Berlin
Bremen	8.7945	53.0913	1924	1945	Bremen
Breslau	17.0359	50.9818	1924	1945	Warclaw, Poland
Danzig	18.6457	54.3495	1926	1945	Gdansk, Poland
Dresden	13.7404	51.0485	1925	1945	Sachsen
Flensburg	9.4529	54.7897	1928	1945	Schleswig-Holstein
Frankfurt	8.7203	50.1634	1924	1945	Hessen
Freiburg	7.8165	48.0081	1926	1945	Baden-Wurttemberg
Gleiwitz	18.5092	50.3014	1925	1945	Gliwice, Poland
Hamburg	10.0996	53.5155	1924	1945	Hamburg
Hannover	9.7112	52.4028	1924	1945	Niedersachsen
Heilsberg	20.5644	54.1389	1930	1945	Lidzbark Warminski, Poland
Kaiserslautern	7.8942	49.4421	1928	1945	Rheinland-Pfalz
Kassel	9.4793	51.3127	1925	1945	Hessen
Koblenz	7.5915	50.3680	1935	1945	Rheinland-Pfalz
Konigsberg	20.4239	54.7308	1924	1945	Kaliningrad Oblast, Russia
Langenberg	8.2399	51.7636	1927	1945	Nordrhein-Westfalen
Leipzig	12.2854	51.1925	1924	1945	Sachsen
Magdeburg	11.6317	52.1330	1928	1944	Sachsen-Anhalt
Munchen	11.6739	48.2262	1924	1945	Bayern
Nurnberg	11.0710	49.4708	1924	1945	Bayern
Reichenbach	12.3008	50.6164	1937	1945	Sachsen
Saarbrucken	6.9281	49.3365	1935	1945	Saarland
Stettin	14.5433	53.4277	1925	1945	Szczecin, Poland
Stolp	17.0296	54.4638	1938	1945	Slupsk, Poland
Stuttgart	8.8528	48.9476	1924	1945	Baden-Wurttemberg
Trier	6.6383	49.7506	1933	1945	Rheinland-Pfalz

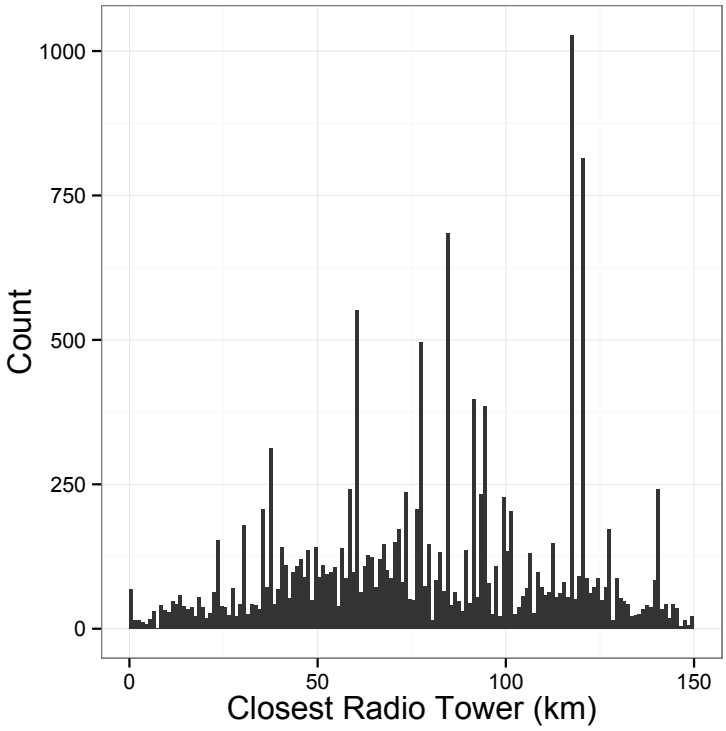

Figure 6: Closest Radio Tower to Soldiers

Supplementary Appendix for: "Ideas and Combat Motivation"

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1 Full Tables from Article

In our paper, in the interest of space, we presented abbreviated versions of our tables. Below are the full tables for all of the regressions run for our analysis.

Table 1: Radio Tower Distance and Soldier Decorations

	Dependent variable:					
	Soldier is Decorated		High Decoration		# of Decorations	
	(Logit)		(Logit)		(Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (km)	−0.004***	−0.003***	−0.004***	−0.004***	−0.003***	−0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Nazi Vote Share	−0.002	−0.004	0.004	0.002	0.002	−0.000
	(0.002)	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)
Soldier from Urban Area	−0.076	−0.145*	−0.092	−0.201*	−0.070	−0.117*
	(0.058)	(0.073)	(0.076)	(0.097)	(0.042)	(0.049)
Age When Joining Army (relative to 18)	−0.073***	−0.077***	−0.118***	−0.124***	−0.067***	−0.071***
	(0.004)	(0.006)	(0.006)	(0.009)	(0.003)	(0.004)
Catholic		−0.202***		−0.113		−0.150***
		(0.048)		(0.062)		(0.032)
Class		−0.013		−0.030		−0.003
		(0.034)		(0.045)		(0.023)
Wounded		1.779***		1.483***		0.960***
		(0.080)		(0.072)		(0.039)
Married		0.097		0.044		0.065
		(0.061)		(0.077)		(0.039)
Height (compared to avg soldier)		−2.166***		−1.740**		−1.670***
		(0.457)		(0.600)		(0.306)
Weight (compared to avg soldier)		0.011**		0.013**		0.010***
		(0.004)		(0.005)		(0.002)
Enlistment Year: 1936	−0.158*	−0.206*	−0.140	−0.229*	−0.076	−0.152**
	(0.079)	(0.096)	(0.089)	(0.110)	(0.053)	(0.058)
Enlistment Year: 1937	−0.315***	−0.369***	−0.039	−0.109	−0.116*	−0.196**
	(0.083)	(0.101)	(0.094)	(0.116)	(0.056)	(0.062)
Enlistment Year: 1938	−0.378***	−0.357***	−0.136	−0.175	−0.194***	−0.216***
	(0.076)	(0.092)	(0.087)	(0.107)	(0.051)	(0.056)
Enlistment Year: 1939	−0.521***	−0.546***	−0.247**	−0.282**	−0.324***	−0.345***
	(0.072)	(0.087)	(0.084)	(0.102)	(0.049)	(0.054)
Enlistment Year: 1940	−0.933***	−0.902***	−0.823***	−0.850***	−0.706***	−0.686***
	(0.073)	(0.090)	(0.090)	(0.112)	(0.051)	(0.057)
Enlistment Year: 1941	−1.477***	−1.431***	−1.355***	−1.247***	−1.180***	−1.141***
	(0.100)	(0.123)	(0.135)	(0.159)	(0.075)	(0.085)
Enlistment Year: 1942	−2.707***	−2.530***	−2.625***	−2.357***	−2.386***	−2.192***
	(0.098)	(0.119)	(0.148)	(0.176)	(0.077)	(0.089)
Enlistment Year: 1943	−3.793***	−3.773***	−4.838***	−4.651***	−3.418***	−3.695***
	(0.196)	(0.251)	(0.582)	(0.713)	(0.163)	(0.237)
Enlistment Year: 1944	−3.141***	−3.836***	−2.496***	−4.067***	−2.252***	−3.232***
	(0.246)	(0.461)	(0.330)	(1.007)	(0.165)	(0.343)
Enlistment Year: 1945	−12.908	−12.900	−12.590	−11.552	−19.640	−22.666
	(103.224)	(161.528)	(170.071)	(161.913)	(3027.662)	(21076.144)
(Intercept)	1.004***	0.907***	−0.425***	−0.538***	0.814***	0.657***
	(0.083)	(0.124)	(0.098)	(0.153)	(0.057)	(0.079)
Likelihood-ratio	2309.070	2314.421	1318.097	1386.463	2888.198	3055.865
Log-likelihood	−7893.520	−5482.836	−5265.540	−3586.708	−16007.831	−11321.489
Deviance	15787.039	10965.673	10531.079	7173.416	11709.023	8684.372
AIC	15817.039	11007.673	10561.079	7215.416	32047.662	22686.978
BIC	15929.840	11159.105	10673.880	7366.848	32167.983	22845.620
# of Soldiers	13630	10007	13630	10007	13630	10007

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2: Radio Tower Distance and Soldier Punishment

	Dependent variable:					
	Soldier is Punished		Severe Punishment		# of Punishments	
	(Logit)		(Logit)		(Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (km)	0.002**	0.003**	0.003	0.006	0.003***	0.004***
	(0.001)	(0.001)	(0.003)	(0.003)	(0.001)	(0.001)
Nazi Vote Share	0.005	0.006	−0.001	−0.001	0.005	0.007
	(0.003)	(0.003)	(0.010)	(0.011)	(0.003)	(0.004)
Soldier from Urban Area	0.223**	0.230**	0.140	0.164	0.214**	0.127
	(0.072)	(0.087)	(0.239)	(0.282)	(0.078)	(0.093)
Age When Joining Army (relative to 18)	−0.087***	−0.096***	−0.075***	−0.063*	−0.095***	−0.098***
	(0.006)	(0.008)	(0.020)	(0.027)	(0.006)	(0.008)
Catholic		−0.075		−0.101		−0.068
		(0.061)		(0.201)		(0.063)
Class		−0.212***		0.002		−0.278***
		(0.046)		(0.142)		(0.047)
Wounded		0.540***		0.240		0.511***
		(0.078)		(0.257)		(0.085)
Married		0.212**		−0.366		0.145
		(0.076)		(0.253)		(0.080)
Height (compared to avg soldier)		−1.084		0.715		−1.195*
		(0.580)		(1.901)		(0.604)
Weight (compared to avg soldier)		−0.004		−0.021		0.002
		(0.005)		(0.017)		(0.005)
Enlistment Year: 1936	−0.272**	−0.251*	−0.631*	−0.589	−0.159	−0.181
	(0.091)	(0.107)	(0.284)	(0.332)	(0.102)	(0.116)
Enlistment Year: 1937	−0.332***	−0.338**	−0.375	−0.390	−0.268*	−0.344**
	(0.098)	(0.117)	(0.280)	(0.333)	(0.109)	(0.126)
Enlistment Year: 1938	−0.473***	−0.452***	−0.886**	−0.657*	−0.409***	−0.465***
	(0.091)	(0.107)	(0.296)	(0.321)	(0.101)	(0.115)
Enlistment Year: 1939	−0.586***	−0.511***	−1.119***	−1.084**	−0.534***	−0.550***
	(0.088)	(0.102)	(0.299)	(0.338)	(0.097)	(0.110)
Enlistment Year: 1940	−0.778***	−0.716***	−0.873**	−0.839**	−0.804***	−0.753***
	(0.090)	(0.107)	(0.269)	(0.308)	(0.099)	(0.113)
Enlistment Year: 1941	−1.145***	−1.127***	−2.469***	−2.955**	−1.282***	−1.361***
	(0.130)	(0.155)	(0.728)	(1.022)	(0.141)	(0.165)
Enlistment Year: 1942	−1.641***	−1.509***	−1.671***	−1.800***	−1.704***	−1.630***
	(0.112)	(0.133)	(0.362)	(0.437)	(0.117)	(0.137)
Enlistment Year: 1943	−2.237***	−1.979***	−3.209**	−16.362	−2.454***	−2.353***
	(0.187)	(0.207)	(1.016)	(485.296)	(0.189)	(0.217)
Enlistment Year: 1944	−3.006***	−3.584***	−2.219*	−16.324	−2.974***	−3.542***
	(0.419)	(0.717)	(1.018)	(809.237)	(0.360)	(0.595)
Enlistment Year: 1945	−12.828	−11.992	−11.243	−16.620	−19.810	−20.138
	(171.840)	(162.115)	(289.087)	(5369.777)	(4517.368)	(7764.464)
(Intercept)	−1.070***	−0.804***	−3.577***	−3.750***	−0.718***	−0.261
	(0.101)	(0.152)	(0.317)	(0.480)	(0.111)	(0.160)
Likelihood-ratio	688.097	627.417	72.123	71.533	743.464	688.089
Log-likelihood	−5320.313	−3911.047	−780.509	−583.246	−7855.954	−5816.848
Deviance	10640.626	7822.095	1561.018	1166.492	5689.047	4283.219
AIC	10670.626	7864.095	1591.018	1208.492	15743.907	11677.696
BIC	10783.427	8015.526	1703.818	1359.924	15864.228	11836.339
# of Soldiers	13630	10007	13630	10007	13630	10007

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Radio Tower Distance and Other Factors

	Dependent variable:							
	Soldier is Wounded		# of Wounds		Soldier is KIA		Soldier is POW	
	(Logit)		(Negative Binomial)		(Logit)		(Logit)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance from Closest Radio Tower (km)	−0.002	−0.001	−0.000	−0.000	0.001	0.001	0.003*	0.003+
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Nazi Vote Share	−0.000	−0.004	−0.002	−0.004	−0.009**	−0.009*	0.007	0.005
	(0.003)	(0.004)	(0.002)	(0.002)	(0.003)	(0.004)	(0.005)	(0.006)
Soldier from Urban Area	0.130	0.126	0.095	0.097	−0.090	−0.068	0.158	0.156
	(0.081)	(0.097)	(0.052)	(0.063)	(0.078)	(0.094)	(0.127)	(0.154)
Age When Joining Army (relative to 18)	−0.050***	−0.073***	−0.042***	−0.059***	−0.060***	−0.045***	−0.043***	−0.068***
	(0.006)	(0.008)	(0.003)	(0.005)	(0.005)	(0.007)	(0.009)	(0.014)
Catholic		−0.024		−0.021		−0.086		−0.140
		(0.067)		(0.043)		(0.061)		(0.108)
Class		−0.097*		−0.095**		−0.117**		0.180*
		(0.049)		(0.031)		(0.045)		(0.075)
Married		0.322***		0.237***		−0.181*		0.356*
		(0.083)		(0.054)		(0.080)		(0.144)
Height (compared to avg soldier)		0.017		−0.405		−0.474		−0.599
		(0.637)		(0.407)		(0.583)		(1.031)
Weight (compared to avg soldier)		0.000		0.005		0.002		−0.002
		(0.005)		(0.003)		(0.005)		(0.009)
Wounded						0.224**		0.220
						(0.084)		(0.151)
Enlistment Year: 1936	0.076	0.040	−0.035	−0.060	0.086	0.088	0.316	0.316
	(0.105)	(0.125)	(0.071)	(0.085)	(0.101)	(0.119)	(0.197)	(0.231)
Enlistment Year: 1937	0.027	0.069	−0.051	−0.014	0.048	−0.013	0.054	0.010
	(0.111)	(0.132)	(0.075)	(0.089)	(0.107)	(0.127)	(0.219)	(0.264)
Enlistment Year: 1938	−0.100	0.048	−0.129	−0.000	0.036	−0.045	0.155	0.246
	(0.104)	(0.122)	(0.069)	(0.081)	(0.098)	(0.116)	(0.196)	(0.229)
Enlistment Year: 1939	−0.105	0.003	−0.086	−0.017	0.027	−0.058	0.337	0.470*
	(0.099)	(0.116)	(0.065)	(0.077)	(0.094)	(0.110)	(0.183)	(0.212)
Enlistment Year: 1940	−0.365***	−0.178	−0.341***	−0.195*	−0.127	−0.168	0.197	0.342
	(0.103)	(0.121)	(0.067)	(0.079)	(0.095)	(0.113)	(0.185)	(0.219)
Enlistment Year: 1941	−0.425**	−0.265	−0.355***	−0.257*	−0.191	−0.334*	0.459*	0.454
	(0.138)	(0.161)	(0.089)	(0.105)	(0.124)	(0.151)	(0.217)	(0.266)
Enlistment Year: 1942	−1.798***	−1.723***	−1.353***	−1.284***	−0.851***	−0.889***	0.195	0.199
	(0.159)	(0.191)	(0.084)	(0.102)	(0.113)	(0.138)	(0.192)	(0.236)
Enlistment Year: 1943	−3.055***	−3.002***	−2.352***	−2.381***	−1.732***	−1.597***	0.227	0.228
	(0.388)	(0.459)	(0.158)	(0.195)	(0.201)	(0.228)	(0.231)	(0.284)
Enlistment Year: 1944	−2.372***	−2.754***	−1.702***	−2.102***	−2.348***	−2.027***	−0.151	−0.423
	(0.458)	(0.718)	(0.194)	(0.296)	(0.420)	(0.463)	(0.371)	(0.539)
Enlistment Year: 1945	−11.918	−11.054	−18.947	−19.063	−12.067	−11.227	1.064	2.013
	(175.848)	(162.327)	(3084.235)	(4709.244)	(175.232)	(162.314)	(1.079)	(1.172)
(Intercept)	−1.421***	−1.274***	−0.213**	−0.070	−1.283***	−1.073***	−3.547***	−3.965***
	(0.114)	(0.168)	(0.074)	(0.109)	(0.106)	(0.156)	(0.206)	(0.296)
Likelihood-ratio	460.181	363.518	799.698	641.453	355.287	243.508	46.015	51.651
Log-likelihood	−4523.567	−3334.114	−12009.568	−8818.708	−5370.615	−3890.614	−2306.595	−1647.539
Deviance	9047.133	6668.229	9482.502	6930.980	10741.229	7781.228	4613.189	3295.077
AIC	9077.133	6708.229	24051.136	17679.417	10771.229	7823.228	4643.189	3337.077
BIC	9189.934	6852.450	24171.456	17830.848	10884.030	7974.660	4755.990	3488.509
# of Soldiers	13630	10007	13630	10007	13630	10007	13630	10007

Standard errors in parentheses
+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

2 Alternative Measures of Distance

In our primary analysis we use distance from radio towers as a proxy for exposure to propaganda. However, it is possible that a simple linear form of distance is too crude of a measure to capture the proxy for propaganda soldiers are exposed to. Therefore in this section we investigate a few other operationalizations of distance and it's impact on our dependent variables.

In Section 2.1 we operationalize exposure to propaganda with logged distance, in order to make sure that the extreme values of our sample are not driving the results. We test logged distance on all of our dependent variables as we did above. The relationship between logged distance and our dependent variables is very consistent with our main findings. Logged distance is negatively and significantly related to all measures of decorations, while positive and significant for the same measures of punishment as well as whether a soldier will become a POW. Just as with our normal linear measure of distance, we find no relationship between distance and our placebo tests.

In Section 2.2 we operationalize exposure to propaganda with distance in a non-linear way. We break up our sample into terciles, measuring those soldiers who are close, middle, and far away from radio towers. We create dummy variables for each of these groups, and included them within our regressions. From this analysis, we find that distance behaves mostly as we would expect. Those who are in the "middle" and "far" category are less likely to receive decorations, and more likely to receive punishments or be POWs. These non-linear tests of distance mimic those found in our main findings.

2.1 Logged Distance

Table 4: Logged Radio Tower Distance and Soldier Decorations

	Dependent variable:					
	Soldier is Decorated (Logit)		High Decoration (Logit)		# of Decorations (Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (Logged km)	-0.170^{***}	-0.134^{***}	-0.144^{***}	-0.128^{*}	-0.125^{***}	-0.072^{**}
	(0.032)	(0.039)	(0.041)	(0.051)	(0.023)	(0.026)
Nazi Vote Share	−0.001	−0.004	0.004	0.002	0.002	−0.000
	(0.002)	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)
Soldier from Urban Area	−0.066	−0.142	−0.082	-0.193^{*}	−0.062	-0.115^{*}
	(0.058)	(0.073)	(0.076)	(0.097)	(0.042)	(0.049)
Age When Joining Army (Relative to 18)	-0.074^{***}	-0.078^{***}	-0.119^{***}	-0.124^{***}	-0.067^{***}	-0.072^{***}
	(0.004)	(0.006)	(0.006)	(0.009)	(0.003)	(0.004)
Catholic		-0.230^{***}		-0.142^{*}		-0.165^{***}
		(0.047)		(0.061)		(0.031)
Class		−0.013		−0.034		−0.004
		(0.034)		(0.045)		(0.023)
Wounded		1.772^{***}		1.481^{***}		0.959^{***}
		(0.079)		(0.072)		(0.039)
Married		0.090		0.030		0.062
		(0.061)		(0.077)		(0.039)
Height (compared to avg soldier)		-2.208^{***}		-1.802^{**}		-1.706^{***}
		(0.455)		(0.597)		(0.305)
Weight (compared to avg soldier)		0.012^{**}		0.014^{**}		0.011^{***}
		(0.004)		(0.005)		(0.002)
(Intercept)	1.430^{***}	1.260^{***}	−0.099	−0.257	1.133^{***}	0.843^{***}
	(0.155)	(0.199)	(0.189)	(0.252)	(0.108)	(0.131)
Enlistment Year Fixed Effects	✓	✓	✓	✓	✓	✓
Likelihood-ratio	2294.522	2323.564	1306.167	1380.679	2867.980	3072.695
Log-likelihood	−7900.316	−5518.718	−5271.334	−3611.373	−16014.602	−11393.662
Deviance	15800.632	11037.436	10542.668	7222.746	11703.844	8734.561
AIC	15830.632	11079.436	10572.668	7264.746	32061.205	22831.325
BIC	15943.431	11230.991	10685.467	7416.302	32181.524	22990.097
# of Soldiers	13629	10066	13629	10066	13629	10066

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Logged Radio Tower Distance and Soldier Punishment

	Dependent variable:					
	Soldier is Punished		Severe Punishment		# of Punishments	
	(Logit)		(Logit)		(Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (Logged km)	0.130**	0.181**	−0.026	0.318	0.168***	0.180**
	(0.046)	(0.056)	(0.146)	(0.199)	(0.048)	(0.057)
Nazi Vote Share	0.005	0.006	0.003	0.003	0.005	0.007
	(0.003)	(0.003)	(0.010)	(0.011)	(0.003)	(0.004)
Soldier from Urban Area	0.216**	0.219*	0.002	0.211	0.200*	0.118
	(0.072)	(0.086)	(0.255)	(0.274)	(0.078)	(0.093)
Age When Joining Army (Relative to 18)	−0.087***	−0.095***	−0.084***	−0.068*	−0.094***	−0.097***
	(0.006)	(0.008)	(0.021)	(0.027)	(0.006)	(0.008)
Catholic		−0.050		−0.106		−0.039
		(0.059)		(0.195)		(0.062)
Class		−0.209***		0.049		−0.279***
		(0.046)		(0.139)		(0.047)
Wounded		0.533***		0.288		0.502***
		(0.078)		(0.251)		(0.085)
Married		0.211**		−0.361		0.146
		(0.076)		(0.253)		(0.080)
Height (compared to avg soldier)		−1.066		1.745		−1.187*
		(0.578)		(1.871)		(0.602)
Weight (compared to avg soldier)		−0.004		−0.004		0.002
		(0.005)		(0.016)		(0.005)
(Intercept)	−1.433***	−1.367***	−3.281***	−4.827***	−1.184***	−0.784**
	(0.210)	(0.268)	(0.660)	(0.934)	(0.224)	(0.276)
Enlistment Year Fixed Effects	✓	✓	✓	✓	✓	✓
Likelihood-ratio	686.501	626.991	72.489	63.320	739.787	683.784
Log-likelihood	−5320.953	−3929.507	−757.669	−592.494	−7857.419	−5840.509
Deviance	10641.907	7859.014	1515.339	1184.988	5689.327	4300.412
AIC	10671.907	7901.014	1545.339	1226.988	15746.838	11725.019
BIC	10784.706	8052.569	1658.138	1378.543	15867.157	11883.791
# of Soldiers	13629	10066	13629	10066	13629	10066

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Logged Radio Tower Distance and Other Factors

	Dependent variable:							
	Soldier is Wounded		# of Wounds		Soldier is KIA		Soldier is POW	
	(Logit)		(Negative Binomial)		(Logit)		(Logit)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance from Closest Radio Tower (Logged km)	−0.046	0.001	−0.024	0.011	0.045	0.047	0.220**	0.231*
	(0.047)	(0.057)	(0.030)	(0.036)	(0.044)	(0.052)	(0.085)	(0.103)
Nazi Vote Share	−0.000	−0.004	−0.002	−0.004	−0.009**	−0.008*	0.006	0.004
	(0.003)	(0.004)	(0.002)	(0.002)	(0.003)	(0.004)	(0.005)	(0.006)
Soldier from Urban Area	0.135	0.137	0.096	0.098	−0.092	−0.085	0.152	0.127
	(0.081)	(0.096)	(0.052)	(0.063)	(0.078)	(0.094)	(0.127)	(0.153)
Age When Joining Army (Relative to 18)	−0.051***	−0.073***	−0.042***	−0.059***	−0.060***	−0.045***	−0.043***	−0.063***
	(0.006)	(0.008)	(0.003)	(0.005)	(0.005)	(0.007)	(0.009)	(0.013)
Catholic		−0.045		−0.027		−0.078		−0.153
		(0.066)		(0.042)		(0.060)		(0.105)
Class		−0.097*		−0.093**		−0.109*		0.177*
		(0.049)		(0.031)		(0.045)		(0.074)
Married		0.321***		0.239***		−0.174*		0.355*
		(0.082)		(0.054)		(0.079)		(0.143)
Height (compared to avg soldier)		−0.004		−0.396		−0.425		−0.674
		(0.634)		(0.406)		(0.580)		(1.023)
Weight (compared to avg soldier)		0.001		0.005		0.002		−0.003
		(0.005)		(0.003)		(0.005)		(0.008)
Wounded						0.225**		0.229
						(0.084)		(0.150)
(Intercept)	−1.351***	−1.359***	−0.143	−0.125	−1.422***	−1.202***	−4.268***	−4.684***
	(0.218)	(0.279)	(0.141)	(0.179)	(0.205)	(0.259)	(0.404)	(0.507)
Enlistment Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Likelihood-ratio	457.407	365.187	799.391	648.798	355.394	243.407	49.153	49.040
Log-likelihood	−4524.836	−3356.846	−12009.364	−8871.597	−5370.409	−3917.748	−2304.984	−1667.150
Deviance	9049.672	6713.693	9481.722	6967.746	10740.818	7835.496	4609.968	3334.300
AIC	9079.672	6753.693	24050.728	17785.194	10770.818	7877.496	4639.968	3376.300
BIC	9192.472	6898.031	24171.048	17936.750	10883.617	8029.051	4752.767	3527.855
# of Soldiers	13629	10066	13629	10066	13629	10066	13629	10066

Standard errors in parentheses
$^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

2.2 Non-Linear Distance

Table 7: Non-Linear Radio Tower Distance and Soldier Decorations

	Dependent variable:					
	Soldier is Decorated		High Decoration		# of Decorations	
	(Logit)		(Logit)		(Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Middle	-0.202^{***}	-0.153^{**}	-0.065	-0.027	-0.081^{*}	-0.039
	(0.047)	(0.056)	(0.058)	(0.070)	(0.033)	(0.037)
Far Away	-0.349^{***}	-0.303^{***}	-0.333^{***}	-0.334^{***}	-0.246^{***}	-0.163^{***}
	(0.049)	(0.061)	(0.064)	(0.082)	(0.035)	(0.041)
Nazi Vote Share	-0.001	-0.004	0.003	0.001	0.001	-0.000
	(0.002)	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)
Soldier from Urban Area	-0.092	-0.163^{*}	-0.116	-0.229^{*}	-0.085^{*}	-0.131^{**}
	(0.058)	(0.073)	(0.076)	(0.097)	(0.042)	(0.049)
Age When Joining Army (Relative to 18)	-0.073^{***}	-0.077^{***}	-0.117^{***}	-0.122^{***}	-0.066^{***}	-0.071^{***}
	(0.004)	(0.006)	(0.006)	(0.009)	(0.003)	(0.004)
Catholic		-0.188^{***}		-0.081		-0.138^{***}
		(0.049)		(0.063)		(0.033)
Class		-0.012		-0.029		-0.002
		(0.034)		(0.045)		(0.023)
Wounded		1.766^{***}		1.473^{***}		0.953^{***}
		(0.079)		(0.072)		(0.039)
Married		0.093		0.033		0.064
		(0.061)		(0.077)		(0.039)
Height (compared to avg soldier)		-2.203^{***}		-1.800^{**}		-1.700^{***}
		(0.455)		(0.598)		(0.304)
Weight (compared to avg soldier)		0.011^{**}		0.014^{**}		0.011^{***}
		(0.004)		(0.005)		(0.002)
(Intercept)	0.876^{***}	0.801^{***}	-0.580^{***}	-0.732^{***}	0.703^{***}	0.579^{***}
	(0.073)	(0.116)	(0.084)	(0.143)	(0.049)	(0.074)
Enlistment Year Fixed Effects	✓	✓	✓	✓	✓	✓
Likelihood-ratio	2319.811	2336.936	1323.772	1394.097	2898.380	3087.441
Log-likelihood	-7887.672	-5512.032	-5262.531	-3604.664	-16003.705	-11389.054
Deviance	15775.344	11024.064	10525.063	7209.328	11711.396	8738.432
AIC	15807.344	11068.064	10557.063	7253.328	32041.411	22824.107
BIC	15927.663	11226.836	10677.382	7412.100	32169.250	22990.096
# of Soldiers	13629	10066	13629	10066	13629	10066

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Non-Linear Radio Tower Distance and Soldier Punishment

	Dependent variable:					
	Soldier is Punished		Severe Punishment		# of Punishments	
	(Logit)		(Logit)		(Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Middle	0.106	0.144*	−0.177	0.020	0.065	0.083
	(0.061)	(0.071)	(0.215)	(0.242)	(0.065)	(0.074)
Far Away	0.159*	0.193*	0.276	0.498*	0.203**	0.247**
	(0.064)	(0.078)	(0.206)	(0.248)	(0.068)	(0.081)
Nazi Vote Share	0.005	0.006	0.007	0.006	0.005	0.007*
	(0.003)	(0.004)	(0.010)	(0.012)	(0.003)	(0.004)
Soldier from Urban Area	0.225**	0.228**	0.061	0.271	0.221**	0.139
	(0.072)	(0.087)	(0.257)	(0.276)	(0.079)	(0.093)
Age When Joining Army (Relative to 18)	−0.087***	−0.095***	−0.088***	−0.071**	−0.095***	−0.098***
	(0.006)	(0.008)	(0.021)	(0.027)	(0.006)	(0.008)
Catholic		−0.054		−0.186		−0.063
		(0.061)		(0.203)		(0.064)
Class		−0.209***		0.040		−0.282***
		(0.046)		(0.139)		(0.047)
Wounded		0.537***		0.309		0.512***
		(0.078)		(0.252)		(0.085)
Married		0.215**		−0.364		0.145
		(0.076)		(0.253)		(0.080)
Height (compared to avg soldier)		−1.049		1.763		−1.204*
		(0.578)		(1.869)		(0.602)
Weight (compared to avg soldier)		−0.004		−0.004		0.002
		(0.005)		(0.016)		(0.005)
(Intercept)	−0.959***	−0.693***	−3.473***	−3.602***	−0.549***	−0.092
	(0.086)	(0.141)	(0.266)	(0.436)	(0.096)	(0.149)
Enlistment Year Fixed Effects	✓	✓	✓	✓	✓	✓
Likelihood-ratio	684.586	622.868	77.166	65.570	735.816	682.579
Log-likelihood	−5321.911	−3931.568	−755.331	−591.369	−7858.927	−5840.788
Deviance	10643.822	7863.137	1510.662	1182.738	5685.951	4297.392
AIC	10675.822	7907.137	1542.662	1226.738	15751.854	11727.576
BIC	10796.141	8065.909	1662.982	1385.511	15879.693	11893.565
# of Soldiers	13629	10066	13629	10066	13629	10066

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: Non-Linear Radio Tower Distance and Other Factors

	Dependent variable:							
	Soldier is Wounded		# of Wounds		Soldier is KIA		Soldier is POW	
	(Logit)		(Negative Binomial)		(Logit)		(Logit)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Middle	−0.081	0.003	−0.056	−0.016	0.191**	0.158*	0.159	0.165
	(0.066)	(0.077)	(0.043)	(0.050)	(0.061)	(0.072)	(0.108)	(0.126)
Far Away	−0.181*	−0.208*	−0.061	−0.064	0.070	0.122	0.147	0.182
	(0.071)	(0.087)	(0.045)	(0.054)	(0.064)	(0.078)	(0.112)	(0.138)
Nazi Vote Share	−0.000	−0.005	−0.002	−0.004	−0.011***	−0.009**	0.005	0.003
	(0.003)	(0.004)	(0.002)	(0.003)	(0.003)	(0.004)	(0.005)	(0.006)
Soldier from Urban Area	0.119	0.114	0.092	0.092	−0.093	−0.079	0.154	0.131
	(0.081)	(0.097)	(0.052)	(0.063)	(0.078)	(0.094)	(0.127)	(0.154)
Age When Joining Army (Relative to 18)	−0.050***	−0.071***	−0.042***	−0.058***	−0.059***	−0.045***	−0.042***	−0.062***
	(0.006)	(0.008)	(0.003)	(0.005)	(0.005)	(0.007)	(0.009)	(0.013)
Catholic		0.011		−0.010		−0.083		−0.140
		(0.068)		(0.044)		(0.062)		(0.108)
Class		−0.096		−0.094**		−0.106*		0.176*
		(0.049)		(0.031)		(0.045)		(0.074)
Wounded						0.226**		0.231
						(0.084)		(0.150)
Married		0.329***		0.241***		−0.176*		0.361*
		(0.082)		(0.054)		(0.079)		(0.142)
Height (compared to avg soldier)		0.028		−0.385		−0.435		−0.640
		(0.634)		(0.406)		(0.580)		(1.023)
Weight (compared to avg soldier)		−0.000		0.005		0.002		−0.003
		(0.005)		(0.003)		(0.005)		(0.008)
(Intercept)	−1.467***	−1.330***	−0.213**	−0.064	−1.296***	−1.078***	−3.414***	−3.805***
	(0.099)	(0.157)	(0.065)	(0.102)	(0.093)	(0.146)	(0.183)	(0.275)
Enlistment Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Likelihood-ratio	463.026	372.697	801.354	650.287	364.537	247.803	44.488	45.853
Log-likelihood	−4522.026	−3353.091	−12008.482	−8870.926	−5365.837	−3915.550	−2307.317	−1668.743
Deviance	9044.053	6706.182	9482.061	6967.821	10731.675	7831.099	4614.633	3337.486
AIC	9076.053	6748.182	24050.964	17785.852	10763.675	7875.099	4646.633	3381.486
BIC	9196.372	6899.738	24178.804	17944.624	10883.994	8033.871	4766.953	3540.259
# of Soldiers	13629	10066	13629	10066	13629	10066	13629	10066

Standard errors in parentheses
$^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

3 Analysis with Division & Company Controls

One possible confounder with our analysis is that soldiers are not exposed to combat uniformly. Soldiers who are assigned to be Military Police face different circumstances than soldiers who are in Panzer Divisions. To account for these differences, in this section we control for both division and company fixed effects. We gather information about what companies soldiers were first assigned to from Rass and Rohrkamp's dataset. Unfortunately this information is unavailable for a large number of soldiers. We then match the companies of the soldiers to the divisions they were located within. These serve as the basis for our division and company fixed effects.

The tables below show our results from our models run with division and company fixed effects. Our main findings, that decorations decrease and punishments increase with distance from radio towers, hold across multiple specifications under both division and company fixed effects. This provides further evidence that our finding is robust.

3.1 Division Fixed Effects

Table 10: Radio Tower Distance and Soldier Decorations – Division Fixed Effects

	Dependent variable:					
	Soldier is Decorated (Logit)		High Decoration (Logit)		# of Decorations (Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (km)	−0.002**	−0.002*	−0.003**	−0.003**	−0.001**	−0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Nazi Vote Share	−0.003	−0.005	0.004	0.003	0.001	0.000
	(0.003)	(0.004)	(0.004)	(0.004)	(0.002)	(0.002)
Soldier from Urban Area	−0.043	−0.150	−0.091	−0.227	−0.040	−0.104
	(0.085)	(0.106)	(0.096)	(0.122)	(0.047)	(0.054)
Age When Joining Army (Relative to 18)	−0.047***	−0.060***	−0.075***	−0.085***	−0.040***	−0.045***
	(0.007)	(0.010)	(0.008)	(0.012)	(0.004)	(0.005)
Catholic		−0.179**		−0.047		−0.084*
		(0.068)		(0.076)		(0.034)
Class		0.041		−0.002		0.011
		(0.048)		(0.056)		(0.025)
Wounded		1.726***		1.213***		0.735***
		(0.113)		(0.089)		(0.039)
Married		0.165		0.148		0.082*
		(0.087)		(0.095)		(0.042)
Height (compared to avg soldier)		−2.558***		−1.425		−1.580***
		(0.664)		(0.754)		(0.340)
Weight (compared to avg soldier)		0.016**		0.007		0.008**
		(0.006)		(0.006)		(0.003)
(Intercept)	1.366***	1.072***	0.137	−0.024	0.957***	0.729***
	(0.194)	(0.259)	(0.205)	(0.275)	(0.106)	(0.128)
Division Fixed Effects	✓	✓	✓	✓	✓	✓
Enlistment Year Fixed Effects	✓	✓	✓	✓	✓	✓
Likelihood-ratio	794.173	915.540	600.822	664.972	1280.384	1451.146
Log-likelihood	−3780.493	−2649.315	−3126.798	−2183.092	−8988.336	−6453.897
Deviance	7560.987	5298.630	6253.596	4366.184	6473.681	4905.675
AIC	7628.987	5378.630	6321.596	4446.184	18046.672	12989.793
BIC	7857.064	5635.121	6549.673	4702.675	18281.457	13252.696
# of Soldiers	6052	4502	6052	4502	6052	4502

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11: Radio Tower Distance and Soldier Punishment – Division Fixed Effects

	Dependent variable:					
	Soldier is Punished		Severe Punishment		# of Punishments	
	(Logit)		(Logit)		(Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (km)	0.003**	0.003*	−0.002	0.002	0.005***	0.004**
	(0.001)	(0.001)	(0.004)	(0.005)	(0.001)	(0.001)
Nazi Vote Share	0.003	0.004	−0.001	−0.009	0.002	0.006
	(0.004)	(0.005)	(0.015)	(0.017)	(0.004)	(0.005)
Soldier from Urban Area	0.407***	0.382**	0.478	0.768*	0.379***	0.245
	(0.099)	(0.119)	(0.329)	(0.357)	(0.108)	(0.128)
Age When Joining Army (Relative to 18)	−0.069***	−0.084***	−0.065	−0.075	−0.083***	−0.102***
	(0.010)	(0.013)	(0.041)	(0.054)	(0.010)	(0.014)
Catholic		−0.065		−0.007		−0.049
		(0.083)		(0.291)		(0.085)
Class		−0.184**		−0.079		−0.248***
		(0.063)		(0.215)		(0.065)
Wounded		0.577***		0.310		0.484***
		(0.099)		(0.344)		(0.105)
Married		0.319**		−0.121		0.355***
		(0.104)		(0.352)		(0.107)
Height (compared to avg soldier)		−0.739		0.457		−1.039
		(0.816)		(2.812)		(0.838)
Weight (compared to avg soldier)		0.001		0.024		0.011
		(0.007)		(0.023)		(0.007)
(Intercept)	−1.311***	−1.286***	−2.568***	−2.892**	−1.175***	−0.845*
	(0.243)	(0.322)	(0.693)	(1.017)	(0.264)	(0.333)
Division Fixed Effects	✓	✓	✓	✓	✓	✓
Enlistment Year Fixed Effects	✓	✓	✓	✓	✓	✓
Likelihood-ratio	204.281	221.972	49.906	48.414	216.020	236.747
Log-likelihood	−2639.625	−1958.227	−334.391	−255.006	−3931.714	−2930.051
Deviance	5279.251	3916.455	668.782	510.012	2818.035	2158.983
AIC	5347.251	3996.455	736.782	590.012	7933.427	5942.101
BIC	5575.328	4252.946	964.858	846.504	8168.212	6205.004
# of Soldiers	6052	4502	6052	4502	6052	4502

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 12: Radio Tower Distance and Other Factors – Division Fixed Effects

	Dependent variable:							
	Soldier is Wounded		# of Wounds		Soldier is KIA		Soldier is POW	
	(Logit)		(Negative Binomial)		(Logit)		(Logit)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance from Closest Radio Tower (km)	−0.001	−0.000	0.000	0.000	0.001	0.001	0.002	0.004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)
Nazi Vote Share	0.003	−0.001	−0.001	−0.003	−0.007	−0.006	−0.008	−0.015
	(0.004)	(0.005)	(0.002)	(0.003)	(0.004)	(0.005)	(0.008)	(0.010)
Soldier from Urban Area	0.154	0.162	0.134*	0.125	0.063	0.064	0.474*	0.556*
	(0.103)	(0.125)	(0.061)	(0.074)	(0.104)	(0.127)	(0.190)	(0.219)
Age When Joining Army (Relative to 18)	−0.040***	−0.079***	−0.032***	−0.055***	−0.039***	−0.018	−0.051**	−0.082**
	(0.009)	(0.013)	(0.005)	(0.007)	(0.009)	(0.012)	(0.019)	(0.026)
Catholic		−0.014		−0.009		−0.185*		−0.264
		(0.084)		(0.049)		(0.083)		(0.170)
Class		−0.166**		−0.107**		−0.181**		0.284*
		(0.063)		(0.036)		(0.063)		(0.117)
Wounded						−0.180		0.424*
						(0.109)		(0.197)
Married		0.396***		0.279***		−0.261*		0.650**
		(0.105)		(0.061)		(0.107)		(0.208)
Height (compared to avg soldier)		1.125		0.134		0.232		−1.017
		(0.823)		(0.479)		(0.812)		(1.665)
Weight (compared to avg soldier)		−0.002		0.003		0.000		−0.022
		(0.007)		(0.004)		(0.007)		(0.015)
(Intercept)	−1.023***	−0.631*	0.056	0.297	−0.903***	−0.376	−3.325***	−3.875***
	(0.227)	(0.293)	(0.137)	(0.175)	(0.223)	(0.294)	(0.478)	(0.606)
Division Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Enlistment Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Likelihood-ratio	273.686	259.154	440.828	404.231	294.242	257.807	48.051	75.796
Log-likelihood	−2631.925	−1906.343	−6735.419	−4935.977	−2671.565	−1946.573	−888.106	−643.229
Deviance	5263.851	3812.686	5325.406	3924.210	5343.131	3893.147	1776.212	1286.458
AIC	5331.851	3890.686	13540.839	9951.955	5411.131	3973.147	1844.212	1366.458
BIC	5559.928	4140.765	13775.624	10208.446	5639.207	4229.638	2072.289	1622.949
# of Soldiers	6052	4502	6052	4502	6052	4502	6052	4502

Standard errors in parentheses
$^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

3.2 Company Fixed Effects

Table 13: Radio Tower Distance and Soldier Decorations – Company Fixed Effects

	Dependent variable:					
	Soldier is Decorated		High Decoration		# of Decorations	
	(Logit)		(Logit)		(Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (km)	−0.003***	−0.003**	−0.003**	−0.004***	−0.002***	−0.001**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Nazi Vote Share	−0.004	−0.007	0.004	0.003	0.000	−0.001
	(0.003)	(0.004)	(0.004)	(0.004)	(0.002)	(0.002)
Soldier from Urban Area	−0.005	−0.119	−0.102	−0.251*	−0.023	−0.099
	(0.081)	(0.102)	(0.095)	(0.120)	(0.045)	(0.052)
Age When Joining Army (Relative to 18)	−0.044***	−0.057***	−0.080***	−0.088***	−0.038***	−0.045***
	(0.006)	(0.009)	(0.008)	(0.012)	(0.004)	(0.005)
Catholic		−0.141*		−0.038		−0.074*
		(0.065)		(0.075)		(0.033)
Class		0.012		−0.006		0.003
		(0.046)		(0.055)		(0.024)
Wounded		1.667***		1.147***		0.696***
		(0.108)		(0.088)		(0.038)
Married		0.190*		0.143		0.094*
		(0.082)		(0.093)		(0.040)
Height (compared to avg soldier)		−2.011**		−1.125		−1.275***
		(0.629)		(0.739)		(0.324)
Weight (compared to avg soldier)		0.012*		0.007		0.007**
		(0.005)		(0.006)		(0.003)
(Intercept)	1.520***	1.273***	0.241	0.070	1.030***	0.836***
	(0.192)	(0.255)	(0.205)	(0.273)	(0.103)	(0.126)
Company Fixed Effects	✓	✓	✓	✓	✓	✓
Enlistment Year Fixed Effects	✓	✓	✓	✓	✓	✓
Likelihood-ratio	1055.359	1132.896	947.571	915.960	1715.975	1814.589
Log-likelihood	−4215.189	−2943.916	−3290.289	−2284.312	−9951.420	−7107.614
Deviance	8430.378	5887.833	6580.579	4568.624	7285.445	5454.989
AIC	8580.378	6047.833	6730.579	4728.624	20054.840	14377.228
BIC	9092.855	6570.384	7243.056	5251.174	20574.149	14906.311
# of Soldiers	6857	5074	6857	5074	6857	5074

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 14: Radio Tower Distance and Soldier Punishment – Company Fixed Effects

	Dependent variable:					
	Soldier is Punished		Severe Punishment		# of Punishments	
	(Logit)		(Logit)		(Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (km)	0.003*	0.003*	−0.002	0.001	0.005***	0.004**
	(0.001)	(0.001)	(0.004)	(0.004)	(0.001)	(0.001)
Nazi Vote Share	0.001	0.001	−0.009	−0.014	−0.001	0.002
	(0.004)	(0.005)	(0.014)	(0.016)	(0.004)	(0.005)
Soldier from Urban Area	0.375***	0.294*	0.659*	0.730*	0.357***	0.138
	(0.096)	(0.116)	(0.304)	(0.351)	(0.103)	(0.123)
Age When Joining Army (Relative to 18)	−0.066***	−0.080***	−0.041	−0.043	−0.075***	−0.089***
	(0.009)	(0.012)	(0.036)	(0.046)	(0.009)	(0.013)
Catholic		−0.015		0.105		−0.060
		(0.079)		(0.279)		(0.081)
Class		−0.196**		0.137		−0.252***
		(0.061)		(0.194)		(0.062)
Wounded		0.621***		0.658*		0.573***
		(0.096)		(0.318)		(0.101)
Married		0.270**		−0.134		0.265**
		(0.098)		(0.325)		(0.100)
Height (compared to avg soldier)		−0.689		−0.037		−0.622
		(0.777)		(2.648)		(0.791)
Weight (compared to avg soldier)		−0.002		0.021		0.007
		(0.007)		(0.022)		(0.007)
(Intercept)	−1.136***	−1.141***	−2.228***	−3.295**	−1.053***	−0.743*
	(0.238)	(0.316)	(0.674)	(1.005)	(0.258)	(0.324)
Company Fixed Effects	✓	✓	✓	✓	✓	✓
Enlistment Year Fixed Effects	✓	✓	✓	✓	✓	✓
Likelihood-ratio	281.661	292.343	101.197	86.391	305.279	327.418
Log-likelihood	−2955.364	−2178.722	−358.144	−269.347	−4403.622	−3257.791
Deviance	5910.729	4357.444	716.288	538.694	3185.021	2428.143
AIC	6060.729	4517.444	866.288	698.694	8959.245	6677.582
BIC	6573.206	5039.995	1378.765	1221.244	9478.555	7206.665
# of Soldiers	6857	5074	6857	5074	6857	5074

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 15: Radio Tower Distance and Other Factors – Company Fixed Effects

	Dependent variable:							
	Soldier is Wounded		# of Wounds		Soldier is KIA		Soldier is POW	
	(Logit)		(Negative Binomial)		(Logit)		(Logit)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance from Closest Radio Tower (km)	−0.001	−0.001	0.000	0.000	0.000	0.001	0.002	0.004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Nazi Vote Share	0.003	−0.000	−0.001	−0.002	−0.004	−0.004	−0.008	−0.015
	(0.004)	(0.005)	(0.002)	(0.003)	(0.004)	(0.005)	(0.008)	(0.009)
Soldier from Urban Area	0.142	0.174	0.135*	0.137	0.043	0.039	0.412*	0.427*
	(0.101)	(0.123)	(0.059)	(0.071)	(0.103)	(0.125)	(0.178)	(0.209)
Age When Joining Army (Relative to 18)	−0.035***	−0.074***	−0.027***	−0.048***	−0.044***	−0.028*	−0.041**	−0.073***
	(0.009)	(0.013)	(0.005)	(0.007)	(0.009)	(0.012)	(0.016)	(0.022)
Catholic		0.008		0.010		−0.177*		−0.175
		(0.082)		(0.047)		(0.081)		(0.155)
Class		−0.153*		−0.102**		−0.167**		0.281**
		(0.061)		(0.035)		(0.061)		(0.105)
Wounded						−0.239*		0.405*
						(0.108)		(0.191)
Married		0.374***		0.240***		−0.228*		0.576**
		(0.102)		(0.059)		(0.104)		(0.188)
Height (compared to avg soldier)		0.972		0.114		−0.244		−1.378
		(0.804)		(0.461)		(0.788)		(1.503)
Weight (compared to avg soldier)		−0.000		0.005		0.002		−0.011
		(0.007)		(0.004)		(0.007)		(0.013)
(Intercept)	−0.923***	−0.548	0.091	0.326	−0.991***	−0.439	−3.210***	−3.847***
	(0.226)	(0.291)	(0.134)	(0.171)	(0.222)	(0.292)	(0.459)	(0.573)
Company Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Enlistment Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Likelihood-ratio	454.147	399.326	707.911	612.507	501.662	404.264	111.202	139.464
Log-likelihood	−2802.425	−2028.168	−7295.986	−5331.048	−2861.362	−2076.489	−1037.249	−753.732
Deviance	5604.851	4056.337	5883.634	4319.201	5722.725	4152.979	2074.497	1507.465
AIC	5754.851	4214.337	14743.971	10822.095	5872.725	4312.979	2224.497	1667.465
BIC	6267.327	4730.355	15263.281	11344.646	6385.202	4835.529	2736.974	2190.015
# of Soldiers	6857	5074	6857	5074	6857	5074	6857	5074

Standard errors in parentheses
$^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4 Geographically Limited Sample

One possible concern with our analysis is the geographic location of soldiers we use to conduct our analysis. Two issues might cause a problem with our analysis. First, soldiers who are farther than 200 km away from radio towers might reside outside of German borders such as France or Austria. These soldiers might not be exposed to the same level of propaganda as soldiers who are 200 km away from a radio tower but still reside within the German borders. To address this concern, we rerun our analysis but only including soldiers that were born within the traditional German borders. We present the results for punishments, decorations, and other factors in Tables 17, 16, 18 respectively. As all of these tables show, our results hold for this restricted sample.

The second concern is that, due to Rass' ability to collect Nazi soldier documents, that our sample is mostly capturing Nordrhein-Westfalen and little else. Since this is where most of our sample is, do our results hold when only looking at this state in particular? Therefore we rerun our analysis but only using soldiers who were born within Nordrhein-Westfalen. We present the results for punishments, decorations, and other factors in Tables 20, 19, 21 respectively. As all of these tables show, our results mainly hold for this restricted sample as well.

These analyses help alleviate the concern that our results are merely a byproduct of geographic location.

4.1 Germany

Table 16: Radio Tower Distance and Soldier Decorations: Mainland Germany Only

	Dependent variable:					
	Soldier is Decorated		High Decoration		# of Decorations	
	(Logit)		(Logit)		(Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (km)	−0.004***	−0.003***	−0.004***	−0.004***	−0.003***	−0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Nazi Vote Share	−0.002	−0.005	0.004	0.003	0.002	0.000
	(0.002)	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)
Soldier from Urban Area	−0.077	−0.154*	−0.093	−0.208*	−0.071	−0.125*
	(0.058)	(0.073)	(0.076)	(0.097)	(0.042)	(0.049)
Age When Joining Army (Relative to 18)	−0.073***	−0.078***	−0.118***	−0.124***	−0.067***	−0.071***
	(0.004)	(0.006)	(0.006)	(0.009)	(0.003)	(0.004)
Catholic		−0.194***		−0.104		−0.150***
		(0.049)		(0.063)		(0.032)
Class		−0.013		−0.033		−0.007
		(0.034)		(0.046)		(0.023)
Wounded		1.749***		1.503***		0.957***
		(0.080)		(0.073)		(0.040)
Married		0.091		0.039		0.063
		(0.061)		(0.078)		(0.040)
Height (compared to avg soldier)		−2.257***		−1.744**		−1.701***
		(0.459)		(0.605)		(0.307)
Weight (compared to avg soldier)		0.012**		0.014**		0.011***
		(0.004)		(0.005)		(0.003)
Enlistment Year: 1936	−0.153	−0.199*	−0.135	−0.219*	−0.074	−0.148*
	(0.080)	(0.097)	(0.090)	(0.111)	(0.053)	(0.058)
Enlistment Year: 1937	−0.314***	−0.364***	−0.050	−0.118	−0.117*	−0.188**
	(0.083)	(0.101)	(0.095)	(0.117)	(0.056)	(0.062)
Enlistment Year: 1938	−0.382***	−0.367***	−0.139	−0.167	−0.198***	−0.216***
	(0.077)	(0.092)	(0.088)	(0.107)	(0.052)	(0.057)
Enlistment Year: 1939	−0.511***	−0.531***	−0.241**	−0.268**	−0.321***	−0.334***
	(0.073)	(0.088)	(0.085)	(0.103)	(0.050)	(0.054)
Enlistment Year: 1940	−0.921***	−0.884***	−0.810***	−0.821***	−0.702***	−0.675***
	(0.074)	(0.090)	(0.091)	(0.112)	(0.051)	(0.057)
Enlistment Year: 1941	−1.482***	−1.429***	−1.356***	−1.248***	−1.183***	−1.143***
	(0.101)	(0.123)	(0.135)	(0.160)	(0.075)	(0.085)
Enlistment Year: 1942	−2.726***	−2.544***	−2.615***	−2.333***	−2.399***	−2.199***
	(0.099)	(0.120)	(0.149)	(0.176)	(0.078)	(0.090)
Enlistment Year: 1943	−3.784***	−3.770***	−4.832***	−4.634***	−3.414***	−3.693***
	(0.196)	(0.251)	(0.582)	(0.713)	(0.163)	(0.237)
Enlistment Year: 1944	−3.187***	−3.831***	−2.487***	−4.042***	−2.269***	−3.228***
	(0.252)	(0.461)	(0.330)	(1.007)	(0.167)	(0.343)
Enlistment Year: 1945	−12.901	−12.689	−12.586	−11.276	−19.638	−22.465
	(103.222)	(140.872)	(169.997)	(140.274)	(3026.663)	(18391.542)
(Intercept)	1.020***	0.934***	−0.421***	−0.560***	0.821***	0.672***
	(0.084)	(0.125)	(0.099)	(0.154)	(0.057)	(0.080)
Likelihood-ratio	2289.637	2291.468	1295.547	1377.657	2860.129	3051.098
Log-likelihood	−7755.912	−5421.184	−5170.831	−3531.584	−15744.913	−11200.327
Deviance	15511.824	10842.369	10341.661	7063.168	11509.861	8581.956
AIC	15541.824	10884.369	10371.661	7105.168	31521.825	22444.653
BIC	15654.384	11035.566	10484.221	7256.366	31641.889	22603.051
# of Soldiers	13413	9896	13413	9896	13413	9896

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 17: Radio Tower Distance and Soldier Punishment: Mainland Germany Only

	Dependent variable:					
	Soldier is Punished		Severe Punishment		# of Punishments	
	(Logit)		(Logit)		(Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (km)	0.002**	0.003**	0.003	0.006	0.003***	0.003***
	(0.001)	(0.001)	(0.003)	(0.003)	(0.001)	(0.001)
Nazi Vote Share	0.005	0.006	−0.003	−0.004	0.004	0.006
	(0.003)	(0.003)	(0.010)	(0.012)	(0.003)	(0.004)
Soldier from Urban Area	0.232**	0.238**	−0.010	0.000	0.220**	0.137
	(0.072)	(0.087)	(0.255)	(0.301)	(0.078)	(0.093)
Age When Joining Army (Relative to 18)	−0.089***	−0.098***	−0.070***	−0.056*	−0.094***	−0.098***
	(0.006)	(0.008)	(0.020)	(0.027)	(0.006)	(0.008)
Catholic		−0.069		−0.303		−0.056
		(0.061)		(0.205)		(0.064)
Class		−0.202***		0.101		−0.271***
		(0.046)		(0.139)		(0.048)
Wounded		0.528***		0.304		0.500***
		(0.078)		(0.258)		(0.086)
Married		0.211**		−0.429		0.146
		(0.077)		(0.257)		(0.081)
Height (compared to avg soldier)		−1.133		0.097		−1.150
		(0.585)		(1.930)		(0.609)
Weight (compared to avg soldier)		−0.003		−0.004		0.003
		(0.005)		(0.016)		(0.005)
Enlistment Year: 1936	−0.264**	−0.228*	−0.629*	−0.374	−0.153	−0.163
	(0.092)	(0.107)	(0.292)	(0.323)	(0.103)	(0.116)
Enlistment Year: 1937	−0.339***	−0.338**	−0.326	−0.316	−0.277*	−0.345**
	(0.099)	(0.117)	(0.283)	(0.338)	(0.110)	(0.126)
Enlistment Year: 1938	−0.480***	−0.458***	−1.109***	−0.877*	−0.416***	−0.471***
	(0.092)	(0.108)	(0.327)	(0.356)	(0.102)	(0.116)
Enlistment Year: 1939	−0.602***	−0.524***	−0.864**	−0.898**	−0.575***	−0.588***
	(0.089)	(0.103)	(0.282)	(0.330)	(0.098)	(0.111)
Enlistment Year: 1940	−0.792***	−0.718***	−0.921***	−0.931**	−0.830***	−0.756***
	(0.091)	(0.107)	(0.280)	(0.330)	(0.100)	(0.114)
Enlistment Year: 1941	−1.167***	−1.152***	−2.007***	−2.832**	−1.308***	−1.390***
	(0.131)	(0.156)	(0.604)	(1.023)	(0.142)	(0.167)
Enlistment Year: 1942	−1.655***	−1.511***	−1.613***	−1.660***	−1.710***	−1.624***
	(0.113)	(0.134)	(0.364)	(0.440)	(0.117)	(0.137)
Enlistment Year: 1943	−2.237***	−1.973***	−3.152**	−16.225	−2.450***	−2.342***
	(0.188)	(0.208)	(1.017)	(485.875)	(0.189)	(0.217)
Enlistment Year: 1944	−3.009***	−3.578***	−15.089	−16.121	−2.971***	−3.531***
	(0.419)	(0.717)	(390.454)	(804.122)	(0.360)	(0.595)
Enlistment Year: 1945	−12.840	−11.717	−15.144	−16.252	−19.820	−19.670
	(171.708)	(139.324)	(2142.521)	(4788.032)	(4536.605)	(6100.125)
(Intercept)	−1.073***	−0.831***	−3.598***	−3.860***	−0.690***	−0.257
	(0.102)	(0.153)	(0.323)	(0.485)	(0.112)	(0.161)
Likelihood-ratio	688.089	624.198	67.497	64.824	735.398	675.671
Log-likelihood	−5215.391	−3844.223	−757.869	−562.914	−7699.059	−5710.871
Deviance	10430.782	7688.446	1515.738	1125.828	5585.969	4212.804
AIC	10460.782	7730.446	1545.738	1167.828	15430.117	11465.743
BIC	10573.341	7881.644	1658.298	1319.026	15550.181	11624.140
# of Soldiers	13413	9896	13413	9896	13413	9896

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 18: Radio Tower Distance and Other Factors: Mainland Germany Only

	Dependent variable:							
	Soldier is Wounded		# of Wounds		Soldier is KIA		Soldier is POW	
	(Logit)		(Negative Binomial)		(Logit)		(Logit)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance from Closest Radio Tower (km)	−0.001	−0.001	−0.000	−0.000	0.001	0.001	0.003*	0.003+
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Nazi Vote Share	−0.001	−0.005	−0.003	−0.005	−0.010**	−0.009*	0.007	0.005
	(0.003)	(0.004)	(0.002)	(0.002)	(0.003)	(0.004)	(0.005)	(0.006)
Soldier from Urban Area	0.132	0.126	0.097	0.096	−0.089	−0.067	0.152	0.149
	(0.081)	(0.097)	(0.052)	(0.063)	(0.078)	(0.094)	(0.127)	(0.154)
Age When Joining Army (relative to 18)	−0.050***	−0.072***	−0.042***	−0.058***	−0.060***	−0.047***	−0.043***	−0.068***
	(0.006)	(0.008)	(0.003)	(0.005)	(0.005)	(0.008)	(0.009)	(0.014)
Catholic		−0.027		−0.027		−0.089		−0.149
		(0.068)		(0.043)		(0.062)		(0.108)
Class		−0.089		−0.090**		−0.106*		0.182*
		(0.049)		(0.031)		(0.045)		(0.075)
Married		0.308***		0.231***		−0.157		0.348*
		(0.083)		(0.055)		(0.081)		(0.145)
Height (compared to avg soldier)		−0.130		−0.494		−0.522		−0.791
		(0.642)		(0.411)		(0.590)		(1.037)
Weight (compared to avg soldier)		0.001		0.005		0.003		−0.002
		(0.005)		(0.003)		(0.005)		(0.009)
Wounded						0.227**		0.229
						(0.085)		(0.151)
Enlistment Year: 1936	0.072	0.032	−0.045	−0.072	0.093	0.098	0.321	0.323
	(0.106)	(0.126)	(0.072)	(0.085)	(0.102)	(0.120)	(0.197)	(0.232)
Enlistment Year: 1937	0.035	0.069	−0.054	−0.015	0.035	−0.027	0.059	0.012
	(0.112)	(0.133)	(0.075)	(0.089)	(0.108)	(0.129)	(0.219)	(0.264)
Enlistment Year: 1938	−0.104	0.029	−0.135	−0.011	0.049	−0.010	0.142	0.230
	(0.105)	(0.123)	(0.070)	(0.081)	(0.099)	(0.118)	(0.197)	(0.230)
Enlistment Year: 1939	−0.102	0.001	−0.089	−0.018	0.034	−0.044	0.321	0.451*
	(0.100)	(0.117)	(0.066)	(0.077)	(0.095)	(0.112)	(0.183)	(0.213)
Enlistment Year: 1940	−0.368***	−0.191	−0.341***	−0.196*	−0.122	−0.143	0.190	0.348
	(0.103)	(0.122)	(0.067)	(0.080)	(0.096)	(0.114)	(0.185)	(0.220)
Enlistment Year: 1941	−0.414**	−0.264	−0.359***	−0.261*	−0.181	−0.312*	0.454*	0.449
	(0.138)	(0.161)	(0.089)	(0.106)	(0.125)	(0.153)	(0.217)	(0.266)
Enlistment Year: 1942	−1.807***	−1.753***	−1.364***	−1.297***	−0.846***	−0.854***	0.176	0.167
	(0.161)	(0.194)	(0.085)	(0.102)	(0.114)	(0.139)	(0.193)	(0.237)
Enlistment Year: 1943	−3.048***	−3.007***	−2.349***	−2.382***	−1.715***	−1.565***	0.221	0.220
	(0.388)	(0.459)	(0.159)	(0.195)	(0.201)	(0.228)	(0.231)	(0.284)
Enlistment Year: 1944	−2.366***	−2.762***	−1.730***	−2.105***	−2.329***	−1.996***	−0.157	−0.435
	(0.458)	(0.718)	(0.197)	(0.296)	(0.420)	(0.464)	(0.371)	(0.539)
Enlistment Year: 1945	−11.926	−11.073	−18.955	−19.072	−12.054	−11.201	1.050	1.999
	(175.849)	(162.320)	(3084.109)	(4709.012)	(175.247)	(162.308)	(1.079)	(1.172)
(Intercept)	−1.423***	−1.284***	−0.208**	−0.072	−1.281***	−1.113***	−3.542***	−3.955***
	(0.115)	(0.169)	(0.075)	(0.110)	(0.107)	(0.158)	(0.207)	(0.297)
Likelihood-ratio	453.773	359.574	791.059	634.147	346.860	232.835	45.309	51.477
Log-likelihood	−4447.144	−3278.620	−11810.837	−8675.486	−5273.173	−3813.876	−2282.094	−1627.980
Deviance	8894.289	6557.241	9325.656	6818.218	10546.347	7627.753	4564.188	3255.960
AIC	8924.289	6597.241	23653.673	17392.973	10576.347	7669.753	4594.188	3297.960
BIC	9036.849	6741.119	23773.737	17544.045	10688.907	7820.825	4706.747	3449.032
# of Soldiers	13413	9837	13413	9837	13413	9837	13413	9837

Standard errors in parentheses
+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4.2 Nordrhein-Westfalen

Table 19: Radio Tower Distance and Soldier Decorations: Nordrhein-Westfalen Only

	Dependent variable:					
	Soldier is Decorated		High Decoration		# of Decorations	
	(Logit)		(Logit)		(Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (km)	−0.004***	−0.004***	−0.005***	−0.005***	−0.003***	−0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Nazi Vote Share	−0.001	−0.003	0.007*	0.008	0.004	0.002
	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)
Soldier from Urban Area	−0.044	−0.145	−0.074	−0.247*	−0.062	−0.138**
	(0.061)	(0.076)	(0.079)	(0.101)	(0.044)	(0.051)
Age When Joining Army (Relative to 18)	−0.074***	−0.080***	−0.114***	−0.121***	−0.068***	−0.072***
	(0.004)	(0.006)	(0.007)	(0.010)	(0.003)	(0.004)
Catholic		−0.190***		−0.063		−0.144***
		(0.053)		(0.068)		(0.035)
Class		0.010		−0.008		0.016
		(0.038)		(0.050)		(0.025)
Wounded		1.683***		1.515***		0.946***
		(0.085)		(0.078)		(0.042)
Married		0.102		0.064		0.067
		(0.067)		(0.084)		(0.043)
Height (compared to avg soldier)		−2.337***		−1.575*		−1.697***
		(0.497)		(0.650)		(0.331)
Weight (compared to avg soldier)		0.012**		0.012*		0.010***
		(0.004)		(0.005)		(0.003)
Enlistment Year: 1936	−0.127	−0.174	−0.097	−0.171	−0.042	−0.132*
	(0.086)	(0.104)	(0.097)	(0.119)	(0.057)	(0.063)
Enlistment Year: 1937	−0.252**	−0.304**	−0.026	−0.113	−0.098	−0.185**
	(0.091)	(0.110)	(0.103)	(0.127)	(0.061)	(0.067)
Enlistment Year: 1938	−0.385***	−0.389***	−0.121	−0.184	−0.185***	−0.225***
	(0.083)	(0.100)	(0.095)	(0.116)	(0.056)	(0.061)
Enlistment Year: 1939	−0.492***	−0.531***	−0.221*	−0.281*	−0.288***	−0.328***
	(0.079)	(0.094)	(0.092)	(0.111)	(0.054)	(0.058)
Enlistment Year: 1940	−0.932***	−0.910***	−0.824***	−0.864***	−0.706***	−0.700***
	(0.080)	(0.097)	(0.098)	(0.121)	(0.056)	(0.062)
Enlistment Year: 1941	−1.515***	−1.495***	−1.318***	−1.258***	−1.191***	−1.149***
	(0.109)	(0.133)	(0.145)	(0.171)	(0.081)	(0.091)
Enlistment Year: 1942	−2.734***	−2.539***	−2.581***	−2.319***	−2.415***	−2.194***
	(0.108)	(0.129)	(0.160)	(0.190)	(0.085)	(0.097)
Enlistment Year: 1943	−3.955***	−3.983***	−4.664***	−4.492***	−3.573***	−3.868***
	(0.226)	(0.293)	(0.583)	(0.714)	(0.188)	(0.275)
Enlistment Year: 1944	−3.523***	−4.603***	−2.807***	−3.853***	−2.672***	−3.475***
	(0.316)	(0.717)	(0.421)	(1.008)	(0.215)	(0.419)
Enlistment Year: 1945	−12.890	−12.708	−12.545	−12.252	−19.623	−22.470
	(102.791)	(140.725)	(170.176)	(231.657)	(3022.590)	(18421.042)
(Intercept)	1.053***	0.938***	−0.407***	−0.580***	0.827***	0.658***
	(0.092)	(0.135)	(0.107)	(0.167)	(0.062)	(0.086)
Likelihood-ratio	2005.249	1974.552	1089.406	1188.600	2513.374	2619.669
Log-likelihood	−6563.196	−4619.803	−4414.990	−3042.531	−13353.106	−9607.124
Deviance	13126.392	9239.606	8829.979	6085.062	9752.164	7332.586
AIC	13156.392	9281.606	8859.979	6127.062	26738.213	19258.247
BIC	13266.519	9429.444	8970.106	6274.900	26855.682	19413.125
# of Soldiers	11405	8433	11405	8433	11405	8433

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 20: Radio Tower Distance and Soldier Punishment: Nordrhein-Westfalen Only

	Dependent variable:					
	Soldier is Punished		Severe Punishment		# of Punishments	
	(Logit)		(Logit)		(Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (km)	0.003**	0.003**	0.006*	0.008*	0.004***	0.004***
	(0.001)	(0.001)	(0.003)	(0.004)	(0.001)	(0.001)
Nazi Vote Share	0.008*	0.011**	0.003	0.008	0.008*	0.011**
	(0.003)	(0.004)	(0.011)	(0.013)	(0.003)	(0.004)
Soldier from Urban Area	0.239**	0.235**	0.135	0.146	0.258**	0.168
	(0.075)	(0.090)	(0.261)	(0.307)	(0.081)	(0.096)
Age When Joining Army (Relative to 18)	−0.092***	−0.099***	−0.065**	−0.061*	−0.100***	−0.104***
	(0.006)	(0.009)	(0.023)	(0.030)	(0.006)	(0.009)
Catholic		−0.093		−0.260		−0.117
		(0.066)		(0.229)		(0.069)
Class		−0.195***		0.187		−0.251***
		(0.050)		(0.154)		(0.052)
Wounded		0.509***		0.170		0.485***
		(0.084)		(0.297)		(0.091)
Married		0.177*		−0.402		0.091
		(0.083)		(0.281)		(0.087)
Height (compared to avg soldier)		−1.170		−1.008		−1.134
		(0.627)		(2.104)		(0.650)
Weight (compared to avg soldier)		−0.004		0.004		0.000
		(0.005)		(0.018)		(0.005)
Enlistment Year: 1936	−0.301**	−0.301**	−0.543	−0.259	−0.157	−0.211
	(0.099)	(0.116)	(0.306)	(0.340)	(0.109)	(0.124)
Enlistment Year: 1937	−0.326**	−0.377**	−0.585	−0.458	−0.201	−0.275*
	(0.106)	(0.126)	(0.335)	(0.388)	(0.117)	(0.134)
Enlistment Year: 1938	−0.509***	−0.490***	−1.229***	−0.982*	−0.401***	−0.447***
	(0.099)	(0.116)	(0.368)	(0.404)	(0.108)	(0.123)
Enlistment Year: 1939	−0.631***	−0.580***	−0.876**	−0.928*	−0.588***	−0.626***
	(0.096)	(0.111)	(0.307)	(0.364)	(0.105)	(0.118)
Enlistment Year: 1940	−0.762***	−0.705***	−1.121***	−0.966**	−0.779***	−0.703***
	(0.096)	(0.113)	(0.321)	(0.363)	(0.106)	(0.120)
Enlistment Year: 1941	−1.277***	−1.298***	−1.854**	−2.641*	−1.399***	−1.533***
	(0.143)	(0.171)	(0.609)	(1.028)	(0.153)	(0.180)
Enlistment Year: 1942	−1.650***	−1.517***	−1.532***	−1.603***	−1.689***	−1.627***
	(0.120)	(0.142)	(0.387)	(0.478)	(0.125)	(0.146)
Enlistment Year: 1943	−2.307***	−2.094***	−2.995**	−16.196	−2.583***	−2.588***
	(0.203)	(0.227)	(1.020)	(524.878)	(0.208)	(0.247)
Enlistment Year: 1944	−3.323***	−4.187***	−15.161	−16.189	−3.315***	−4.607***
	(0.510)	(1.008)	(426.889)	(886.984)	(0.437)	(1.020)
Enlistment Year: 1945	−12.873	−11.771	−15.267	−16.329	−19.832	−20.741
	(171.177)	(139.325)	(2141.771)	(4790.338)	(4447.344)	(9994.399)
(Intercept)	−1.102***	−0.840***	−4.064***	−4.479***	−0.805***	−0.393*
	(0.112)	(0.166)	(0.381)	(0.557)	(0.121)	(0.174)
Likelihood-ratio	611.415	547.263	56.402	55.264	672.361	627.125
Log-likelihood	−4498.344	−3323.950	−624.014	−465.960	−6673.640	−4947.006
Deviance	8996.689	6647.901	1248.028	931.920	4835.967	3649.645
AIC	9026.689	6689.901	1278.028	973.920	13379.279	9938.013
BIC	9136.816	6837.739	1388.155	1121.758	13496.748	10092.891
# of Soldiers	11405	8433	11405	8433	11405	8433

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 21: Radio Tower Distance and Other Factors: Nordrhein-Westfalen Only

	Dependent variable:							
	Soldier is Wounded		# of Wounds		Soldier is KIA		Soldier is POW	
	(Logit)		(Negative Binomial)		(Logit)		(Logit)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance from Closest Radio Tower (km)	−0.002*	−0.002*	−0.000	−0.000	0.000	0.001	0.003+	0.003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Nazi Vote Share	−0.001	−0.004	−0.003	−0.004	−0.011***	−0.012**	0.007	0.003
	(0.004)	(0.004)	(0.002)	(0.003)	(0.003)	(0.004)	(0.006)	(0.007)
Soldier from Urban Area	0.168*	0.163	0.120*	0.116	−0.093	−0.072	0.148	0.122
	(0.083)	(0.099)	(0.054)	(0.065)	(0.080)	(0.097)	(0.132)	(0.160)
Age When Joining Army (Relative to 18)	−0.050***	−0.069***	−0.044***	−0.058***	−0.056***	−0.043***	−0.052***	−0.076***
	(0.006)	(0.009)	(0.004)	(0.006)	(0.006)	(0.008)	(0.010)	(0.015)
Catholic		−0.031		−0.063		−0.100		−0.150
		(0.073)		(0.047)		(0.067)		(0.117)
Class		−0.092		−0.085*		−0.084		0.162
		(0.054)		(0.034)		(0.049)		(0.084)
Married		0.270**		0.182**		−0.164		0.411**
		(0.090)		(0.059)		(0.086)		(0.155)
Height (compared to avg soldier)		0.223		−0.547		−0.129		−1.118
		(0.686)		(0.440)		(0.630)		(1.107)
Weight (compared to avg soldier)		−0.002		0.004		0.001		0.003
		(0.006)		(0.004)		(0.005)		(0.009)
Wounded						0.209*		0.288
						(0.091)		(0.158)
Enlistment Year: 1936	0.144	0.098	0.015	−0.012	0.117	0.157	0.338	0.328
	(0.114)	(0.136)	(0.077)	(0.091)	(0.109)	(0.128)	(0.206)	(0.243)
Enlistment Year: 1937	0.077	0.134	−0.013	0.033	0.019	0.003	0.032	−0.031
	(0.123)	(0.144)	(0.082)	(0.096)	(0.118)	(0.138)	(0.233)	(0.282)
Enlistment Year: 1938	−0.059	0.121	−0.113	0.012	0.064	−0.025	0.102	0.183
	(0.114)	(0.132)	(0.075)	(0.088)	(0.107)	(0.126)	(0.209)	(0.245)
Enlistment Year: 1939	−0.055	0.061	−0.058	0.014	0.032	−0.064	0.311	0.445*
	(0.109)	(0.126)	(0.071)	(0.083)	(0.102)	(0.120)	(0.193)	(0.225)
Enlistment Year: 1940	−0.314**	−0.117	−0.305***	−0.173*	−0.142	−0.206	0.088	0.273
	(0.112)	(0.131)	(0.072)	(0.085)	(0.103)	(0.123)	(0.198)	(0.234)
Enlistment Year: 1941	−0.371*	−0.197	−0.346***	−0.238*	−0.088	−0.236	0.297	0.380
	(0.149)	(0.171)	(0.096)	(0.112)	(0.132)	(0.160)	(0.235)	(0.285)
Enlistment Year: 1942	−1.772***	−1.742***	−1.345***	−1.286***	−0.863***	−0.889***	0.064	0.172
	(0.175)	(0.212)	(0.092)	(0.111)	(0.124)	(0.151)	(0.206)	(0.252)
Enlistment Year: 1943	−2.865***	−2.830***	−2.343***	−2.366***	−1.676***	−1.565***	0.216	0.296
	(0.389)	(0.461)	(0.171)	(0.208)	(0.213)	(0.244)	(0.241)	(0.295)
Enlistment Year: 1944	−2.675***	−3.258**	−1.937***	−2.323***	−2.352***	−2.089***	−0.199	−0.293
	(0.588)	(1.009)	(0.232)	(0.352)	(0.460)	(0.517)	(0.394)	(0.544)
Enlistment Year: 1945	−11.871	−11.789	−18.932	−19.839	−12.041	−11.053	0.988	1.861
	(175.737)	(233.933)	(3075.744)	(6735.655)	(175.520)	(143.664)	(1.082)	(1.147)
(Intercept)	−1.403***	−1.218***	−0.220**	−0.044	−1.239***	−1.133***	−3.456***	−3.860***
	(0.125)	(0.182)	(0.082)	(0.118)	(0.115)	(0.170)	(0.222)	(0.320)
Likelihood-ratio	389.058	313.507	696.617	550.641	289.818	198.504	45.614	47.879
Log-likelihood	−3795.901	−2852.922	−10071.623	−7506.343	−4546.269	−3307.408	−1958.212	−1413.495
Deviance	7591.801	5705.844	7963.995	5889.356	9092.537	6614.816	3916.425	2826.989
AIC	7621.801	5745.844	20175.246	15054.687	9122.537	6656.816	3946.425	2868.989
BIC	7731.928	5886.642	20292.715	15202.525	9232.664	6804.654	4056.552	3016.827
# of Soldiers	11405	8433	11405	8433	11405	8433	11405	8433

Standard errors in parentheses
+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5 Radio Tower Clustered Standard Errors

Another concern regarding our analysis is that our analysis is misspecified due to soldiers being clustered in space. We try to account for some of the spatial variation by including geographic variables such as Nazi vote share, however this may not be enough. Therefore we rerun our analysis and cluster the standard errors by the closest radio tower to the soldiers. Tables 23, 23, and 23 present our results.

On the whole, the results are in line with our main findings. Decorations and distance to the closest radio tower remains significant across almost all specifications. Punishments fairs a little worse. The fully specified model of whether a soldier receives a severe punishment and whether a soldier receives any punishment at all remain significant. The other model specifications regarding punishment, however, do not.

Our placebo tests mostly mirror those of our main results. Distance from the closest radio tower is negatively correlated with wounds and positively correlated with a soldier being KIA. However, just as in our main findings, these results are highly dependent upon specification and often will drift out of levels of significance. Strikingly, our finding between distance from the closest radio tower and whether a soldier becomes a POW becomes much more significant.

Table 22: Radio Tower Distance and Soldier Decorations: Closest Radio Tower Clustered Standard Errors

	Dependent variable:					
	Soldier is Decorated		High Decoration		# of Decorations	
	(Logit)		(Logit)		(Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (km)	-0.004^{*}	-0.003^{*}	-0.004^{**}	-0.004^{***}	-0.003^{**}	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Nazi Vote Share	-0.002	-0.005	0.004	0.002	0.002	-0.000
	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
Soldier from Urban Area	-0.076	-0.149^{*}	-0.092^{*}	-0.203^{***}	-0.070	-0.120^{***}
	(0.087)	(0.075)	(0.046)	(0.041)	(0.044)	(0.027)
Age When Joining Army (Relative to 18)	-0.073^{***}	-0.078^{***}	-0.117^{***}	-0.123^{***}	-0.067^{***}	-0.071^{***}
	(0.007)	(0.004)	(0.009)	(0.010)	(0.006)	(0.004)
Catholic		-0.204^{**}		-0.109		-0.150^{***}
		(0.074)		(0.077)		(0.044)
Class		-0.012		-0.033		-0.003
		(0.034)		(0.025)		(0.019)
Wounded		1.769^{***}		1.479^{***}		0.957^{***}
		(0.109)		(0.068)		(0.068)
Married		0.093^{*}		0.035		0.064^{**}
		(0.041)		(0.036)		(0.023)
Height (compared to avg soldier)		-2.206^{***}		-1.788^{**}		-1.700^{***}
		(0.141)		(0.616)		(0.137)
Weight (compared to avg soldier)		0.011^{**}		0.014^{*}		0.011^{**}
		(0.004)		(0.006)		(0.003)
Enlistment Year: 1936	-0.158^{***}	-0.207^{***}	-0.140^{***}	-0.225^{***}	-0.076^{***}	-0.152^{***}
	(0.024)	(0.030)	(0.041)	(0.060)	(0.015)	(0.020)
Enlistment Year: 1937	-0.315^{***}	-0.364^{***}	-0.039	-0.109	-0.116^{***}	-0.189^{***}
	(0.042)	(0.037)	(0.049)	(0.061)	(0.028)	(0.031)
Enlistment Year: 1938	-0.378^{***}	-0.363^{***}	-0.136^{***}	-0.173^{***}	-0.194^{***}	-0.215^{***}
	(0.056)	(0.037)	(0.038)	(0.052)	(0.023)	(0.019)
Enlistment Year: 1939	-0.521^{***}	-0.543^{***}	-0.247^{***}	-0.276^{***}	-0.324^{***}	-0.340^{***}
	(0.052)	(0.026)	(0.047)	(0.047)	(0.024)	(0.018)
Enlistment Year: 1940	-0.933^{***}	-0.901^{***}	-0.823^{***}	-0.842^{***}	-0.706^{***}	-0.683^{***}
	(0.059)	(0.046)	(0.064)	(0.072)	(0.026)	(0.032)
Enlistment Year: 1941	-1.477^{***}	-1.428^{***}	-1.355^{***}	-1.244^{***}	-1.180^{***}	-1.139^{***}
	(0.059)	(0.062)	(0.070)	(0.081)	(0.027)	(0.027)
Enlistment Year: 1942	-2.707^{***}	-2.534^{***}	-2.625^{***}	-2.352^{***}	-2.386^{***}	-2.192^{***}
	(0.115)	(0.085)	(0.070)	(0.097)	(0.064)	(0.044)
Enlistment Year: 1943	-3.793^{***}	-3.780^{***}	-4.838^{***}	-4.649^{***}	-3.418^{***}	-3.697^{***}
	(0.213)	(0.266)	(0.316)	(0.585)	(0.214)	(0.292)
Enlistment Year: 1944	-3.141^{***}	-3.847^{***}	-2.496^{***}	-4.064^{***}	-2.252^{***}	-3.238^{***}
	(0.260)	(0.372)	(0.356)	(1.013)	(0.307)	(0.425)
Enlistment Year: 1945	-12.908^{***}	-12.700^{***}	-12.590^{***}	-11.291^{***}	-19.640^{***}	-22.470^{***}
	(0.737)	(0.782)	(0.745)	(0.748)	(0.746)	(0.753)
(Intercept)	1.003^{***}	0.915^{***}	-0.425^{***}	-0.544^{***}	0.814^{***}	0.658^{***}
	(0.038)	(0.101)	(0.039)	(0.082)	(0.024)	(0.051)
Likelihood-ratio	2308.471	2330.559	1317.813	1389.617	2887.525	3081.174
Log-likelihood	-7893.342	-5515.221	-5265.511	-3606.904	-16007.590	-11391.012
Deviance	15786.683	11030.441	10531.021	7213.809	11708.687	8736.796
AIC	15816.683	11072.441	10561.021	7255.809	32047.181	22826.025
BIC	15929.482	11223.996	10673.821	7407.364	32167.500	22984.797
# of Soldiers	13629	10066	13629	10066	13629	10066

Clustered standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 23: Radio Tower Distance and Soldier Punishment: Closest Radio Tower Clustered Standard Errors

	Dependent variable:					
	Soldier is Punished (Logit)		Severe Punishment (Logit)		# of Punishments (Negative Binomial)	
	(1)	(2)	(3)	(4)	(5)	(6)
Distance from Closest Radio Tower (km)	0.002	0.003*	0.003	0.006**	0.003	0.003
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Nazi Vote Share	0.005	0.006*	−0.003	−0.004	0.005	0.007
	(0.003)	(0.003)	(0.012)	(0.015)	(0.005)	(0.004)
Soldier from Urban Area	0.223***	0.227***	−0.012	0.011	0.214***	0.129***
	(0.065)	(0.031)	(0.220)	(0.374)	(0.053)	(0.031)
Age When Joining Army (Relative to 18)	−0.087***	−0.095***	−0.070***	−0.056*	−0.095***	−0.098***
	(0.008)	(0.013)	(0.014)	(0.025)	(0.009)	(0.014)
Catholic		−0.064		−0.267		−0.060
		(0.044)		(0.180)		(0.066)
Class		−0.210***		0.103*		−0.279***
		(0.026)		(0.049)		(0.029)
Wounded		0.537***		0.297*		0.507***
		(0.039)		(0.136)		(0.044)
Married		0.212***		−0.441**		0.145
		(0.064)		(0.139)		(0.089)
Height (compared to avg soldier)		−1.056**		0.516		−1.205***
		(0.333)		(1.673)		(0.183)
Weight (compared to avg soldier)		−0.004		−0.006		0.003
		(0.003)		(0.009)		(0.003)
Enlistment Year: 1936	−0.272***	−0.241***	−0.662**	−0.378	−0.159**	−0.174***
	(0.042)	(0.043)	(0.250)	(0.254)	(0.052)	(0.053)
Enlistment Year: 1937	−0.332***	−0.334***	−0.358	−0.320	−0.268***	−0.340***
	(0.042)	(0.038)	(0.221)	(0.168)	(0.063)	(0.045)
Enlistment Year: 1938	−0.473***	−0.451***	−1.065***	−0.802***	−0.409***	−0.462***
	(0.026)	(0.037)	(0.168)	(0.179)	(0.057)	(0.083)
Enlistment Year: 1939	−0.586***	−0.502***	−0.896***	−0.902***	−0.534***	−0.539***
	(0.047)	(0.064)	(0.090)	(0.113)	(0.081)	(0.111)
Enlistment Year: 1940	−0.778***	−0.704***	−0.952***	−0.940**	−0.804***	−0.743***
	(0.074)	(0.057)	(0.265)	(0.339)	(0.050)	(0.047)
Enlistment Year: 1941	−1.145***	−1.121***	−2.031***	−2.835***	−1.282***	−1.354***
	(0.091)	(0.127)	(0.454)	(0.449)	(0.084)	(0.110)
Enlistment Year: 1942	−1.641***	−1.501***	−1.639***	−1.661***	−1.704***	−1.622***
	(0.100)	(0.119)	(0.147)	(0.182)	(0.068)	(0.078)
Enlistment Year: 1943	−2.236***	−1.971***	−3.175***	−16.222***	−2.454***	−2.346***
	(0.066)	(0.069)	(0.410)	(0.778)	(0.140)	(0.210)
Enlistment Year: 1944	−3.006***	−3.575***	−15.099***	−16.117***	−2.974***	−3.536***
	(0.533)	(0.589)	(0.711)	(0.716)	(0.501)	(0.545)
Enlistment Year: 1945	−12.828***	−11.701***	−15.156***	−16.253***	−19.810***	−19.665***
	(0.799)	(0.752)	(0.909)	(0.806)	(0.792)	(0.771)
(Intercept)	−1.071***	−0.816***	−3.567***	−3.889***	−0.718***	−0.271
	(0.110)	(0.147)	(0.433)	(0.488)	(0.119)	(0.169)
Likelihood-ratio	687.892	625.793	69.008	64.864	743.251	687.140
Log-likelihood	−5320.258	−3930.106	−768.489	−569.263	−7855.889	−5839.045
Deviance	10640.515	7860.212	1536.978	1138.526	5688.957	4299.828
AIC	10670.515	7902.212	1566.978	1180.526	15743.778	11722.090
BIC	10783.315	8053.767	1679.777	1332.081	15864.097	11880.862
# of Soldiers	13629	10066	13629	10066	13629	10066

Clustered standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 24: Radio Tower Distance and Other Factors: Closest Radio Tower Clustered Standard Errors

	Dependent variable:							
	Soldier is Wounded		# of Wounds		Soldier is KIA		Soldier is POW	
	(Logit)		(Negative Binomial)		(Logit)		(Logit)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance from Closest Radio Tower (km)	−0.002***	−0.001	−0.000*	−0.000	0.001	0.001*	0.003***	0.003***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Nazi Vote Share	−0.000	−0.004	−0.002	−0.004**	−0.009**	−0.008*	0.007**	0.004
	(0.002)	(0.002)	(0.001)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)
Soldier from Urban Area	0.130***	0.132***	0.095***	0.097***	−0.091	−0.081	0.158***	0.133
	(0.028)	(0.021)	(0.017)	(0.015)	(0.222)	(0.231)	(0.036)	(0.076)
Age When Joining Army (Relative to 18)	−0.050***	−0.072***	−0.042***	−0.059***	−0.060***	−0.045***	−0.043***	−0.063***
	(0.006)	(0.006)	(0.004)	(0.005)	(0.010)	(0.006)	(0.008)	(0.013)
Catholic		−0.025		−0.022		−0.088		−0.162*
		(0.030)		(0.028)		(0.064)		(0.069)
Class		−0.098***		−0.093***		−0.109***		0.175***
		(0.026)		(0.016)		(0.030)		(0.034)
Married		0.326***		0.240***		−0.175		0.357*
		(0.047)		(0.041)		(0.092)		(0.148)
Height (compared to avg soldier)		0.017		−0.390		−0.427		−0.653
		(0.444)		(0.273)		(0.257)		(0.648)
Weight (compared to avg soldier)		0.000		0.005		0.002		−0.003
		(0.006)		(0.005)		(0.002)		(0.006)
Wounded						0.226***		0.232**
						(0.039)		(0.089)
Enlistment Year: 1936	0.076	0.035	−0.035	−0.067	0.086*	0.085	0.316***	0.292***
	(0.059)	(0.049)	(0.063)	(0.055)	(0.038)	(0.070)	(0.064)	(0.067)
Enlistment Year: 1937	0.027	0.057	−0.051	−0.023	0.048	−0.022	0.054	0.022
	(0.068)	(0.075)	(0.039)	(0.047)	(0.054)	(0.098)	(0.200)	(0.102)
Enlistment Year: 1938	−0.100	0.049	−0.129***	−0.005	0.036	−0.043	0.155	0.214*
	(0.066)	(0.065)	(0.025)	(0.038)	(0.046)	(0.080)	(0.150)	(0.085)
Enlistment Year: 1939	−0.105**	−0.008	−0.086**	−0.027	0.027	−0.057	0.337*	0.436***
	(0.035)	(0.050)	(0.030)	(0.037)	(0.049)	(0.100)	(0.147)	(0.077)
Enlistment Year: 1940	−0.365***	−0.175**	−0.341***	−0.194***	−0.127	−0.170	0.197*	0.340*
	(0.038)	(0.066)	(0.039)	(0.042)	(0.109)	(0.120)	(0.091)	(0.145)
Enlistment Year: 1941	−0.425***	−0.275***	−0.355***	−0.269***	−0.191	−0.342*	0.459	0.441***
	(0.042)	(0.062)	(0.035)	(0.030)	(0.127)	(0.135)	(0.261)	(0.111)
Enlistment Year: 1942	−1.798***	−1.729***	−1.353***	−1.293***	−0.851***	−0.883***	0.195	0.192
	(0.082)	(0.152)	(0.046)	(0.061)	(0.068)	(0.075)	(0.194)	(0.117)
Enlistment Year: 1943	−3.055***	−3.009***	−2.352***	−2.391***	−1.732***	−1.603***	0.227	0.224*
	(0.215)	(0.168)	(0.139)	(0.123)	(0.116)	(0.098)	(0.120)	(0.099)
Enlistment Year: 1944	−2.372***	−2.764**	−1.702***	−2.119***	−2.348***	−2.037***	−0.151	−0.208
	(0.250)	(0.948)	(0.200)	(0.406)	(0.198)	(0.224)	(0.147)	(0.215)
Enlistment Year: 1945	−11.918***	−10.835***	−18.947***	−18.840***	−12.067***	−11.062***	1.064	1.865
	(0.774)	(0.714)	(0.792)	(0.726)	(0.772)	(0.726)	(0.635)	(1.049)
(Intercept)	−1.421***	−1.272***	−0.213***	−0.064	−1.284***	−1.086***	−3.547***	−3.944***
	(0.041)	(0.102)	(0.023)	(0.045)	(0.118)	(0.116)	(0.171)	(0.114)
Likelihood-ratio	460.061	366.729	799.452	648.796	355.127	244.214	45.988	47.338
Log-likelihood	−4523.509	−3356.075	−12009.360	−8871.598	−5370.542	−3917.344	−2306.567	−1668.001
Deviance	9047.018	6712.151	9482.260	6967.746	10741.084	7834.688	4613.133	3336.002
AIC	9077.018	6752.151	24050.719	17785.196	10771.084	7876.688	4643.133	3378.002
BIC	9189.817	6896.489	24171.039	17936.751	10883.884	8028.243	4755.932	3529.557
# of Soldiers	13629	10066	13629	10066	13629	10066	13629	10066

Clustered standard errors in parentheses

$^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6 Sensitivity Analysis: Simulation of Unobserved Omitted Variable Bias

We argue that distance from radio towers represents the probability of exposure to propaganda and the exogenous placement of radio towers gives us causal leverage to investigate propaganda's effect on soldier performance. As with any study claiming causality, omitted variable bias is of central concern to our analysis. In order to assure that we have an unbiased estimate of propaganda, we attempt to control other channels in which soldier performance would be correlated with distance from radio towers, such as underlying Nazi support and human capital. However, there is always a possibility that we missed some variable that could be correlated with *both* our dependent variable and independent variable of interest thus confounding our results. The question then becomes: how would this unobserved variable effect our results? What would happen to our measure for propaganda? Would it no longer be significant?

If our finding is robust, we should see that a soldier's distance from the closest radio tower should be consistently significant across a broad range of correlations of an omitted variable. Since our ability to measure important variables of interest retroactively is limited, we turn to simulations to preform a sensitivity analysis on unobserved omitted variable bias. We simulate an unobserved omitted variable and vary its correlation with a soldier's distance to the closest radio tower *and* our various dependent variables of interest and then include it within thousands of new regressions to see how it effects the significance of our estimate of our distance variable.

To do this we use the standardized (mean of zero and variance of one) versions of distance to radio towers ($\bar{iv}$) and our various dependent variables ($\bar{dv}$) like decorations, punishments, pow, wounds, kia, etc. and solve this system of equations for a_1 and a_2:

$$a_1 + (\delta)a_2 = \gamma$$
$$a_1(\delta) + a_2 = \omega$$

where δ is the correlation between our standardized variables ($\bar{iv}$ and $\bar{dv}$), γ is the desired correlation between our new simulated variable V and our dependent variable, and ω is the desired correlation between our new simulated variable V and our independent variable of interest: radio tower distance. Once we obtain a_1 and a_2, we solve the following two equations in order to obtain V our simulated variable of interest:

$$a_3 = \sqrt{(1 - a_1^2 - a_2^2) - (2a_1a_2\delta))}$$
$$V = (a_1 \times \bar{iv}) + (a_2 \times \bar{dv}) + (a_3 \times e)$$

where e is a random normal variable with mean zero and a variance of one. We repeat this process process for each combination of γ from -1 to 1 and ω from 0 to 1.[1] This gives us over 20,000 different V's which are correlated with our independent variable and dependent variable at different levels. Some of these combinations are not possible computationally, for example it's impossible for a variable to be correlated with degree 1 to two different variables q and p if those two variables are not also perfectly correlated themselves. Therefore any combination of γ and ω that are not possible are excluded from our tests.

We then rerun our models of interest with all control variables, and include the simulated omitted variable to see how it changes the estimate of distance from the radio tower. Figures 1, 2, and 3 show the results for these regressions. The x-axis varies from -1 to 1 and represents the correlation between the unobserved variable and our main variable of interest, a soldier's distance to the closest radio tower. The y-axis represents the correlation between the unobserved variable and our various outcomes of interest. Each grid represents the p-value for the soldier's distance to the closest radio tower after a fully-specified regression after including our simulated unobserved omitted variable. If the grid is dark blue, this means that the soldier's distance to the closest radio tower was found to be significant at the 0.05 level or lower, while the lighter colors show significance at the 0.1 level or not significant at the 0.1 level. The white spaces mean that the joint correlation between the distance and the DV for the simulated unobserved variable was not possible. The purple space means that the sign of the coefficient flips, thus finding the opposite effect than we originally observed. It's important to note that the significance of these "opposite signs" effect varies as well, thus meaning that the findings are not always significant.

To give an overview of our results: we find that distance to closest radio tower is fairly robust to unobserved omitted variables for decorations and punishments, but less so for POW. We present our results for decorations, punishments, and POW on Figures 1, 2, and 3 respectively. To aid interpretation of these results, we place points of several control variables used within our analysis and their correlations with both variables of interest. These represent the best guess for other unobserved variables within the universe of our sample. From these we can create anchor points to judge the likelihood that an unobserved variable lies beyond these particular points.

As Figure 1 shows, our proxy for propaganda (distance from the closest radio tower) remains significant at the 0.05 level for the majority of the 20,000+ regressions we run with different levels of omitted variable bias on whether a soldier receives a decoration. Most of the graph is dark blue, and there is little in terms of insignificance among the bounds of the correlation variables. The relationship between distance to radio tower and decorations is largely robust, except when there is an omitted variable that is negatively correlated with distance and positively correlated with decorations. When the omitted variable is highly related with decorations and negatively related to distance from the closest radio tower, the relationship between distance and decorations actually reverses. Thus, we should be concerned about variables that are highly negatively correlated with distance and moderately correlated with decorations or visa versa.

[1] Ideally we would have set up a desired correlation matrix and used Cholesky decomposition to obtain an exact correlation for our desired variable, however this only works for continuous variables and all of our dependent variables are binary. Therefore we use this linear approximation as a second best solution.

What is the likelihood of an unobserved variable being highly correlated with those two things simultaneously? To aid in interpretation, we plot the control variables to provide a guide about the correlation between with both distance and decorations. As we can see from the black points, most variables are relatively uncorrelated with both distance from the closest radio tower and whether a soldier is decorated. This is intuitive due to these variables being largely exogenous to most individual characteristics of soldiers. The largest correlation with our distance variable is whether a soldier was catholic or not. Soldiers born farther away from the radio towers are more likely to be catholic than soldiers born close to radio towers, but being catholic is also largely uncorrelated with decorations.

As for decorations, one control variable stands out to its relation to decorations: whether a soldier was wounded. Here we can see that being wounded is highly correlated with receiving a decoration. This is obvious, since soldiers who are exhibiting valor are more likely to get wounded and more likely to be decorated for that valor. It is unlikely, however, that there are other variables that are highly correlated with decorations in the same way. Perhaps whether soldiers were on the front line, but this is also unlikely to also be highly correlated with distance from the closest radio tower. It's hard to imagine a scenario where soldiers were put into increased combat situations based upon where they live in relation to a radio tower.

Figure 2 shows how an unobserved variable effects the relationship between the soldier's distance to closest radio tower and whether a soldier was punished. Here the amount of space where the relationship between distance and punishments is robust is smaller than for decorations. However, the majority of correlations between distance and punishments are still robust to different levels of unobserved omitted variables. The exception is when there is an omitted variable that is positively correlated with distance and positively correlated with punishments, in these scenarios we find that the direction of the relationship between distance and punishments reverses.

Just as with decorations we also plot various control variables to give a sense of the range of correlations an omitted variable might have with distance and punishments. Similarly to decorations, we also see that most of the variables are clustered around very little correlation between distance and punishments. The few exceptions are whether the soldier was wounded, the age of the soldier, and again whether the soldier was Catholic. However, in all of these cases, the relationship between distance and punishments would be robust to an unobserved variable of equal characteristics.

Finally, Figure 3 shows how an unobserved variable effects the relationship between the soldier's distance to closest radio tower and whether a soldier was a POW. In this figure we can see that the amount of area that is dark blue is much smaller than the two previous graphs. This is the first graph where the relationship between closest radio tower and the dependent variable, here POW, is mostly insignificant at the 0.05 level. Further, it does not take much in terms of an omitted variable in order for the results to cease being significant. While, understandably, most variables are uncorrelated with a soldier becoming a POW, if an omitted variable is positively correlated with distance almost any amount of correlation with being a POW would make our finding not robust.

All of this shows that the relationship between the closest radio tower and two of our main variables of interest, decorations and punishments, is fairly robust to different levels of unobserved omitted variables. For the relationship between the closest radio tower and whether a soldier is a POW, we are far less certain. Given the weak requirements needed for an unobserved omitted variable to cause our results to not be significant, the relationship between propaganda and being a POW should be taken with caution.

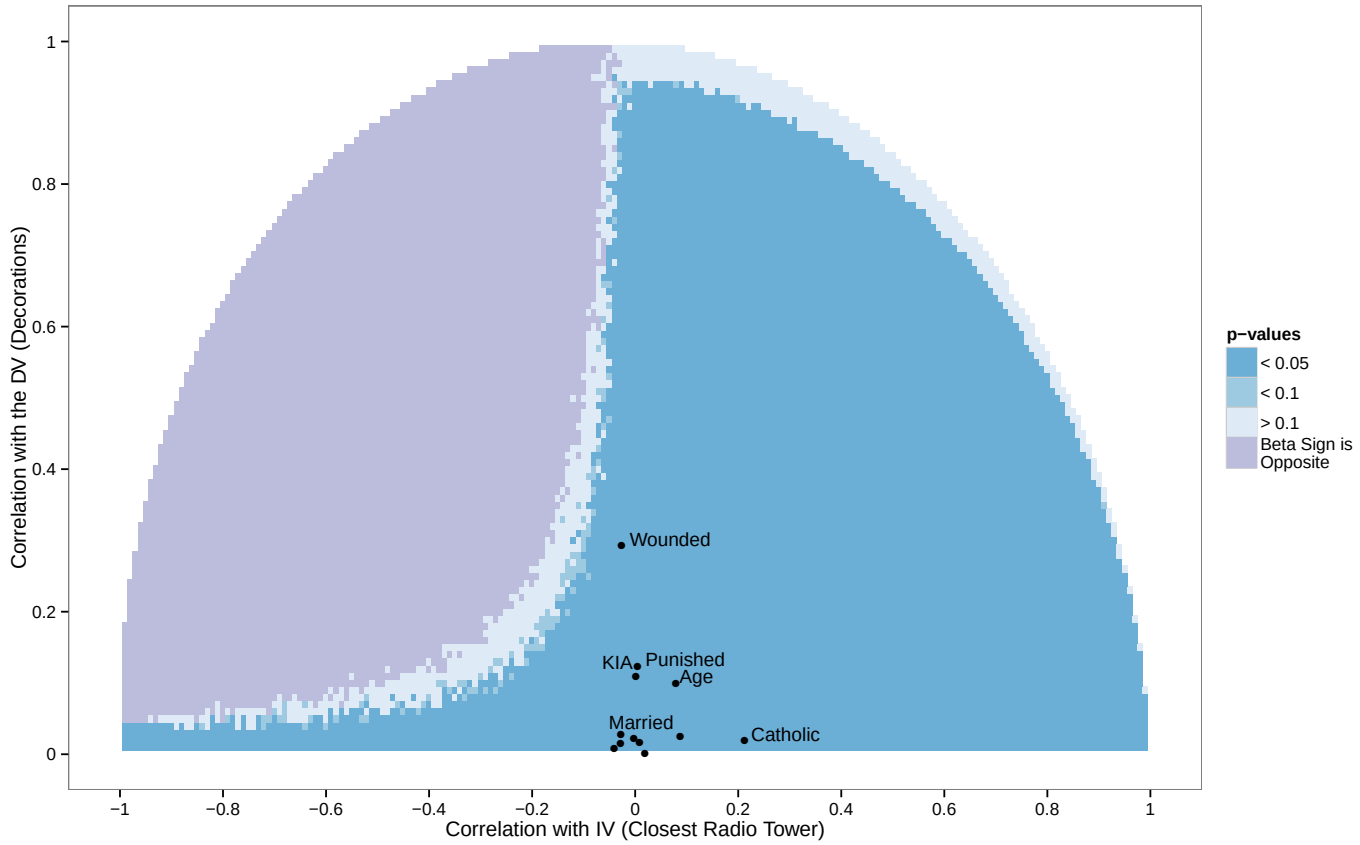


Figure 1: Sensitivity Analysis for an Unobserved Omitted Variable: Radio Distance & Decorations

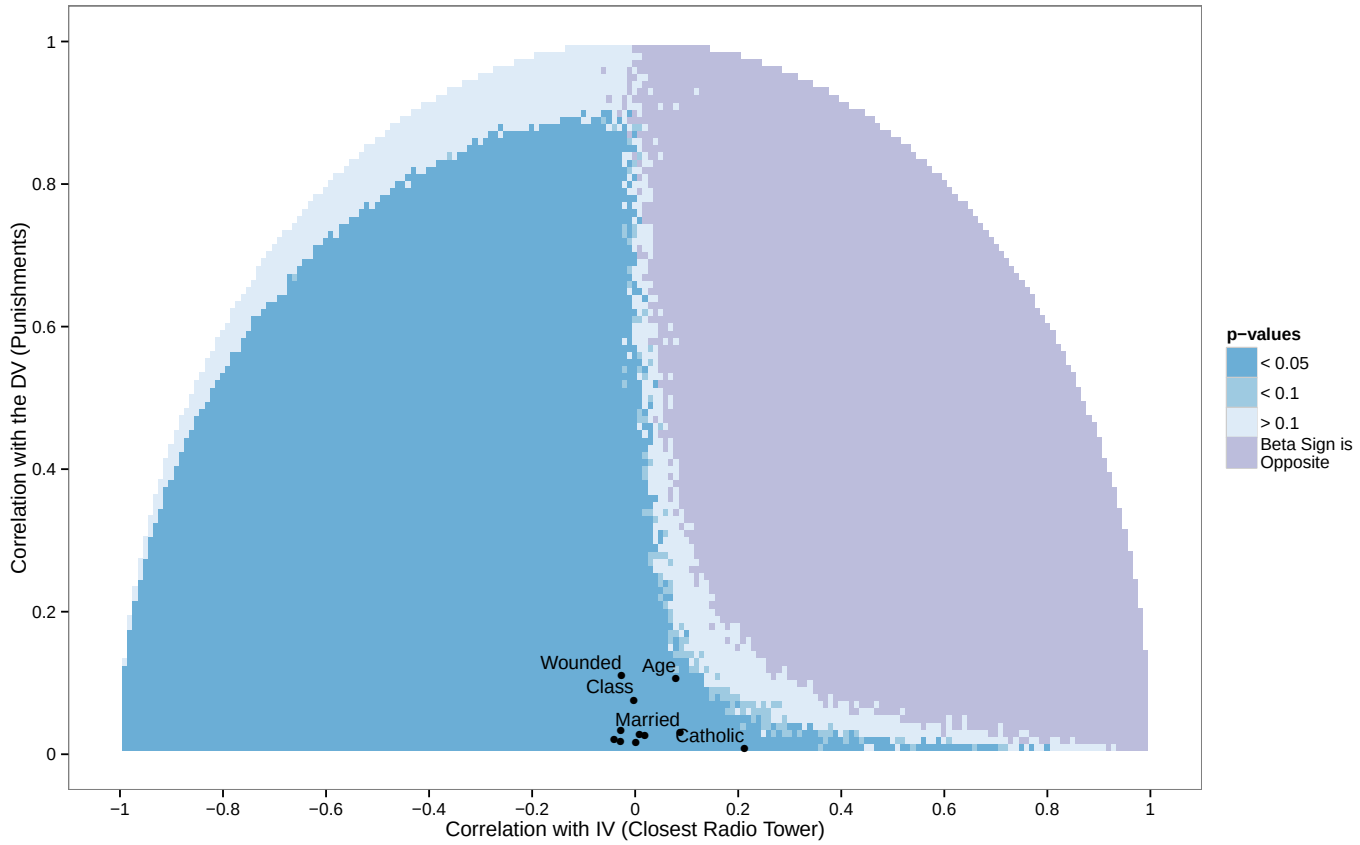


Figure 2: Sensitivity Analysis for an Unobserved Omitted Variable: Radio Distance & Punishments

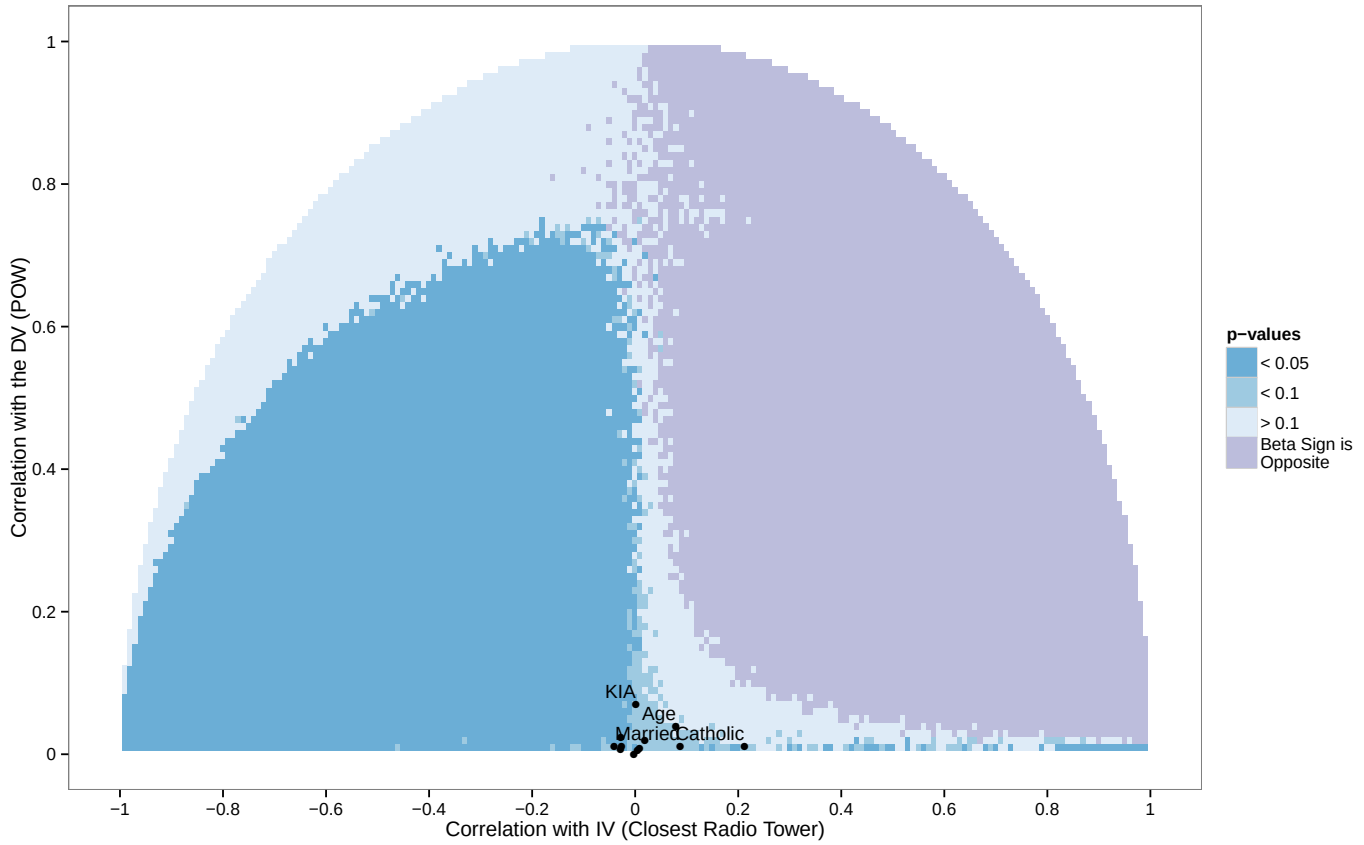


Figure 3: Sensitivity Analysis for Radio Distance & POW

7 Extreme Bounds Analysis

In our paper we show that distance from radio towers have an effect on various levels of soldier performance. To end up with these results we picked a reasonable set of plausible control variables and presented a select few finalized models. This is the standard practice in the field when researchers have a good sense of what variables should effect the outcome of interest. In this case, however, there is little theory to guide us on which variables are important to include or exclude for soldier valor, insubordination, imprisonment, injury, or death. In cases where there is no strong theoretical prior for control variables, there is a worry that researchers can pick a certain combinations of variables that give an "artificially" statistically significant outcome. To avoid this, and to test the robustness of our main explanatory variable, we employ Extreme Bounds Analysis (EBA), a global sensitivity analysis that evaluates the coefficients of interest for every combination of plausible control variables. The strength of EBA is it can test a key independent variable in the face of uncertainty about what control variables to include. We chose this to Bayesian Model Averaging (BMA) since EBA can check the robustness of the key independent variable, while BMA works in reverse: it finds models that have the best fit and then identifies important variables included within those models.

To conduct our EBA we divide all control variables into two groups: a set of mandatory control variables that is always included in every model specification and a set of "optional" control variables. Then we estimate a separate model for each possible combination of the "optional" control variables with the "mandatory" controls. For each model there are 13 "optional" controls, which gives us $\sum_{i=0}^{13} \frac{13!}{i!\,(13-i)!} = 8192$ model specifications.[2] We then look across all of these model specifications to see the robustness of our results.

For our analysis we limit the "mandatory" control variables to three variables that are highly likely to influence all dependent variables. The first is the soldier's age at the time they join the army. To make the variable age easier to interpret, we standardize the age variable to 18. Positive scores are soldiers who were older than 18 when they joined the army, and negative scores are those who were under 18. Since we have the soldiers day of birth and day of enlistment, we are able to make this variable continuous. The second mandatory variable is whether soldier were from an urban or rural environment. Soldiers who are from urban backgrounds will most likely have better radio reception and could for any number of reasons also be more motivated soldiers (e.g. better political knowledge, greater familiarity with modern technology, which makes them less likely to be panicked by encountering high technology weaponry, etc). Finally, to alleviate concern about the experience of the soldier, we include a fixed effect for the year in which the soldier joined the army.

For our "optional" variables we include a host of variables of individual and geographical variables that might influence a soldier's performance. At the individual level we include whether the soldier was catholic, married, the number of children they had, the number of siblings they had, the height of the soldier compared to the average soldier, the weight of the soldier compared to the average soldier, the soldier's economic class, a measure for the soldier's human capital, and whether the soldier was a member of the Nazi party in any way. At the geographical level,

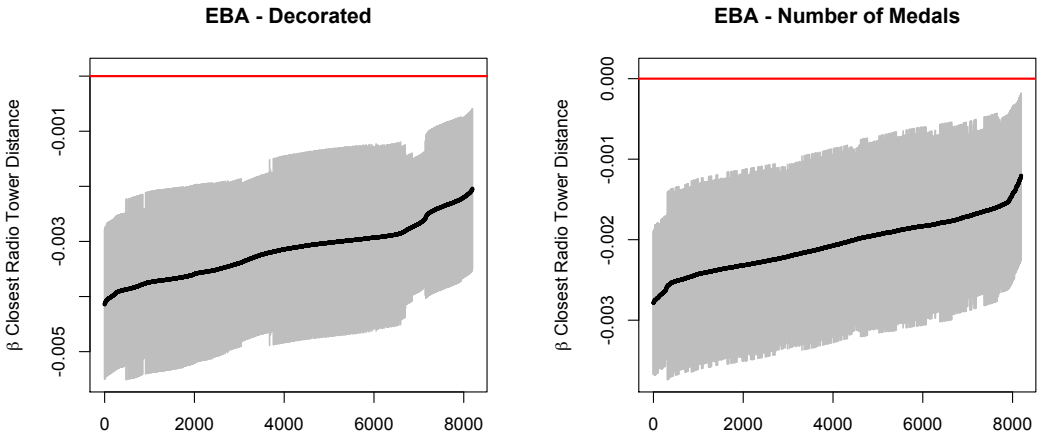
[2]The one exception is for wounded, which has 11 variables for 2048 regressions

we merged our data with O'Loughlin (2002) data on district characteristics in the 1930s to add control variables of total unemployment and the districts vote for the Nazi party in the 1930 election. Every combination of these variables are run in their own separate regression, and then we compile the results to test the robustness of our main finding.

Since results often shift across many model specifications, there are two approaches to evaluate the results from an Extreme Bounds Analysis. Levine and Renelt (1992) suggest looking at the smallest and largest coefficient from across all model specifications. A finding is considered robust if both coefficients have the same sign and their 95 percent confidence intervals do not include zero. Sala-i Martin (1997) argues that this might be too stringent of a test, and develops the cdf(0) statistic which gives the percentage of coefficients which fall on a particular side of zero (using the average coefficient and standard errors). Sala-i-Martin suggests a finding is considered robust if the cdf(0) is greater than 0.95. We report our findings using Sala-i-Martin's measure on Table 25.

Overall our findings from the EBA are extremely robust. We test seven dependent variables using the EBA: decorated, number of medals, punishment, number of punishments, and whether a soldier is a POW, wounded, or killed. Most of the EBA results are congruent with our regression results above. Figure 4 shows that all 8192 model specifications looking at the effect of distance to the closest radio station on soldier valor, as measured by war decorations, is positive and significant. This holds for the logit analysis looking at whether a soldier gets a medal or not, as in Figure 4(a), and for the number of medals that the soldier receives, as shown in Figure 4(b). This also holds for the effect of distance to the closest radio station on punishments, where Figure 5 shows that all 8192 model specifications are positive and significant. This is true for whether the soldier was punished, as in Figure 5(a), and for number of punishments, as shown in Figure 5(b).

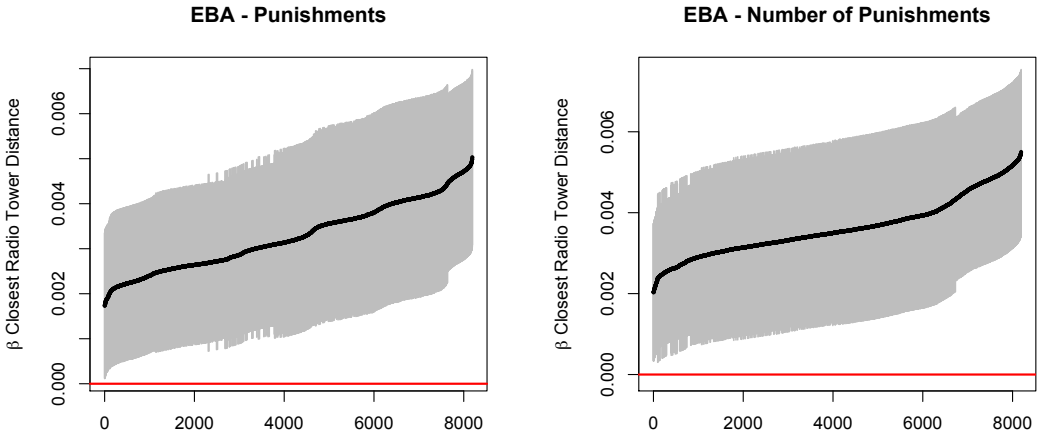
The results are more mixed with soldiers becoming a POW. As Figure 6(a) shows, the EBA for POW fails the Levine-Renelt test since the lowest confidence interval dips below the 0 mark. As a matter of fact, most of the regression specifications contain 0 within their 95% confidence intervals. However, the EBA still passes the Sal-i-Martin's robustness test both on the unweighted and weighted versions, with the cdf(0) over 0.95. Meanwhile, the EBA for whether a soldier is wounded or soldiers are killed in action are consistent with the regressions above. In both the EBAs neither dependent variable crosses over the 0.95 threshold for the cdf(0).



(a) Being Decorated

(b) Number of Medals

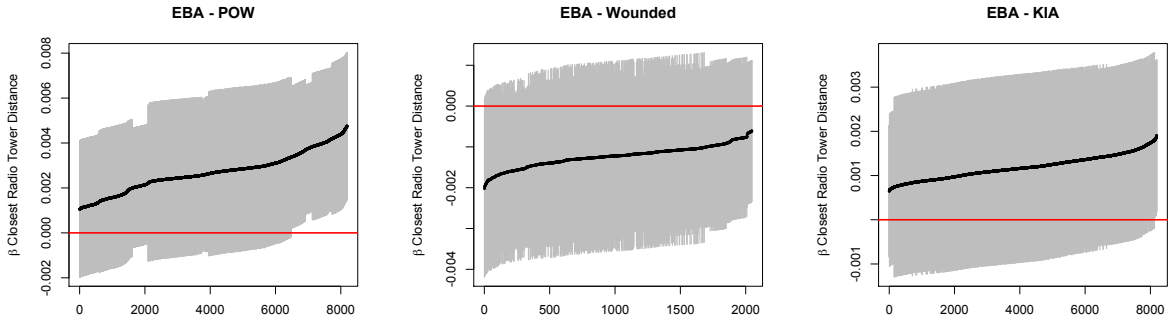
Figure 4: EBA of the Effect of Distance to Closest Radio Tower on Decorations



(a) Being Punished

(b) Number of Punishments

Figure 5: EBA of the Effect of Distance to Closest Radio Tower on Punishments



(a) Being a POW (b) Being Wounded (c) Being KIA

Figure 6: EBA of the Effect of Distance to Closest Radio Tower on POW, Wounds, and KIA

Table 25: Results of Sala-i-Martin Extreme Bounds Analysis

	Dependent Variable	β	SE	z-score	cdf(0)
Decorations	Soldier was Decorated, unweighted	-0.0032	0.0007	-4.5407	0.9999
	Soldier was Decorated, weighted	-0.0032	0.0007	-4.4491	0.9999
	# of Decorations, unweighted	-0.0021	0.0005	-4.2736	0.9999
	# of Decorations, weighted	-0.0021	0.0005	-4.1985	0.9999
Punishments	Soldier was Punished, unweighted	0.0033	0.0009	3.5317	0.9998
	Soldier was Punished, weighted	0.0034	0.0010	3.5407	0.9998
	# of Punishments, unweighted	0.0036	0.0009	-3.7776	0.9999
	# of Punishments, weighted	0.0037	0.0010	3.7021	0.9999
POW	Soldier was POW, unweighted	0.0027	0.0016	1.7530	0.9584
	Soldier was POW, weighted	0.0027	0.0016	1.6895	0.9532
KIA	Soldier was KIA, unweighted	0.0012	0.0009	1.3325	0.9066
	Soldier was KIA, weighted	0.0012	0.0009	1.2994	0.9007
Wounded	Soldier was Wounded, unweighted	-0.0012	0.0010	-1.2406	0.8912
	Soldier was Wounded, weighted	-0.0013	0.0010	-1.2253	0.8885

8 Variable Creation

8.1 Decorations

- 1 Non–German medals. These were placed lowest on the official Wehrmacht order of merit (For Führer and Fatherland:– Military Awards of the Third Reich, John R Angolia, pp 421)
- 2–6 Badges and clasps for bravery in combat, with an additional point awarded for each grade(ie, *Stufe 1, Stufe 2, Stufe 3* etc) (*Die Wehrmacht im Dritten Reich*, Rudolf Absolon, pp 494–503). If the grade (*Stufe*) is not noted, it is assumed to be the lowest grade, 1. Specifically, these badgesand clasps include– *Bandenkampfabzeichen, Tiefffliegervernichtungsabzeichen, Sonderabzeichen fur das Niederkampfen von Panzerkampfwagen durch Einzelkampfer, Panzerkampfabzeichen, Sturmabzeichen (Bronze),Nahkampfspange (Bronze)*
- 7 Iron Cross 2nd Class/*Nahkampfspange (Silber)/Sturmabzeichen (Silber)*
- 8 Iron Cross 1st Class/*Nahkampfspange (Gold)/Sturmabzeichen (Gold).* The *Nahkampfspange(Gold)* was considered by Hitler to be the highest bravery award for the infantry before the Knight's Cross of the Iron Cross, the Fuehrer reserving the right to award them personally (Angolia p100). In fact, according to Absolon, a winner of the gold *Nahkampfspange* had the same rights as a winner of the Knight's Cross of the Iron Cross (Absolon, p495). This would make it equivalent at least to the Iron Cross 1st Class, with the Silver *Nahkampfspange* being equivalent to the Iron Cross 2nd Class. The *Sturmabzeichen* was equivalent to the *Nahkampfspange*- the difference being that different units were eligible for one or the other (Absolon, p496)
- 9 German Cross in Gold. Winner had to already have the Iron Cross First Class. Ranked below the Knight's Cross of the Iron Cross.
- 10 Knight's Cross of the Iron Cross
- 11 Knight's Cross of the Iron Cross with Oak Leaves
- 12 Knight's Cross of the Iron Cross with Oak Leaves and Swords
- 13 Knight's Cross of the Iron Cross with Oak Leaves, Swords and Diamonds
- 14 Knight's Cross of the Iron Cross with Golden Oak Leaves, Swords and Diamonds. According to the protocol laid down by the Führer Directive of 1st September 1939, *Reichsgesetzblatt* I S. 1573, and modified by I S. 849 of June 3rd 1940, I S. of 28th September 1941 and I S. 11 of 9th December 1944.

  NB– We are omitting campaign medals and non-combatant decorations from consideration, even though they were rated highly in the Wehrmacht's order of merit. For instance, the non–combatant War Merit Cross (*Kriegsverdienstkreuz*) and the Eastern Front Winter Campaign Medal 1941-1942 scored second and fourth on the order of merit (Angolia, p421). Yet these do not capture military merit in the same way that combat decorations do. The criteria for the awards were simply that an individual soldier had 'served honorably' on the front to

which they had been assigned (Absolon, p496-498). Given that, in many cases, the campaigns referred to German units being surrounded by the Red Army (e.g. the Demyansk Shield), it is hard to see what other choice they had.

8.2 Punishments

- 1 *Verweis*– warning
- 2 *Strafexerzieren*– punishment drill
- 3 *Geldstrafe*– fine
- 4 *Ausgangsbeschraẅkung*– suspension of leave privileges
- 5 *Kasernenarrest*– confinement to barracks
- 6 *gelinder Arrest*– arrest
- 7 *geschaẅfter Arrest*– severe arrest
- 8 *Dienstgradherabsetzung*– demotion
- 9 *Gefaẅgnis*– prison
- 10 *Dienstentlassung*– dishonorable discharge
- 11 *Todesstrafe*– death

  Source:– Brandstetter and Hoffman, *Gesetzbuch der deutschen Wehrmacht*

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