Surviving Andersonville: The Benefits of Social Networks in POW Camps

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For most of history, soldiers captured by the enemy were either slaughtered or enslaved to die quickly in a mine or galley ship or other lethal place. The concept of prisoners of war (POWs) developed during the seventeenth and eighteenth centuries, both because of the Enlightenment and because the mercenaries widely used by seventeenth century armies sought to save their own lives. During the Napoleonic Wars, the first to employ mass conscription, captured troops were often kept in prison camps and later exchanged. The first total war, the American Civil War, saw the first formal code of conduct for dealing with prisoners of war, drawn up in 1863 at President Lincoln's request. It stipulated that captured troops had to be imprisoned, fed, and given medical treatment and could not be enslaved, tortured, or killed (Lawrence Malkin 2001). The Civil War reality, however, did not match the ideals of the code. The death rate for imprisoned POWs was 12 percent in the North and 16 percent in the South (James Ford Rhodes 1904, 507–08). Some prison camps achieved notoriety, particularly Andersonville in the South and to a lesser extent Florence and Salisbury in the South and Elmira in the North. At Andersonville, which at its peak capacity was the fifth largest city in the south, roughly one-third of the men died within seven months (Rhodes, 1904, 404) and 40 percent of the men who passed through Andersonville died there.[1]

How did men survive the horrific conditions of Civil War POW camps? This paper uses a unique longitudinal database of Union Army soldiers and a cross-sectional database of the population of Andersonville to examine the role of social networks in ensuring survival in Confederate POW camps. A prison camp, with its absence of law enforcement, property rights, and formal markets, and its subsistence income level, is closer to a primitive society than to a civil society. Social networks are therefore particularly likely to be important. The consumption smoothing literature has emphasized that in developing countries the family plays a key role in smoothing idiosyncratic shocks (Mark R. Rosenzweig 1988; Robert M. Townsend 1995; Franque Grimard 1997; Marcel Fafchamps and Susan Lund 2003). Social networks can play the same role. The accounts of survivors of Civil War POW camps, Nazi concentration camps, the Soviet Gulag, and Vietnamese POW internment mention the role of friends in addition to various psychological mechanisms, collaboration with the enemy, preying upon fellow prisoners, own youth, health, and physical strength, and pure luck (John McElroy 1957; John Ransom 1963; Leo Eitinger 1964; David R. Jones 1980; Paul Schmolling 1984; Anne Applebaum 2003). Schmolling (1984) argued that friends were the single most important key to survival in Nazi concentration camps. Those without friends might end up with short rations and had more trouble adapting psychologically. In the Gulag of the late 1940s, the Ukranians, Balts, and Poles

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[1] See United States War Department (1880–1901, Series II, Vol. VIII, 615, 781). In the longitudinal sample that we subsequently use, roughly 38 percent of the 554 men held at Andersonville died there. In the cross-sectional data that we subsequently use, 40 percent of the listed men died at Andersonville.

created their own systems of mutual assistance where they were in large numbers (Applebaum 2003, 380). Health researchers have argued that the quality of social attachments affects health through its impact on the immune and neuroendocrine systems (e.g., Lisa F. Berkman 1995). Civil War diaries indicate that friends in POW camps provided the moral support necessary to avoid depression, provided extra food or clothing through trade of valuables or from work on prison detail such as the bakery, ensured that none strayed too close to the "dead line," protected against the predations of other prisoners, and tended to the sick. Ransom (1963, 93) wrote in his Andersonville diary, "I have always been blessed with friends, and friends too, of the right sort."

This paper contributes to the growing empirical literature on the benefits of participating in a social network. Many network papers focus on information acquisition. Social networks are important sources of job tips (Yannis M. Ioannides and Linda Datcher Loury 2004; Patrick Bayer, Steven L. Ross, and Giorgio Topa 2005), retirement plan information (Esther Duflo and Emmanuel Saez 2003), and other types of assistance. Migrants are drawn to destinations where their peers previously moved (Enrico Moretti 1999; Kaivan Munshi 2003; Costa and Kahn 2006). Networks may be an important determinant of government program participation (Marianne Bertrand, Sendhil Mullainathan, and Erzo Luttmer 2000; Anna Aizer and Janet Currie 2004). As in these papers, we examine how the quantity and quality of social networks affect outcome indicators. A distinguishing feature of our study is that our outcome measure, death, represents "higher stakes" than the outcome measures in these other studies. Another distinguishing feature of our study is that our setting is one of unusually high stress and, unlike survivor accounts, we do not depend upon a selected sample. In such a setting, friends may be particularly valuable because there are no market substitutes, but they could also be less valuable because in an environment where infectious disease is rampant they can offer little protection.

I. Confederate POW Camps

An estimated 211,411 Union soldiers were captured during the Civil War; 16,668 were never imprisoned because they were paroled on the field, but of the remaining 194,743 men, 30,218 died while in captivity (Rhodes 1904, 507). Thus, 7 percent of all United States soldiers were imprisoned, compared to figures of 0.8 percent for World War II and 0.1 percent for the Korean War.[2] Until mid-1863 many POWs were exchanged immediately. Prisoner exchanges stopped as the two sides argued over the terms (particularly the treatment of black soldiers and their white officers). General Grant opposed re-establishing a system of exchange, stating, "If we commence a system of exchange which liberates all prisoners taken, we will have to fight on until the whole South is exterminated."[3] Although men were exchanged again in December of 1864 and early in 1865, the mean number of days spent in prison until death or release for men who were captured prior to mid-1863 was 20, whereas it was 92 for men who were captured after mid-1863. Forty-three percent of the men in the longitudinal sample that we use were captured in July 1863 or later.

Men who were captured after mid-1863 faced ever worsening conditions as the numbers of prisoners increased.[4] In our longitudinal data, only 4 percent of the men captured before July 1863 died in captivity, whereas 27 percent of those captured July 1863 or later died in captivity. (In contrast, the total wartime mortality rate was 14 percent.) Men suffered from poor and meager rations, from contaminated water, from grounds covered with human excrement and with other filth, from a want of shoes, clothing, and blankets (having often been stripped of these by needy Confederate soldiers), from a lack of shelter in the open stockades that constituted camps such as Andersonville and Millen, from the risk of being robbed and murdered by fellow prisoners, and from trigger-happy guards. John Ransom recounted in his diary that when

[2] Estimated from the figures in US Department of Veterans Affairs (2004) and from http://www.cwc.lsu.edu/cwc/other/stats/warcost.htm (accessed January 29, 2007).

[3] See United States War Department (1880–1901, Series II, Vol. VII, 607.).

[4] Northern complaints about Southern prisons began in 1862. For example, on February 22, 1862, *Harper's* reported, "The condition of our soldiers … is indeed fearful … covered with vermin, … half-starved and nearly naked …." See http://www.sonofthesouth.net/leefoundation/the-civil-war.htm (accessed January 29, 2007).

taken prisoner he weighed 178 pounds and when he left Andersonville suffering from scurvy and dropsy he weighed only 95 pounds (Ransom 1963, 142).

Conditions across prisons varied widely, and within prisons varied widely across time. Andersonville, which with a maximum capacity of 10,000 men held at one point 32,899 men, was the most notorious (Lonnie R. Speer 1997, 332). The chief causes of death were scurvy, diarrhea, and dysentery. Scorbutic ulcers became gangrenous.[5] In contrast to Andersonville, prisoners at Savannah, for example, received better and more plentiful rations. At camps such as Florence and Salisbury, however, food was scarce and the monthly death rates rivaled those at Andersonville. Florence became notorious for the number of cases of gangrene, brought on by frostbite, that led men to cut off their own putrefying limbs with pocket knives (Speer 1997, 276).

Captured men were transferred to a prison by rail, tightly packed in cattle cars, with the choice of prison camp determined largely by time and place of capture. Men were transferred across prisons, and we will use transfers and new captures as part of our instrumental variables strategy. In 1863 the majority of prisoners were held at Richmond, but prisoners were rapidly moved out of Richmond in February and March of 1864 in response to prison escapes to nearby Union lines and to a (failed) Union raid to free prisoners. Andersonville was emptied of men in September of 1864 when Sherman's army threatened. Prisoners were then moved to Charleston and Florence, South Carolina, and Millen and Savannah, Georgia, among others. When a November raid by Sherman forced the abandonment of the prison at Millen, prisoners were sent to Blackshear and Thomasville, Georgia. Although a few officers of the colored troops were punished by being sent to Andersonville, the choice of prison appears to have largely depended upon when the prisoners were moved. Prisoners could be moved about 400 to 700 per day from one camp to another (William Best Hesseltine 1930; Speer 1997). But, for example, prisoners could not be sent to Millen until the stockade had been constructed (Hesseltine 1930).

Once within a prison camp, the prisoners were responsible for scavenging their own living quarters, digging holes for shelter, or constructing tents from sticks of wood and blankets. They were responsible for dividing any food or firewood given to "squads" and, at Andersonville, they were responsible for policing themselves.[6] Commissioned officers, except those commanding colored troops, received preferential treatment and were either kept in separate quarters within the same prison or in prisons reserved for officers (Speer 1997, 58).

II. Survival and Social Networks

A prisoner's objective is to survive a POW camp. His survival probability, S, is a function of his consumption, C, and of the disease environment, D:

$$S = f(C, D). \tag{1}$$

Consumption, in turn, is a function of individual characteristics (I) such as initial health endowment, human capital, and physical capital; the social network or the number of friends (F); macro camp conditions (M); and random shocks, ε_1. The disease environment is a function of macro camp conditions, of the social network (because of local contagion effects), and of random shocks, ε_2:

$$C = g(I, F, M, \varepsilon_1), \tag{2}$$

$$D = h(F, M, \varepsilon_2). \tag{3}$$

This paper's primary focus is on the effect of F on survival probabilities. Social networks have both costs and benefits, i.e., $\partial S/\partial F$ could be either positive or negative. We expect both the number of men in a network and the strength

[5] Testimony from the trial of Captain Wirtz, reprinted in Ransom (1963).

[6] For the purpose of issuing rations and for roll calls within the camps, newcomers were divided into squads (generally 100 men, but 270 men at Andersonville) which in turn were subdivided into messes (generally 20, but 90 at Andersonville). Units of friends were not necessarily in the same squad or mess and some squads were organized by the first letter of men's last names (Hesseltine 1930, 137, 161; McElroy 1957, 249–50). However, there was no deliberate attempt to break up units.

of their ties to each other, the "quality'' of the network, to affect mortality. A group member could benefit from the extra food or clothing his friends could provide, from the care his friends provided when he was sick, from moral support, and from protection against other prisoners.[7] But, his close physical proximity to the men in his network would increase the risk of disease transmission.

Upon entering a camp, a man could either have as his social network men he already knows such as those from the same company, regiment, or hometown, or he could form new social networks. Because of the costs of learning about new people, we expect that the men he already knows would be the default network.[8] Since a POW has relatively little choice over his community, this reduces selection problems inherent in estimating neighborhood effects (Steven Durlauf 2004).

Could men "buy" a friend? As shown in equations (1) and (2), own consumption and networks are substitutes in determining survival. If there were no market in friends, perhaps because of lack of trust between strangers or the inability to credibly punish those who betray their new friends, then the default network of men who already know each other correctly measures a network's size. Suppose, however, that a POW could trade consumption to purchase a larger network. (While a POW might not literally purchase a friend, he could purchase a bodyguard.) A POW who enters a camp with no friends might have to sacrifice consumption to buy a friend, whereas a POW who enters a camp with friends has a much larger initial endowment. This endowment acts as an income effect. If friends have a causal effect on survival, then men who enter with no friends will sacrifice the most energy and consumption to make friends. In equilibrium, there could be few actual differences in network sizes between those who entered the camp with a network and those who purchased a network, but we would expect the former to have a greater life expectancy because the income effect allows them to eat more.

The theoretical literature has advanced several hypotheses concerning who forms cohesive groups. Social identity theory predicts that a prisoner would know those of his own kind (e.g., members of the same ethnic group or same town) best because individual utility depends upon being in a group with members of own's own type (Alberto Alesina and Eliana La Ferrara 2000; George A. Akerlof and Rachel E. Kranton 2000, 2005). One's own kind would be more likely to inspire trust and altruism and to spur group members to exert greater efforts on each other's behalf. McElroy (1957, 81–82) described how at Andersonville the POWs "were strangers to each other and distrustful of all outside their own little circles,'' sticking with comrades from the same state or group of states. They also formed their own ethnic ghettos (William Marvel 1994, 111).

Even with no preference for one's own type, it may be optimal to transact with members of one's own kind when there are market imperfections (Avner Greif 1993). Contracts in POW camps could not be legally enforced, making it hard to purchase a friend. Intertemporal trade, not just of valuables but also of care in sickness, could be possible within a group because the group would have full information on its members and could impose sanctions on violators (Robert C. Ellickson 1991; Avinash Dixit 2004). In addition, if the group existed in civilian life, a prisoner would be concerned about reputation effects once he returned home. Of course, as quoted in Robert Knox Sneden (2000, 229), "Nearly all of us had given up all hopes of being exchanged or seeing our homes again … everyone was for himself regardless of consequences ….'' Although the costs of getting to know new people, tastes, and strategic considerations would lead prisoners to turn to their own kind, a successful group might need members with complementary skills in production (Alesina, Enrico Spolaore, and Romain Wacziarg 2000). A group with a good trader, a good gambler, and a good baker who could steal food from his prison detail might be more successful than a

[7] Trade in POW camps is commonplace (e.g., Radford 1945) and Civil War POW camps were no exception. Men bartered and traded with each other and with guards to obtain food, clothing, shoes, blankets, sticks of wood, and tools for greenbacks, metal buttons, valuables, or even preferred real estate in the camp. Men too sick to consume their cornmeal rations would trade them for soup and men would trade their rations for services such as haircuts or shaves (Ransom 1963; McElroy 1957).

[8] The expectation that group interactions in a POW camp are not an infinitely repeated game implies that reciprocity between strangers is unlikely.

group of good farmers. But, there is a trade-off between the benefits of heterogeneous skills in production and the costs that arise from difficulties in communications or in agreement on basic behavioral norms (Edward P. Lazear 1999a, b). McElroy (1957, 82) reported that at Andersonville the men from Ohio, Indiana, Illinois, Iowa, and Kansas "spoke the same dialect, read the same newspapers, had studied *McGuffey's Readers*, *Mitchell's Geography* and *Ray's Arithmetics* at school, admired the same great men and generally held the same opinions on any given subject. It was never difficult to get them to act in unison. They did it spontaneously, while it required an effort to bring about harmony of action with those of other sections."

III. Data and Empirical Framework

We use both longitudinal data on Union Army soldiers and cross-sectional data on the population of Andersonville to investigate the role of friends in ensuring survival. Our longitudinal data allow us to sample from multiple prisons at different points in time and provide a rich set of covariates that permit us to examine many of the observable dimensions of heterogeneity in who enters a POW camp, what shape a soldier was in when he entered a POW camp, and how a soldier reacted to camp life. These longitudinal data consist of a full sample of all men within 303 companies (with roughly 100 men in each company).[9] Complete military records are available for these men and they provide information on wartime service and on demographic and socioeconomic characteristics at enlistment. The data are also linked to the 1860 Census, which provides additional information such as the value of personal property for all individuals in the household and literacy, and which allows us to infer marital status.[10]

Within the longitudinal data we have 3,175 cases of captivity with known dates of capture and of release or death for 3,040 men.[11] We know which prison a man entered and on what date, whether he survived or whether he died, and how many men from his company were in the prison with him on any given day. We are not assuming that POWs are a random subset of soldiers. If a subset of men "fight to the death" we would never see them in a POW camp. Thus, we are less likely to sample the most ideological men.

In our analysis we exclude one company (Company I of the 16th Illinois regiment) as an outlier, leaving us with 3,026 cases of captivity for 2,972 men.[12] Forty-five of the men in this company were captured together (and more were captured at a later date) and mortality rates were high. While we suspect that there are some nonlinearities in the effect of the number of friends, we cannot test for this because we do not have enough companies where many men were captured together. The next largest company in captivity was one of 24 men, and for 75 percent of the data only 6 or fewer men were together in captivity at any time.

We use the longitudinal data to estimate a hazard model of days until death, censoring on release from captivity.[13] Men's spells will be truncated by exchange or the end of the war and their stays in any single POW camp by transfers. We estimate an exponential hazard function such that the hazard at time t is

$$h(t) = exp(\beta_1 F + \boldsymbol{\beta_2 I} + \boldsymbol{\beta_3 M}), \tag{4}$$

where F is the number of friends (defined as members of the same company) and the remaining control variables are a vector of individual

[9] The data are available at http://www.cpe.uchicago.edu and were collected by a team of researchers led by Robert Fogel. The sample of 35,570 represents roughly 1.3 percent of all whites mustered into the Union Army and 8 percent of all regiments that comprised the Union Army. Ninety-one percent of the sample consists of volunteers, with the remainder evenly divided between draftees and substitutes. The data are based on a 100 percent sample of all enlisted men in 331 randomly chosen companies. Our sample is limited to 303 companies because complete data have not yet been collected on all 331 companies.

[10] This linkage allows us to determine that the sample is representative of the Northern population of military age in terms of 1860 real estate and personal property wealth, and in terms of literacy rates.

[11] Because of the system of prisoner exchange (and the hope that it would be revived), the South had an incentive to record information on men who were captured.

[12] This company was not an outlier in terms of other observable characteristics.

[13] We use an exponential hazard model because when we used a Weibull hazard we found that the hazard was constant.

characteristics ($\boldsymbol{I}$) and an indicator of macro camp conditions (M). The variable M varies by month and, as discussed below, we will use both a measure of F that varies by month (and by camp) and a measure of friends in the initial POW camp. The number of friends could either reduce ($\beta_1 < 0$) or increase mortality rates ($\beta_1 > 0$) because although friends provide assistance, they are also sources of local contagion, particularly since men slept huddled together for warmth. As a measure of camp conditions, we will primarily be using camp and month dummies.[14] However, we can also proxy for camp congestion by using the number of prisoners in camp in each month.

Using the longitudinal data, we cannot observe idiosyncratic networks formed outside the company. Men who are in a POW camp with no one else from the same company have the greatest incentive to seek out new friends. This implies that observed friends, F, is likely to be negatively correlated with unobserved "new" friends. In this case, our estimate of β_1 in equation (4) underestimates the true effect of friends on survival probabilities.

Our first estimation strategy allows the number of friends in equation (4) to vary by month. The number of friends changes because of death, because the POW is transferred elsewhere, because friends are transferred elsewhere, or because men from the same company are transferred in, either from other prison camps or as new captures. (The next section discusses the determinants of the number of men a POW is caught with.) We interpret the estimate of β_1 in equation (4) as reflecting both exogenous and endogeneous social interactions (Charles F. Manski 1993; Robert A. Moffitt 2001). A POW may become depressed if all his friends die (an endogenous social interaction). The characteristics of his friends (e.g., their skills or other endowments) could also affect his survival probabilities (an exogenous social interaction). Because the contemporaneous number of friends could capture the lagged mortality for the group (an endogenous social interaction), we turn to our second estimation strategy. In this case, the presence of friends would predict survival, but this could just be a reflection of own unobserved health.[15]

Our second estimation strategy avoids the reflection problem by using the number of men in the initial camp as a proxy for friends.[16] A POW with a greater initial endowment of friends is "richer," and even if he later loses friends, he may still have a greater chance of survival because of initial effects on health. While the initial number of friends is more defendable as an exogeneous variable, it ignores the variation in the size of the network due to deaths, transfers, and exchanges.

Our third estimation strategy allows the number of friends to vary by month, but instruments for the number of friends with the number of net transfers into a camp and with a dummy variable indicating whether or not the POW was transferred, controlling for company fixed effects. Within a company, newly captured men and previously captured men who were transferred because the Union Army was threatening a location arguably provide a source of exogenous variation in the number of friends.[17]

Our first two estimation strategies assume that the number of friends is uncorrelated with a POW's unobserved health or with his will to live. We can control for a rich set of prewar covariates and also for war experience prior to entering the camp. We control for company death rates prior to capture as a measure of hardships endured prior to capture. Individual characteristics that we control for include age, whether the soldier was wounded ten days before capture, whether the soldier enlisted in a large city (a measure of prior disease exposure), the soldier's occupation at enlistment (since artisans and professionals may have had skills

[14] Unfortunately, climate data are unavailable because weather stations in the South were shut during the Civil War.

[15] If all companies had the same initial friend count and there were no transfers in or out, there would be a one-to-one mapping between a company's death rate and the contemporaneous friend count.

[16] Another possibility would be to use the number of friends in each camp, but friends might not be transferred because of their death or because they are too sick too move.

[17] We recognize that if only those who could walk could be transferred, the characteristics of friends who were transferred in may differ from those of friends who were already there. Our IV strategy assumes that a POW's unobserved health is uncorrelated with transfer status.

that were either marketable in the camp or that were needed by the Confederacy), his family wealth in 1860 as stated in the Census (a soldier who could hide money or other valuables could buy food and clothing from the guards or from other prisoners), and his height, both an indicator of his health during his growing years and of his caloric needs while in the POW camp. In Section V we examine how the observable characteristics of POWs with many friends differed from those with few friends.

What is novel and unusual about our mortality specification is examining the impact of friends; unfortunately, our longitudinal sample is too small to examine the effect of the quality of the network (e.g., how close individuals are to each other) on survivorship, and our longitudinal data do not allow us to examine networks outside the company. We can, however, augment our analysis with cross-sectional data on the single largest POW camp—Andersonville, which held roughly 17 percent of all men who were ever POWs.

The National Park Service's Andersonville database contains 35,323 men and was drawn from such disparate sources as the lists of the dead and published state muster rolls.[18] While the sample does not cover the entire population of Andersonville (and probably never can, given the lack of complete records), it comes close. An estimated 45,000 men passed through Andersonville (United States War Department (1880–1901), Series II, Vol. VIII, 789). The data provide information on the soldier's name, rank, regiment, and company. Because the data provide only incomplete records on camp entry and exit dates, we cannot turn it into longitudinal data.[19] We collected company information for 3,110 of the men from the National Park Service's online Soldiers and Sailors system, giving us a total of 31,688 men with complete company information in 1,570 regiments and 7,451 companies. We infer town or county of origin from where the regiment was organized, using Frederick H. Dyer (1908). Our longitudinal data show that roughly 70 percent of men enlisted in the town they lived in, in 1860. We inferred ethnicity from the soldier's last name. (Details and a discussion of measurement error are available in the Data Appendix.)

The data on the entire population of Andersonville suggest that there are some nonlinearities in the relation between survival and the number of friends. However, the nonlinearities arise only because of two companies of Massachusetts Heavy Artillery that were part of the "Plymouth Pilgrims" (so called because they were guarding Plymouth, South Carolina). The entire companies were captured (one company of 153 men and another of 115 men) and suffered unusually high mortality. According to McElroy (1954, 41), "They gave up the moment the gates were closed upon them and began pining away."[20] The number of men from the same company in Andersonville tends to be much smaller. The next biggest company was one of 78 men, and for 90 percent of the data, the number of men from the same company was 40 or fewer. Therefore, for ease of comparability with the longitudinal data, we exclude two companies in the Andersonville data as outliers and mainly focus on regression results in which the number of friends is entered as a linear term. However, we also show the nonlinearities that arise when we include these two companies.

The Andersonville data provide us with a rich set of social network measures. We use as measures the number of men in the company, the number of men in the regiment, the number of men of the same ethnicity in the company, the number of men with the same last name in the regiment (a measure of kinship), and the fraction of men in the same company with a rank of sergeant or higher (a measure of how well the company's command structure was preserved).

We use the cross-sectional Andersonville data to estimate a probit model of the probability of survival as a function of the number of friends and of demographic characteristics. That is, we estimate the probability of survival, S, as

$$\Pr(S = 1) = \Phi(\boldsymbol{\beta}_1 \boldsymbol{F} + \boldsymbol{\beta}_2 \boldsymbol{I}), \tag{5}$$

[18] A searchable version of the database is available online as part of the Soldiers and Sailors system at http://www.itd.nps.gov/cwss.

[19] Capture dates are provided but these are not the same as camp entry dates. Death dates are also provided but not the dates when men were transferred out of Andersonville.

[20] These two companies were captured in April of 1864. The proportion of company that had died by the end of July, August, and September was 9, 25, and 38 percent, respectively, for a total mortality rate of 48 percent.

where $\boldsymbol{F}$ is a vector of the number of friends and $\boldsymbol{I}$ is a vector of individual characteristics. We examine the quality of the network by running regressions of the form

$$\Pr(S = 1) = \Phi(\boldsymbol{\beta}_1 \boldsymbol{F}_i + \boldsymbol{\beta}_2 \boldsymbol{F}_{ij} + \boldsymbol{\beta}_3 \boldsymbol{I} | \text{ethnicity} = j). \tag{6}$$

By using the total number of friends who were ever in the camp, we are using a measure of the maximum possible number of friends.[21] These static regressions therefore underestimate the effect of friends on survival rates because we can observe only the total number of friends who were ever in the camp, but the network varies over time.

IV. POW Characteristics

Our longitudinal data allow us to examine heterogeneity in who became a POW. Table 1 shows that men who were POWs were more likely to be volunteers, to have enlisted earlier (1862), to be slightly better off, and to be from companies that experienced higher death rates, as might be expected from men who were captured in the field. When we run a probit in which the dependent variable is POW status and the independent variables are individual economic and demographic characteristics and the number of men in the company who were ever wounded or who ever died, we find that these two company characteristics were the main predictors of POW status. The derivative on the number of men in the company who ever died was 0.257 (robust $\hat{\sigma} = 0.257$) and the derivative on the number of men who were ever wounded was 0.139 (robust $\hat{\sigma} = 0.042$).

Why did some POWs have many friends at the beginning of captivity and others few? Men who were caught on scouting missions and men who became lost on the battlefield in the haze and smoke were more likely to be caught alone whereas those who surrendered were more likely to be caught together (and the surrender decision would be made by the commanding officers). Men who charged ahead of their comrades or those too slow to run away when a retreat was sounded would be caught by the enemy. The largest numbers of men surrendering together would be the defenders of a fort, not men on the battlefield. While these men might be healthier if they had not experienced prolonged campaigning, they might never have "toughened up." Friends would then be lost to transfers.

We do not know how most men were caught, but we can compare those caught in the company of several friends with those caught with few friends. Table 2 shows that men who had three or more friends (men from the same company) in the same camp in their first two weeks of captivity were more likely to be US-born, come from wealthier households, and were less likely to have been wounded ten days before capture (we expect that men who were wounded on the day of captivity are most likely undernumerated). The companies that these men came from did not differ in battlefield experience from the companies of men with few friends, nor did they differ in terms of birth place or occupational heterogeneity. When we ran an OLS regression of the number of friends on the covariates we later use in our hazard specification, we found that professionals and proprietors, the Irish, older men, and the recently wounded were less likely to have many friends, whereas those from a large city had more friends.[22] Because, as we discuss in the next section, those with no friends do not die off immediately, we doubt having few friends at camp entry proxies for poor unobservable health. We will also present evidence controlling for company fixed effects and therefore for company-wide hardships. We also found no evidence of group surrender to become a POW—men who were captured in 1864 and 1865 had more friends, even though a group who surrendered during these years would have no hope of a quick exchange.

V. POW Survival Results

A. Evidence from Longitudinal Data

The top panel of Figure 1 shows the Kaplan-Meier hazard rates for the longitudinal data for

[21] Only in 62 percent of all cases do we observe that two or more men from the same company have the same capture year and month.

[22] The coefficient on recently wounded was −0.879 ($\hat{\sigma} = 0.397$).

TABLE 1—CHARACTERISTICS OF SOLDIERS BY POW STATUS

	All	*POW*	*Never POW*
US born	0.745	0.746	0.743
Irish	0.087	0.086	0.102
German	0.074	0.075	0.062
British	0.039	0.039	0.034
Other	0.054	0.055	0.043
Artisan	0.200	0.199	0.212
Farmer	0.506	0.505	0.507
Professional or proprietor	0.075	0.077	0.061
Laborer	0.212	0.212	0.212
Unknown	0.007	0.007	0.008
Enlisted in 1861	0.210	0.205	0.263
Enlisted in 1862	0.344	0.331	0.487
Enlisted in 1863	0.068	0.066	0.087
Enlisted in 1864	0.256	0.266	0.147
Enlisted in 1865	0.122	0.132	0.009
Volunteer	0.909	0.905	0.951
Height in inches	67.600	67.589	67.708
Household property income in 1860	533.913	531.468	558.200
Company birthplace fragmentation	0.642	0.644	0.620
Company occupation fragmentation	0.559	0.558	0.570
Fraction company died as non-POWs	0.133	0.132	0.156
Sample size	35,570	32,395	3042

Notes: All tabulations are from our longitudinal data. POWs with missing capitivity dates are excluded from the POW sample. To estimate company birthplace fragmentation, we calculated, by company, the fraction of individuals born in the United States in New England, in the Middle Atlantic, in the East North Central, in the West North Central, the Border states, the South, and the West and born abroad in Germany, Ireland, Canada, Great Britain, Scandinavia, northwestern Europe (France, Belgium, Luxembourg, the Netherlands), other areas of Europe, and other areas of the world. Our birthplace fragmentation index, f_i, is then

$$f_i = 1 - \sum_k s_{ki}^2,$$

where k represents the categories and where s_{ki} is the share of men of born in place k in company i. To estimate company occupational fragmentation, we calculated, by company, the fraction of individuals who were farmers, higher-class professionals and proprietors, lower-class professionals and proprietors, artisans, higher-class laborers, lower-class laborers, and unknown. Our occupational fragmentation index is then calculated similarly to our birthplace fragmentation index.

the sample as a whole, and the bottom panel shows the lower survival rates for those captured late (July 1863 or later) once the exchange system had stopped. The top panel of Figure 2 shows the lower survival rates among late captures for the 554 men at Andersonville compared to men who were at other camps. The bottom panel of Figure 2 shows that, among men who were at Andersonville and who were captured in 1864, survival rates were higher for those with ten or more friends at camp entry (26 percent of the sample) compared to those with fewer friends. When we compared survival rates of those with no friends to the survival rates of those with more friends, we found that the hazard rate of those with no friends diverged only after 50 days.

The longitudinal data show that the number of friends reduced mortality, regardless of whether we use the contemporaneous number of friends or the initial number of friends. Both an additional contemporaneous friend and an additional initial friend led to a mortality hazard that was 0.98 times lower (see Table 3). As the number of friends increases from 0 to 5, the predicted probability of death, using the second specification in Table 3, decreases from 0.31 to 0.28, and as the number of friends increases to 10, the predicted mortality probability falls to 0.26. (The mean number of friends in each month was 5.6, with a standard deviation of 9.2, and the median was 2.) Assuming that the value of life circa 1860 was around 152 to 456 thousand 2005 dollars (Costa and Kahn 2004), the value

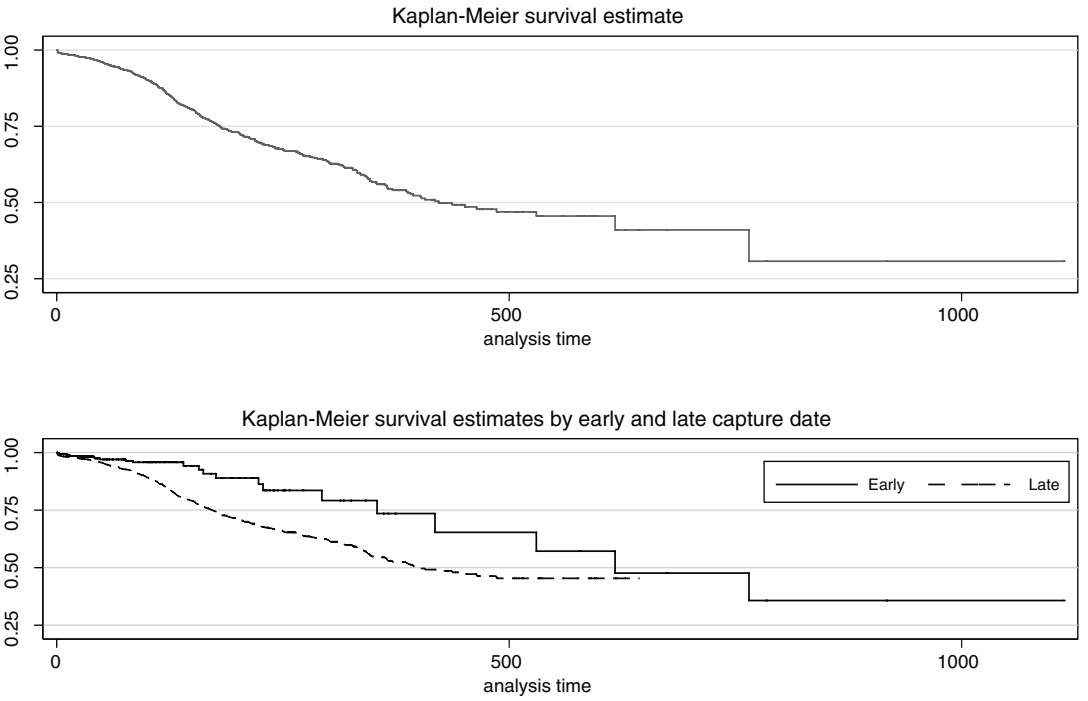

FIGURE 1. SURVIVAL RATES, OVERALL AND BY CAPTURE DATE

Notes: Estimated from the longitudinal data. An early capture date is before July 1863.

of a friend was around 900 to 2,700 2005 dollars. Even when we included state of regiment fixed effects, the hazard ratio on the number of friends remained virtually unchanged (e.g., the hazard ratio on the initial number of friends was 0.976, $\hat{\sigma} = 0.009$). Our experiments with splines suggested that the marginal effect of a friend on survival was greater for the first two friends than for more.[23]

We found that camp level contagion, that is the total number of men in the camp, increased mortality. Using the second specification in Table 3, a one-unit increase in the logarithm of the number of men in the camp increased the mortality hazard 1.5 times and a one-unit increase in the fraction of friends dying in the previous month increased the mortality hazard 5.9 times. An increase in the number of men from 7,500 to 15,000 and then to 30,000, as happened at Andersonville, increased the predicted probability of death from 0.17 to 0.21 and then to 0.26. How many friends were needed to compensate for these mortality increases? As the number of men in the camp rose from 7,500 to 15,000, the number of friends needed to keep mortality rates constant was 15, far above the median number.

The regressions show that individual characteristics affected survival. A corporal, sergeant, or officer faced an odds of death 0.5 times that of a private; a professional or proprietor faced an odds of death 0.5 to 0.6 times that of a farmer, and a laborer faced an odds of death 1.3 to 1.5 times higher than that of a farmer. The US-born and the German-born were more likely to die than those born in foreign countries other than Germany. Age increased mortality rates. When we controlled for state fixed effects (not shown), we found that the tall were more likely to die,

[23] The hazard rate on the marginal effect of fewer than three friends was 0.956 ($\hat{\sigma} = 0.044$) and the hazard rate on the marginal effect of three or more friends was 0.980 ($\hat{\sigma} = 0.011$). Although the first hazard rate was not statistically significantly different from one, the two terms together were jointly significant.

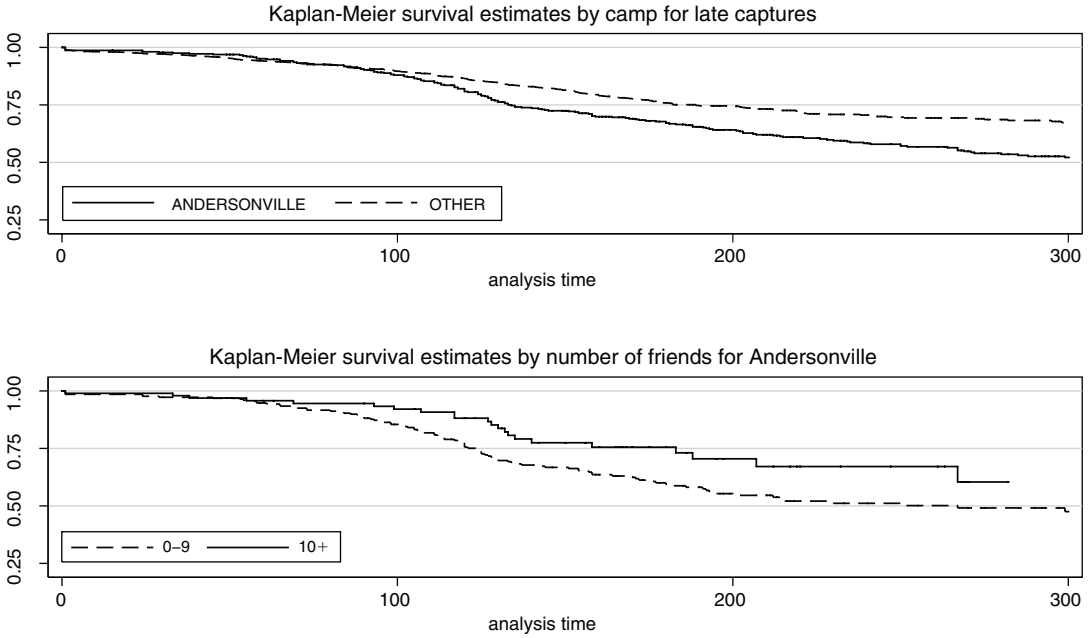

FIGURE 2. SURVIVAL RATES, BY CAMP AMONG MEN CAPTURED LATE AND BY NUMBER OF FRIENDS AMONG MEN AT ANDERSONVILLE CAPTURED IN 1864

Notes: Estimated from the longitudinal data. The number of friends is the number of friends upon entry into Andersonville. A late capture date is July 1863 or later. Time was truncated at 300 days because there were few observations beyond 300 days.

probably because they could not subsist as well as the short on meager rations. We did not find that company-level stress, as measured by the fraction of the company dying before captivity, mattered. Our other covariates (not shown), including wealth, marital status, literacy, whether or not the soldier was wounded 10 days before capture, and size of city of enlistment, were not statistically significant predictors of mortality. Interactions of individual characteristics with the number of friends were statistically insignificant.

When we use a Weibull rather than an exponential specification, we found no evidence of duration dependence—the survivors did not toughen up and become less likely to die after their initial time in the POW camps, nor did they become weaker and more likely to die after their time in the camps.[24] When we included dummy variables in our specifications indicating that an individual had survived 1, 2, 3, and 4 or more months, we found that those who had survived one or two months were less likely to die than those still in their first month of captivity, but that the advantage of having survived a third month was small and there was no advantage to having survived a fourth month.[25] We found no evidence of individual level heterogeneity when we reestimated our specifications modeling unobserved heterogeneity by introducing an unobserved multiplicative effect on the hazard function. We suspect that in an environment where malnutrition and infectious diseases that are not immunity dependent are endemic, past experiences may have provided very little protection.

[24] Our results remained unchanged when we split the sample into the exchange and post-exchange periods, suggesting that our results are not driven by bias introduced from exchanges cutting short the duration of the sick.

[25] We also investigated the use of a Cox proportional hazard model to allow the baseline hazard to rise or fall in any month. Controlling for camp conditions, we obtained a statistically insignificant hazard ratio on friends of 0.987 ($\hat{\sigma} = 0.009$). We suspect that we are losing power because of our small sample size.

Table 2—Characteristics of POWs by Number of Friends in First Two Weeks of Captivity

	All		No. of friends < 3		No. of friends ≥ 3	
	Mean	Std. err.	Mean	Std. err.	Mean	Std. err.
US born	0.731	0.444	0.708	0.455	0.754	0.431
Irish	0.120	0.325	0.115	0.319	0.125	0.331
German	0.063	0.245	0.081	0.273	0.045	0.207
British	0.034	0.182	0.042	0.201	0.026	0.160
Other	0.050	0.217	0.053	0.223	0.047	0.211
Artisan	0.209	0.407	0.214	0.410	0.204	0.403
Farmer	0.421	0.494	0.440	0.500	0.401	0.490
Professional or proprietor	0.070	0.256	0.077	0.266	0.064	0.245
Laborer	0.266	0.442	0.243	0.429	0.288	0.245
Unknown occupation	0.034	0.182	0.025	0.157	0.044	0.204
Enlisted in city of over 50,000	0.475	0.450	0.493	0.500	0.457	0.498
Household property income in 1860	576.475	1855.699	483.609	1084.987	661.771	2348.676
Age when captured	25.960	7.056	26.645	7.415	25.265	6.604
Height when captured	171.576	6.612	171.790	6.394	171.356	6.833
Commissioned or noncommissioned officer	0.076	0.266	0.083	0.276	0.070	0.255
Married in 1860	0.257	0.437	0.276	0.448	0.239	0.427
Wounded 10 days before capture	0.118	0.323	0.148	0.356	0.088	0.284
Fraction company dead before capture	0.089	0.064	0.093	0.070	0.085	0.057
Company birthplace Fragmentation	0.542	0.200	0.547	0.193	0.536	0.206
Company occupational Fragmentation	0.596	0.173	0.586	0.173	0.607	0.172

Notes: All tabulations are from our longitudinal data. The number of friends refers to the number of friends who were in the camp with the POW in the first two weeks of captivity. The data are for the subset of POWs for whom we know the POW camp and exclude the one outlier company. The total number of observations is 1923. See the notes to Table 1 for a definition of birthplace and occupational fragmentation.

Throughout this section we have assumed that the number of friends is an exogenous variable and is uncorrelated with the unobserved characteristics of the prisoner. We recognize, however, that *within a company* the number of friends may merely reflect mortality conditions in the camp (the number of friends falls as mortality rates rise) and therefore an individual's unobserved health.[26] We therefore instrument for the number of friends in each month with new transfers into the camp and with a dummy variable equal to one if the POW were transferred, using a control function approach (Newey, Powell, and Vella 1999) and estimating an equation similar to the second specification of Table 3, augmented with company-specific fixed effects. As new men are transferred in, the number of friends increases but mortality conditions in the camp remain the same (or may even worsen). Being transferred to a camp may either increase or decrease the number of friends, but the change in the number of friends will not affect the POW's unobserved health.

Table 4 shows that the number of friends in a company continues to have a positive and statistically significant effect on reducing mortality, even when we control for company fixed effects and when we instrument using transfers. When we do not instrument but control for company fixed effects, we obtain a hazard ratio of 0.98 on the number of friends. When we instrument we find that in our first-stage regression our R^2 was greater than 0.5 and in our second-stage regression the hazard ratio on the number of friends was 0.90. While this estimate is high, it reflects both the effects of a bigger network and an income effect if the newly captured entered the camp with better health and physical capital. Instead of running IV estimates, we also

[26] For a POW who is not transferred, the number of friends (F) at time t can be written as $F_t = (1 - \phi)\, F_{t-1} + \Delta T$, where ϕ is the fraction of friends who died in the previous month and ΔT is net transfers into the camp.

TABLE 3—SOCIAL NETWORKS AND INDIVIDUAL CHARACTERISTICS ON MORTALITY

	(1)		(2)		(3)	
	Haz. rate	Std. err.	Haz. rate	Std. err.	Haz. rate	Std. err.
Contemporaneous number of friends	0.983†	0.008	0.977†	0.009		
Initial number of friends					0.976†	0.008
Log (total number of men in the camp)			1.536†	0.140	1.521†	0.139
Fraction company dying before capture	1.091	0.782	0.892	0.636	0.630	0.449
Dummy = 1 if occupation at enlistment						
Farmer						
Professional or proprietor	0.567†	0.146	0.563†	0.143	0.556†	0.141
Artisan	0.944	0.119	0.947	0.119	0.937	0.117
Laborer	1.298†	0.154	1.295†	0.152	1.287†	0.152
Dummy = 1 if born in						
US						
Germany	1.197	0.215	1.167	0.209	1.149	0.206
Ireland	0.768*	0.121	0.762*	0.118	0.750*	0.116
Great Britain	0.641*	0.171	0.654	0.174	0.656	0.177
Other foreign country	0.658*	0.154	0.645†	0.153	0.642*	0.151
Dummy = 1 if sergeant, corporal, or officer	0.549‡	0.115	0.543‡	0.111	0.541‡	0.111
Age at captivity	1.045‡	0.007	1.044‡	0.007	1.044‡	0.007
Height at enlistment	1.010	0.007	1.010	0.007	1.011	0.007
Log pseudo likelihood	−1324.607		−1308.229		−1307.170	

Notes: Estimated from the longitudinal data. The number of friends is the number of men in the company in the same POW camp in the same month. Additional controls include the logarithm of household personal property wealth, a dummy equal to one if married, a dummy equal to one if illiterate, a dummy equal to one if wounded 10 days before captivity, a dummy equal to one if the individual enlisted in a city of 50,000 or more, year dummies, month dummies, 11 camp dummies (including a dummy indicating that camp information is missing), dummies indicating if rank, occupation, illiteracy information, and deaths in the previous month are missing, a dummy indicating if the soldier was not linked to the 1860 Census, a dummy indicating if the number of friends is unknown, and a dummy indicating if the total number of men in the camp is unknown. When the number of friends is unknown (either because the camp is unknown or because dates are unknown) the number of friends is set equal to 0. When the total number of men in the camp is unknown the value is set equal to 40. When the number of deaths in the previous month is missing the value was set to 0 (this includes the cases where the POW had no friends). 3,026 observations. The symbols ‡, †, and * indicate that the hazard ratio differs from one at the 1, 5, and 10 percent level of statistical significance.

estimated the effect of having a friend transferred in. We obtained a hazard coefficient on friends transferred of 0.957 ($\hat{\sigma} = 0.020$).

How did friends affect survival? Was it through their provision of food, care, or moral support? Unfortunately, we cannot tease out the precise causal mechanism because we do not have information on the daily consumption of each prisoner. If we had, we could have used full insurance tests to see if group-level consumption growth was a sufficient statistic for individual consumption growth and we could have tested whether individual consumption was increased to offset health shocks.

B. *Cross-Sectional Andersonville Data*

A weakness of our longitudinal data is that because they do not provide a census of a POW camp, we may miss existing networks outside of the company, such as those based on hometown. Fortunately, the Andersonville data allow us to test a variety of hypotheses concerning how different networks affect survival (see Table 5). An additional POW from the same regiment increased a POW's own survival probability by only 0.0004 in a sample where the overall probability of survival was 0.59. An additional POW from the same company increased a POW's own survival by 0.003, and an additional POW of the same last name within the same regiment, a measure of kinship, raised survival by 0.034.[27] We also find that among men from

[27] We can use the longitudinal data to test our claim that, by using the maximum possible number of men who were ever in the camp, we are underestimating the effect of friends on mortality. When we run a hazard model of the

TABLE 4—EFFECT OF SOCIAL NETWORKS ON MORTALITY, WITH COMPANY FIXED EFFECTS AND INSTRUMENTED

			IV	
	Haz. rate	Std. err.	Haz. rate	Std. err.
Number of friends	0.978*	0.012	0.895†	0.055
Log (total number of men in the camp)	1.437‡	0.122	1.537‡	0.196
Residual			1.106†	0.071

Notes: The instruments are time-varying and are a dummy for whether the soldier was transferred and the count of men in his company transferred into the camp. All regressions contain company fixed effects and all of the variables are used in the second specification in Table 3, with the exception that instead of the full set of camp dummies only an Andersonville dummy is used. The number of friends is the number of friends in the same POW camp in the same month. The regressions exclude observations where the number of friends is unknown because the camp is unknown or because dates within the camp are unknown. The total number of cases of captivity is therefore 1,824. We report bootstrap standard errors for the IV regressions. The symbols ‡, †, and * indicate that the hazard ratio differs from 1 at the 1, 5, and 10 percent level of statistical significance.

smaller towns, survival was higher the greater the number of POWs from the same town. We do not find any mortality differences between companies where men were captured together and companies where they were not captured together, suggesting that friendships with men who were familiar with camp ways or who had favorable squatters' rights within the camp were not the main benefits of friendship.

The relationship between friends and survival is nonlinear when we include our two outlier companies (see Table 6). We find that the logarithm of the number of men from the same company is statistically significant, with a derivative on the coefficient of 0.019 ($\hat{\sigma} = 0.007$). Our results are robust to including state of origin fixed effects.[28] When we restricted the sample to exclude deaths after September 1864 and captures prior to October 1864 because only the dying may have been left at Andersonville once men were transferred out, our results remained unchanged. The derivative of the coefficient on the number of men in the company was 0.003 ($\hat{\sigma} = 0.001$) and the derivative of the coefficient on the number of men in the regiment with the same last name was 0.035 ($\hat{\sigma} = 0.007$).

Ethnic similarity between men within the same company reduced mortality, suggesting that the quality of social networks matters (see Table 7). Among the Irish, the Germans, and the French (or French Canadian), an additional POW from the same company increased survival by roughly 0.002 to 0.003. But, an additional POW in the same regiment who was Irish increased the survival of the Irish by 0.030; an additional POW in the same regiment who was German increased the survival of the Germans by 0.030; and, an additional POW in the same regiment who was French increased the survival of the French by 0.019.[29] These results bolster the recent theoretical literature emphasizing the importance of group loyalty as a determinant of choices and economic outcomes (Akerlof and Kranton 2000).

We can test for one more indicator of network quality. For each company, we know what share of men in the camp had the rank of sergeant or higher from the same company. All else equal, a 10 percentage point increase in the fraction of higher-ranked men raised survival by 1.2 percentage points (see Table 5). We hypothesize that in these companies organizational capital was preserved through the chain of command. The fraction of sergeants or higher rank is not a reflection of own officer mortality. When we restricted the sample to privates, we found that the derivative of this coefficient was 0.115 ($\hat{\sigma} = 0.054$).[30]

form given in column 1 of Table 3, and instead of using the number of men in the same company in the camp in each month, use the maximum number of men in the same company in the camp, we obtain a hazard ratio of 0.986 on the number of friends rather than a ratio of 0.983.

[28] When we include regiment fixed effects, our coefficient on the number of men in the company falls to 0.0002 ($\hat{\sigma} = 0.0004$) and our coefficient on the number of men with the same last name falls slightly to 0.0221 ($\hat{\sigma} = 0.0047$). When we use the logarithm of the number of men in the company rather than the number of men, we obtain a statistically borderline insignificant coefficient.

[29] There were too few colored troops at Andersonville to examine their social networks. We found no mortality difference between the nonofficers of the colored troops and the rest of the Andersonville population.

[30] The Andersonville data show that officers had a distinct mortality advantage. According to Marvel (1994, 112), most of the officers in the Andersonville stockade, except for the officers of the few colored troops who were there, "still wore sergeants' stripes, either because their commis-

TABLE 5—EFFECT OF SOCIAL NETWORKS ON PROBABILITY OF SURVIVAL

					From small town	
	Mean	$\frac{\partial P}{\partial x}$	$\frac{\partial P}{\partial x}$	$\frac{\partial P}{\partial x}$	$\frac{\partial P}{\partial x}$	$\frac{\partial P}{\partial x}$
Number of men in regiment ÷ 10	9.157 (10.358)	0.004‡ (0.001)				
Number of men in company	12.899 (15.390)		0.003‡ (0.001)	0.002‡ (0.001)	0.003‡ (0.001)	0.002‡ (0.001)
Fraction of company with rank sergeant or higher	0.073	0.120‡ (0.034)	0.128‡ (0.034)	0.079‡ (0.032)	0.152* (0.061)	0.085 (0.056)
Number of men with same last name in regiment	1.190 (0.599)	0.033‡ (0.007)	0.033‡ (0.007)	0.036‡ (0.006)	0.018† (0.009)	0.023‡ (0.009)
Log (number of men in camp from same town)	5.101 (1.994)	−0.003 (0.005)	−0.002 (0.005)	0.000 (0.005)	0.018† (0.009)	0.026‡ (0.008)
Dummy = 1 if town population < 9552	0.423	0.037‡ (0.014)	0.034‡ (0.014)	0.032‡ (0.013)		
Private	0.824					
Officer	0.003	0.347‡ (0.027)	0.347‡ (0.027)	0.354‡ (0.021)	0.311‡ (0.038)	0.328‡ (0.025)
Sergeant	0.068	0.080‡ (0.011)	0.080‡ (0.011)	0.083‡ (0.011)	0.084‡ (0.017)	0.088‡ (0.018)
Other rank	0.010	0.028	0.034	0.030	0.067	0.046
Corporal	0.078	0.055‡ (0.030)	0.055‡ (0.030)	0.046‡ (0.030)	0.064‡ (0.049)	0.054‡ (0.050)
Irish surname	0.023	0.020 (0.019)	0.022 (0.019)	0.017 (0.019)	0.069† (0.030)	0.059* (0.030)
German surname	0.043	−0.009 (0.015)	−0.009* (0.015)	−0.016 (0.015)	−0.001 (0.024)	−0.025 (0.025)
French surname	0.028	0.028 (0.017)	0.028 (0.017)	0.028 (0.017)	0.033 (0.027)	0.032 (0.028)
Continental surname	0.029	0.006 (0.018)	0.007 (0.018)	−0.004 (0.018)	−0.021 (0.032)	−0.029 (0.032)
State fixed effects?		N	N	Y	N	Y
Pseudo R^2		0.043	0.044	0.087	0.048	0.115
Observations	31,336	31,336	31,336	31,330	12,002	12,002

Notes: Estimated from the Andersonville data, excluding the two outlier companies. Additional control variables include year of capture dummies, a dummy variable indicating whether the regiment's town of formation was unknown, and a dummy variable indicating whether year of capture was unknown. Standard errors, clustered on the company, in parentheses. The symbols ‡, †, and * indicate that the coefficient is different from 0 at the 1, 5, and 10 percent level of statistical significance. A small town is defined as one of fewer than 9,552 persons and one that excludes the large military camps in Springfield, IL, and Readville, MA.

VI. Costs of Social Networks

We have stressed that social networks assisted survival in POW camps because of the care that friends provided. But, there could be a "dark" side to this care if the most effective groups were gangs who robbed and murdered their fellow prisoners. Sneden (2000, 235) described the Andersonville Raiders as being "all strong, as they bought food from the sutler and other dealers with stolen money, or robbed some poor prisoner of his whole stock of food." Although we cannot observe how friends assisted survival, we do not observe a decline in deaths in the Andersonville data after July 11, 1864, when six of the Raiders were hanged. One implication of the gangs hypothesis is that there are increasing returns to friends; in a zero-sum game for calories within the camp, bigger groups could

sions had arrived at regimental headquarters after they were captured or because they had not yet been mustered in." Other officers were kept in a nearby pen called Castle Reed (Speer 1997, 261). Only one officer in the Andersonville data was listed as being kept at Castle Reed. Those with a rank of lieutenant or higher had a death probability that was 0.31 to 0.35 lower than that of privates. Even sergeants and corporals had a mortality probability that was lower by 0.08 and 0.05, respectively, than that of privates.

TABLE 6—EFFECT OF SOCIAL NETWORKS ON PROBABILITY OF SURVIVAL, LOGARITHMIC FORM

					From small town	
	Mean	$\frac{\partial P}{\partial x}$	$\frac{\partial P}{\partial x}$	$\frac{\partial P}{\partial x}$	$\frac{\partial P}{\partial x}$	$\frac{\partial P}{\partial x}$
Log (number of men in regiment)	3.865	0.011†				
	(1.290)	(0.005)				
Log (number of men in company)	2.052		0.019‡	0.010*	0.028†	0.020†
	(1.180)		(0.007)	(0.006)	(0.012)	(0.009)
Fraction of company with rank sergeant or higher	0.072	0.133‡	0.132‡	0.078†	0.151‡	0.078
		(0.035)	(0.034)	(0.032)	(0.061)	(0.056)
Log (number of men with same last name in regiment)	0.113	0.101‡	0.095‡	0.096‡	0.061‡	0.063‡
	(0.305)	(0.012)	(0.012)	(0.011)	(0.018)	(0.017)
Log (number of men in camp from same town)	5.114	0.003	0.000	0.003	0.024‡	0.031‡
	(1.991)	(0.005)	(0.005)	(0.005)	(0.009)	(0.008)
State fixed effects?		N	N	Y	N	Y
Pseudo R^2		0.039	0.040	0.084	0.044	0.113
Observations	31,678	31,678	31,678	31,678	12,025	12,025

Notes: Estimated from the Andersonville data, including the two outlier companies. The same control variables are used as in Table 5. That is, additional control variables include a dummy equal to one if the town population is less than 9,552, rank dummies, ethnicity dummies, year of capture dummies, a dummy variable indicating whether the regiment's town of formation is unknown, and a dummy variable indicating whether year of capture is unknown. Standard errors, clustered on the company, in parentheses. The symbols ‡, †, and * indicate that the coefficient is different from 0 at the 1, 5, and 10 percent level of statistical significance. A small town is defined as one of fewer than 9,552 persons and one that excludes the large military camps in Springfield, IL, and Readville, MA.

steal from smaller groups. Although we cannot formally test the hypothesis that relative size matters because we do not have a census of the camp at different points in time, Table 6 suggests that there are diminishing returns to friends.

Social networks may have imposed costs on their members. One way to survive was to collaborate with the enemy. In the extreme case, this meant joining the Confederate Army. Sneden (2000, 190) commented on one recruitment effort: "If any of us had showed any symptoms of recruiting to the Rebels, he would have been murdered at once by his comrades." Out of our 3,175 cases of captivity in the longitudinal data, we observe only 17 enlistments in the Confederate Army (all out of Salisbury). A probit regression that controls for individual characteristics shows that men who enlisted were more likely to be foreign-born, to be married, to be wealthier, to be nonfarmers, and to have been caught with fewer men. The derivative of the coefficient on number of comrades originally captured with was -0.00015, ($\hat{\sigma} = 0.00001$). Given the small numbers, these results can be only suggestive. Also suggestive of friends not always helping survival is that, among the men at Andersonville, we find no evidence that the number of friends predicted whether an individual was one of the 140 who escaped.

VII. Conclusion

In Civil War camps such as Andersonville, starving men were crowded into a space where "[t]here was hardly any room for all to lie down at night, and to walk a few hundred feet in any direction would require an hour's patient threading of the mass of men and tents" (McElroy 1957, 98). "The dead and dying lie alongside each other" and each day the corpses "piled up near the dead line ... nearly all naked, black as crows, festering in the hot sun all day, covered with lice and maggots" until they were "loaded up in the ration wagon like cordwood …. The ground in the thickest part settled in the camp is fairly alive and moves with maggots or lice" (Sneden 2000, 229). Such horrific conditions made a mockery of survival strategies. In two independent datasets we found that friends had a statistically significant positive effect on survival probabilities, and that the closer the ties between friends as measured by such identifiers as ethnicity, kinship, and the same hometown, the bigger the effect. Although as crowding increased, the accompanying increase in friends could not compensate for the deterioration in camp conditions, it is nonetheless striking that even under such duress, friends continued to have a positive effect on survival probabilities.

TABLE 7—EFFECT OF ETHNIC NETWORKS ON PROBABILITY OF SURVIVAL

	Irish		German		French	
	$\frac{\partial P}{\partial x}$	Std. err.	$\frac{\partial P}{\partial x}$	Std. err.	$\frac{\partial P}{\partial x}$	Std. err.
Number of men in company	0.003†	0.002	0.003†	0.001	0.002	0.002
Number of men of own ethnicity in company	0.030	0.036	0.030†	0.013	0.019	0.026
Dummy = 1 if						
Private	−0.046	0.049	−0.078†	0.037	−0.093†	0.043
From small town	0.100‡	0.040	0.036	0.031	0.054	0.036
Captured 1864 or 1865	0.239‡	0.077	0.282‡	0.049	0.388	0.058
Pseudo R^2	0.036		0.059		0.058	
$\chi^2(2)$ test for joint significance of number of men in company and number of men of own ethnicity	8.60		22.01		3.20	
Observations	735		1355		869	

Notes: Estimated from the Andersonville data. The regressions include a dummy indicating if capture date is unknown. The symbols ‡, †, and * indicate that the coefficient is different from 0 at the 1, 5, and 10 percent level of statistical significance. Standard errors are clustered on the company.

DATA APPENDIX

Longitudinal Data

DEPENDENT VARIABLE

We calculated days from capture until death in captivity. We allowed for censoring by calculating days from capture until exchange, escape, or release. When day (but not month or year) of death, exchange, escape, or release is unknown, we set it equal to 15.

INDEPENDENT VARIABLES

1. **Number of friends.** Number of company members in the camp at the same time. When the number of friends is unknown, either because the camp is unknown or the dates when the POW was in the camp are unknown, the number of friends is set equal to zero and a dummy variable indicating whether or not the number of friends is unknown is set equal to one. The number of friends was more likely to be unknown if the POW was captured before July of 1863—men who were exchanged in the field immediately after capture would never have seen a POW camp.

2. **Number of friends dying in the previous month.** The number of friends in the camp dying in the previous month. If a POW had no friends in the camp in the previous month, the number of friends dying in the previous month is set equal to zero and a dummy variable indicating that the variable is unknown is set equal to one.

3. **Log (total number of men in the camp)**. The logarithm of the total number of men in the camp by month, as found in United States War Department (1880–1901), Series II. When the total number of men in the camp is unknown, the variable is set equal to the logarithm of 40 and a dummy variable indicating that the total number of men in the camp is unknown is set equal to one.

4. **Fraction of company dying before capture**. The fraction of the company dying before the POW's capture.

5. **Camp dummies**. Eleven camp dummies indicating if the camp was Andersonville, Salisbury, Richmond, Danville, one of the Texas camps, one of the Arkansas, Florida, Mississippi, Louisiana, or Alabama camps, one of the other North Carolina or Georgia camps, Charleston or Columbia, Florence, one of the Tennessee or other Virginia camps, and other or unknown.

6. **Year dummies**. Dummy variables indicating the year.

7. **Month dummies**. Dummy variables indicating the month.

8. **Occupation**. Dummy variables indicating whether at enlistment the recruit reported his occupation as farmer, artisan, professional or proprietor, or laborer. Farmers' sons who were not yet farmers in their own right would generally report themselves as farmers.

9. **Birth place**. Dummy variables indicating whether at enlistment the recruit reported his birth place as the United States, Germany, Ireland, Great Britain, or other.

10. **Corporal, sergeant, or officer**. A dummy equal to one if the POW's rank before capture was corporal, sergeant, or officer.

11. **Age at captivity**. Age when captured.

12. **Height in inches**. Height in inches at enlistment preceding capture.

13. **Wounded ten days before capture**. A dummy set equal to one if the POW was wounded ten days before capture.

14. **Enlisted in large city**. A dummy equal to one if the POW enlisted in a city of 50,000 or more (one of the 13 largest cities in the United States).

15. **Married in 1860**. This variable is inferred from family member order and age in the 1860 Census. This variable was set equal to zero if the recruit was not linked to the 1860 Census.

16. **Log (total household personal property) in 1860**. This variable is the sum of personal property wealth of everyone in the recruits' 1860 household. This variable is set equal to zero is the recruit was not linked to the 1860 Census.

17. **Missing census information**. A dummy equal to one if the recruit was not linked to the 1860 Census. Linkage rates from the military service records to the 1860 Census were 57 percent. The main characteristic that predicted linkage failure was foreign birth.

18. **Illiterate**. This variable is from the 1860 Census and provides illiteracy information only for those age 20 and older.

19. **Missing illiteracy information**. A dummy equal to one if we do not know whether the recruit was illiterate, either because he was not linked to the 1860 Census or because he was less than age 20 in 1860.

Andersonville Database

DEPENDENT VARIABLE

Our dependent variable is a dummy equal to one if the POW died at Andersonville.

INDEPENDENT VARIABLES

1. **Number of men in the regiment**. The number of men in the regiment excluding the POW's own company.

2. **Number of men in company**. The number of men in the POW's own company.

3. **Fraction of company with rank sergeant or higher**. The fraction of men in the company with rank of sergeant or higher.

4. **Number of men with same last name in the regiment**. The number of men in the regiment with the same last name. Because regiments were formed locally, we interpret this variable as a measure of kinship.

5. **Log (number of men in camp from same town)**. The logarithm of the number of men in the camp from the same town, where same town refers to the town where the regiment was formed.

6. **Dummy if town population $<$ 9,552**. A dummy equal to one if the regiment was not organized in a town that was not one of the 100 most populous towns.

7. **Rank**. Dummies indicating if the POW was a private, officer, sergeant, corporal, or other rank (e.g., support position or musician).

8. **Irish, German, French, and Continental surnames**. Dummies equal to one if the POW's last name was an Irish, German, French, or Continental surname. We determined the nationality of a surname by looking at the entire 1880 Census. We called a surname Irish, for example, if only individuals born in Ireland and not in other European countries had that surname. This may lead us to misclassify an Irish soldier as non-Irish if in the 1880 Census there were Irishmen born in England with that name. However, this will not bias our results on ethnicity presented in Table 7, though it may reduce sample size and therefore power.

9. **Year of capture dummies**. Year of capture, including year of capture unknown, dummies.

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