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Abstract

Exploiting a database of administrative records for 300,000 members of the US Armed Forces, we find evidence of severe bias in the selection of personnel deployed to serve in Afghanistan and Iraq. Of most concern, we find that African American were far less likely than other service members to have been deployed to serve in combat zones, and were less likely to face intense combat if deployed.

Keywords: Military Manpower, OEF, OIF, Combat, War, African Americans, PTSD

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And I heard the voice of the Lord, saying: Whom shall I send, and who will go for us? Then I said: 'Here am I; send me.'

- Isaiah 6:8

1. Introduction

More than 2.5 million Americans served overseas in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). Those young men and women will carry their experience of war with them for the rest of their lives, and it will affect them and their families – potentially in ways that require a policy response. As a result, there has been considerable research interest in identifying the impact of service in OEF and OIF on the veterans of those conflicts.

Such research efforts, however, confront a familiar problem – selection bias in military service. Simply put, the men and women who fought in OEF and OIF chose to serve in the military, and comparing them to those who made no such choice conflates the effects of combat with inherent differences in character between those who volunteer to serve and those who don't.

To overcome this problem of self-selection for military service, a growing number of papers compare veterans of OEF/OIF with other service members who did not deploy. Underpinning this strategy is the belief that deployment can be regarded as a kind of natural experiment since individual military personnel have little influence in determining whether they were deployed or not. Instead, the military ostensibly deployed entire units to OEF/OIF rather than individuals.

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Using a dataset that tracks all first term enlistees in the US Army (USA) and the US Marine Corps (USMC) who were serving during the earliest days of OEF and OIF, we find considerable evidence that deployment was not random and that demographic characteristics were powerful determinants of who was sent. Furthermore, almost all of this selection is at the unit assignment level. This means that statistical strategies that use unit deployment as an instrument for individual deployment (see Engel et al, 2010) are also invalid as means of clarifying the impact of combat on individuals.

Of most concern, we find evidence of *severe racial selection* in deployment. African Americans were *25% less likely* to serve in OEF and OIF relative to otherwise similar service members who are Asian, Hispanic, or White.

It is already well known that in recent years African Americans have served disproportionately in non-combat roles.[1] What our analysis reveals is that African Americans – whether they were assigned to combat or non-combat roles - were also far less likely than others to serve in units that were deployed to OEF and OIF, while those who served in units that were deployed to OEF and OIF were more likely than others in their units to be left behind and not accompany their comrades. African Americans who did deploy with their units were far less likely than others to be serving in units that would experience intense combat. And finally, African Americans were more likely than others to be dishonorably discharged or excluded from deployment due to disciplinary problems. The picture that emerges from our analysis points to a gaping divide between African

[1] See http://www.prb.org/Publications/Articles/2005/ArmyRecruitmentGoalsEndangeredasPercentofAfricanAmericanEnlisteesDeclines.aspx

Americans and others in terms of their experience of, and attitude towards, military service.

This paper has seven sections. In Section Two, we review the relevant literature, focusing on recent papers that have attempted to identify the impact of combat experiences on veterans of OEF/OIF. In Section Three, we describe the data used in this paper. In Section Four, we report results of logit analyses that demonstrate considerable racial and other demographic selection in deployment to OEF/OIF and into deployed units that experienced heavy combat. In Section Five, we use bi-variate probit to consider whether this selection bias took place within or between units. In Section Six, we consider the implications of our findings regarding African Americans. Section Seven concludes the paper.

II. Literature Review

Economists have long sought to identify how combat experience and military service affects veterans. The problem has always been to differentiate between effects that are caused by participation in the military and effects that are caused by fundamental differences in personality and character that lead some people to serve in the military while others avoid service.

One approach, first articulated in Angrist's seminal 1990 paper, uses the birthdates of those drafted in WWII and the Vietnam War as an instrument for military service. Other papers that have exploited this strategy include Angrist and Krueger (1994), Dobkin and Shabani (2009), Rohlfs (2010), Angrist and Chen (2011), and Autor et al (2011). This approach, however, cannot really shed light on the impact of military service and combat on volunteers, nor can it differentiate between the impacts on service members who

actually participated in combat as opposed to those who served in non-combats roles. Hence, the results of such studies may provide little insight on what we can expect to see amongst the veterans of OEF/OIF.

A new line of research offers an alternative approach that allows study of the specific impact of deployment and combat on volunteers. In this literature, it is assumed that for those who already serve, deployment is exogenous since individuals neither choose nor are chosen to deploy. Rather, entire units are deployed, and individuals will be deployed if they have been assigned to those units. It is also assumed that individuals have little control over their unit assignment, and no control of the deployments of their assigned units, allowing researchers to treat deployment as a kind of natural experiment among military personnel. A number of recent papers - Lyle (2006), Engel et. al. (2010), Shen et. al. (2010), Cesur et. al. (2013), and Armey and Lipow (2015) - have exploited this feature of OEF/OIF in order to evaluate the impact of combat deployment on veterans' mental health, interest in higher education, and the school performance of their children.

Edwards (2015) observes that despite exogeneity in assignment to units, service members do choose their "military occupation specialty" (MOS), and this choice is likely to impact a service member's propensity to be deployed and see intense combat once deployed. This "MOS problem" cannot be easily resolved, since Edwards' study is based on data from the 2010 National Survey of Veterans, which does not report veterans' MOS. To partially overcome this, Edwards applies propensity score matching on socioeconomic observables to estimate the likelihood that individuals were actually deployed.

In principle, access to large administrative data sets would allow researchers to control directly for factors such as MOS – a far superior solution. Even so, Engel et al

(2010) note that while an individual cannot control their unit assignment nor their unit's probability of deployment, they can influence their probability of being deployed along with their unit. To overcome this, Engel et al use a dummy variable for 30% of a unit being deployed as an instrument for individual deployment.

A recent US army report (Arnold et al, 2011) reinforces Engel et al's caution. According to the report, an increasing number of soldiers cannot be deployed with their units due to medical, disciplinary, and family hardship. With sufficiently large and thorough administrative data sets, it is possible to control for some of these factors.

III. Data

The data for this study is drawn from comprehensive administrative records of enlisted personnel housed at the Defense Manpower Data Center (DMDC). We examine two cohorts of male enlisted members of the US Army and US Marine Corps (USMC). The analysis in this paper is focused on those who volunteered for service prior to September 2001 but had yet to complete their first term of service by that date. By focusing on this cohort, we eliminate any possibility that attitudes towards 9/11 or the prospect of imminent combat deployment could have influenced volunteers' decisions to serve in the armed forces. As a check of the robustness of our findings, we also examined the cohort of those who volunteered for service between September 2001 and December 2005. This group is made up of recruits who understood that their decision to enlist was likely to result in exposure to an active conflict.

Our analysis considers several possible drivers of non-random selection for deployment. One important factor is clearly MOS. Service members are generally able to choose their MOS. This can influence the likelihood of their deployment in a number of

ways. Certain professions, such as "airborne infantry," lead to assignments with an extremely high probability of deployment, while other professions, such as "musician," lead to assignments in units that are unlikely to deploy. A second factor that may matter is intellectual aptitude, with units preferring to send their most capable personnel on combat deployments. Other possible drivers of selection, such as race and family status, are also considered. Table 1 summarizes the definitions of the variables used in our analysis.

Table 2 provides summary statistics for our primary cohort. The table is divided into two services - the USMC and the USA. Within each service, we distinguish between those with combat and non-combat MOSs. Combat MOSs are designated as infantry, armor, cavalry, artillery, amphibious, and combat engineering roles. The descriptive statistics make clear that choice of MOS is connected to personal characteristics - some of which are more easily controlled for than others (MacLean and Parsons, 2010). For each of these branch and MOS choices, the table gives information on aptitude as measured by the Armed Forces Qualification Test (AFQT), age, race, marital and family status, and whether individuals or their units were deployed to Iraq or Afghanistan.

Across service and MOS, the data reveal important differences in personal characteristics. AFQT scores were somewhat different across branch and MOS. The AFQT is a subtest of the larger Armed Services Vocational Aptitude Battery (ASVAB), and is formed from a composite score of four general areas: arithmetic reasoning, word knowledge, paragraph comprehension, and mathematics knowledge. In the USA, the mean AFQT score varied little between the combat and non-combat soldiers, while in the USMC, Marines with non-combat MOS assignments had substantially higher AFQT scores.

The average age of personnel in all four groups was similar, though those with non-combat MOSs were about a year older on average. Marriage, measured at the start of the period, was far more common amongst those in non-combat professions. Similarly, those in non-combat MOSs were more likely to have children in 2001.

There are also notable differences among racial groups. For the USA, African Americans made up 12 percent of those with combat MOSs while 30 percent of those with non-combat MOSs are African American. For comparison, in the 2000 census, African Americans constituted 14.8% of the 18-24 year old population[2]. Hence, African Americans were slightly underrepresented among combat soldiers and massively overrepresented in the Army in general. Meanwhile, Hispanics constituted 12 percent of those with combat MOSs in the USA and 11 percent of non-combat Army MOSs. (and were 17.5% of the 18-24 year old population[3].) Similar racial patterns show up in the USMC.

Finally, there was a roughly equal likelihood that USMC combat and non-combat personnel were deployed, while in the USA, non-combat personnel were far less likely to be deployed than combat personnel. The Marines also had lower rates of medical separations and higher rates of disciplinary actions and dishonorable discharges than the Army.

Table 3 (for combat MOSs) and Table 4 (for noncombat MOSs) focus on the same information as Table 2, but specifically compare the groups that were deployed with those that were not. These tables also include mortality information from DMDC data on individuals' OEF/OIF deployments. We use unit (company) level data on monthly deaths and other casualties - which includes information as to whether the casualties were due to

[2] see http://www.infoplease.com/us/census/data/demographics and https://www.census.gov/prod/2001/pubs/c2kbr01-12.pdf for underlying data.
[3] see http://www.infoplease.com/us/census/data/demographics and https://www.census.gov/prod/2001/pubs/c2kbr01-12.pdf for underlying data.

hostile action - to calculate the number of deaths sustained by each individual's unit during his deployment. We treat the number of unit deaths as a proxy for the intensity of the combat experienced during the deployment

Comparing the deployed and non-deployed groups will show whether deployment is "as good as random." Table 3 shows that the USA, but not the USMC, deployed those with higher AFQT scores in combat roles, perhaps indicating that higher aptitude personnel are more likely to be selected for deployment, or that lower aptitude personnel are more likely to be left behind. Similarly, those deployed were a year older in the USA than the non-deployed, while the age difference in the USMC was only three months.

Not surprisingly, both soldiers and Marines who were married, or had children, were less likely to be deployed. These differences were large. For instance, 14% of deployed combat Marines were married while 24% of non-deployed combat Marines were married.

Race and ethnicity also differed across deployed and non-deployed groups. While African Americans comprise 13% of non-deployed combat personnel in the US Army, they only comprise 9% of those deployed. In non-combat professions, African Americans comprise 28% of the non-deployed and only 23% of those deployed. In the Marines, the differences are less dramatic: African Americans comprise 8% of the non-deployed combat professionals and 7% of those deployed. Amongst the non-combat professions, 17% of non-deployed Marines were African American while they constituted 15% of those deployed.

The differences cited above in the deployed and non-deployed are all statistically significant. Deployment was not random with respect to observable personal characteristics.

Table 3 also includes data on medical separations and dishonorable discharges. Across services and MOSs, those not deployed had greater separation and discharge rates than those who were deployed. These numbers further reinforce the evidence that there were fundamental differences between those who were sent and those who were not.

Table 3 also shows that 80% or more of those deployed went as part of a unit that was itself at least 30% deployed. Similarly, fewer than 5% were left behind in units that were 30% or more deployed. The final row of Table 3 gives the chance of being in a unit that sustained fatalities. USMC combat units were more likely to sustain fatalities than USA combat units.

Comparing Table 3 and Table 4 illustrates that there are meaningful differences between those in combat and noncombat MOSs. For instance, in the USA, deployed non-combat personnel were far more likely to be married and have children, and to be African American, when compared to deployed USA combat personnel. That said, the patterns observed between non-combat personnel who were deployed or not deployed largely mirrored those of the combat personnel.

This simple cut of the data is sufficient to both validate a more cautious approach to identification, and raise concerns about racial biases. Clearly, a number of factors connected to underlying demographics shape the likelihood of deployment. Controlling for these factors requires a multivariate analysis, which we turn to in the next section.

IV. Model for Selection

How does one get sent to a combat zone? How does one end up serving in a unit with combat deaths? From the point of view of the U.S. Armed Forces, these are not the outcomes of random processes. Each situation calling for deployment has operational objectives and challenges. Each unit has different capabilities and different levels of combat readiness. Individuals are deployed with their units, though not by any means do all members of a unit deploy. The choice of who to send within a unit creates another level of potentially non-random selection.

The probability that an individual deploys is based on the probability that a unit is sent, the probability an individual is in that unit, and the probability that an individual is in the fraction of the unit that is sent. The probability that a unit is sent, while not random, has nothing to do with the individual characteristics of service members. An airborne unit is sent because an airborne unit is required, not because it has more Hispanics or fewer married people assigned to it.

The probability that an individual is in a particular unit is also not random, and may be shaped by individual decisions. There is selection based on observable characteristics – such as marriage and family status – and potentially also on unobservable characteristics, such as an individual's taste for adventure.

Several decisions shape the likelihood of being in a highly deployable unit. First an individual chooses the service they want to serve in. Members of the USMC, for example, are more likely to be deployed than members of other services - and are certainly more likely to experience intense combat. Individual recruits also have considerable control over the selection of their MOS. And certain types of unit are much more likely to be deployed than others. For example, in the USA, elite infantry units such as the 82nd

Airborne and the Ranger Regiment are much more likely to be deployed than other infantry units. Hence, explicitly asking to "go airborne" upon recruitment - or excellent performance during initial training - can get a soldier assigned to a unit within the USA that carries a higher chance of deployment.

Finally, even within units that deploy, some individuals are not sent - potentially as a result of observable personal characteristics. In our sample of USA combat personnel (Table 3), 4% of the non-deployed were in units where at least 30% of the personnel were deployed. Additionally, some individuals were assigned to augment deploying units, even when only small fractions of their own units deployed. For example, of USA combat personnel who were deployed, 12% were in units where less than 30% of their unit was deployed. Decisions on who is deployed reflect the commander's judgement of the readiness of individuals to deploy, which may be influenced by marriage and family status, discipline, medical condition, or myriad other factors.

To sum this up, individual choice of service, preference for MOS, and preference for type of unit help determine, in a non-random way, which unit an individual serves in. Command choices based on operational needs, and not explicitly on the characteristics of personnel, determine which units are sent. Command decisions based on unit needs *and* individual characteristics determine who within a unit is sent.

The reduced form answer to "who will go for us" is the regression of who is sent on the observable, predetermined characteristics of soldiers and Marines. Table 5 reports results of a logit analysis of the likelihood of deployment based on personal characteristics, while Table 6 reports results of a logit analysis for the likelihood of being in a unit that sustains fatalities during its deployment. Once control variables are taken into account, a

much more noticeable selection story appears than what could be identified in the descriptive statistics.

We show our result in terms of odds ratios to make interpretation easier. Odds ratios for categorical variables show the difference in odds for an outcome for the categorical variable in question relative to the base, or the percentage change in odds for a one-unit increase in a continuous variable. For example, an odds ratio of 1.09 represents a 9% increase in odds of deployment.

Unsurprisingly, family concerns lead to a greatly reduced likelihood of deployment. Being married reduced the likelihood of deployment by as much as 53%, while having children led to at most a 42% reduction in the likelihood of deployment. Those who are married and have children are about 60% less likely to deploy across services and MOSs.

Due to the large size of our samples, even unimportant parameters appear statistically significant. For example, differences in the average age and AFQT scores are highly significant, but the small standard deviation in age in most of the sample and the small size of the coefficient on AFQT, make these unimportant results. A one standard deviation increase in AFQT – about 20 percentage points - would increase one's odds of deploying by about 10% in combat in the USA, or decrease one's chance of deploying in a combat role in the USMC by about 4%.

Of far greater interest, the racial patterns identified in the descriptive statistics grew more pronounced in the multivariate analysis. African Americans were *far less likely* than others to deploy, and had they deployed, they were up to 27% less likely than others to have served in units that sustained fatalities. In contrast, Hispanics were significantly *more*

likely to deploy than non-Hispanics across MOSs and services, and were as likely as whites to serve in units that sustained fatalities.

We conducted several robustness checks and find that these patterns are consistent across cohorts and correcting for various fixed effects. First, we examined whether the relationships identified above persist when we examine the sample of first term personnel recruited between 2002 and 2005, and found patterns essentially identical to those identified above for the pre-9/11 cohort of recruits. Moreover, we looked at whether MOS or Unit location fixed effects would explain deployment patterns, controlling for MOS fixed effects lead to almost no change in the coefficients. Similarly, the same patterns are observable across unit locations.

From this initial look at the results, it appears that race and ethnicity play an important role in determining whether soldiers and Marines will deploy to combat zones and what they will experience once deployed. The question is why?

V. Interunit v. Intraunit Selection for Deployment

There can be only two possible, but not mutually exclusive, explanations for the low deployment rates observed for service members who are married, have children, or are African American. One possibility is that they are not deploying with their units – intraunit selection. The other is that units with disproportionate numbers of these types of service members are not being deployed as often as other units – interunit selection.

Some evidence that we have already seen hints that interunit selection is an important driver of differences in deployment history. First, the preponderance of soldiers and Marines deploy with their units. Second, in Table 6 we demonstrated that units that incurred fatalities differed demographically from units that did not.

Interunit selection requires that service members who are married, have children, or are African Americans are disproportionately represented in units that are less likely to deploy.[4] How could this be? There is no formal policy segregating those with families into different units. As for African American, such segregation is literally inconceivable in an organization that rightfully prides itself as one of the most integrated institutions in America.

Oddly enough, however, it isn't that hard for such segregation to take place. As we mentioned above, certain types of unit are deployed more often than other types of unit. It is quite conceivable that soldiers with families, for example, who hold an infantry MOS disproportionately prefer to serve in mechanized infantry units rather than airborne units. Airborne units are highly "expeditionary" and are often sent overseas at a moment's notice to deal with crisis situations. Soldiers with spouses and children may not find that feature of service as a paratrooper particularly appealing.

It is not difficult to understand how intraunit selection could take place either. For example, consider a unit commander who has an opportunity to leave one soldier behind while the rest of the unit deploys (such opportunities occasionally present themselves). All else equal, the commander might choose to leave a service member with a family behind.

To clarify to what extent interunit and/or intraunit selection occurred and account for our results, Table 7 reports the results of a biprobit analysis for USA combat personnel (Table 8 does the same for USMC combat personnel). The two dependent variables are (1) whether a soldier was in a unit that deployed at and (2) whether a soldier was themselves

[4] If that is the case, then it is insufficient to instrument for individual deployment with unit deployment as in Engel et al (2010).

deployed. This allows us to identify intra-unit and inter-unit selection on observables. The biprobit also explains four possible outcomes: (i) the soldier's unit deployed and the soldier was deployed; (ii) the soldier's unit deployed but the soldier was not deployed; (iii) the soldier's unit did not deploy but the soldier was deployed - ostensibly with another unit; and (iv) neither the unit nor the soldier were deployed. The independent variables are the same demographic characteristics as in table 5.

The first two columns in table 7 are the coefficients of the biprobit regressions. The first column contains the coefficients for the probability that a soldier's unit was deployed. The second column contains the coefficients for the probability of an individual soldier's deployment. Not surprisingly, these are not independent of each other and Rho is significant at the 99% level. The coefficients in both columns are all highly significant, as expected with nearly 30,000 observations. The results clearly indicate that both intraunit and interunit selection did take place, and followed the same demographic patterns.

The next four columns give the marginal effects for the four outcomes. The third column of Table 7 corresponds to a soldier being deployed with their unit. It shows that if a soldier was married, had children, or was African American, his unit was less likely to be deployed and the soldier himself was less likely to be deployed. A soldier is 11 percentage points less likely to deploy and be in a deployed unit if they had children, 8 percentage points less likely if they were married, and 5 percentage points less likely if they were African American.

The fourth column shows the effect of demographics on the probability that a soldier was in a unit that deployed but the soldier did not. As only 3% of our sample was in this group, it is not surprising that none of the marginal impacts in this column are very

large. The fifth column is the effect of demographics on the probability that a soldier deployed but his unit did not. Again, this is a small fraction of our sample - only 4% - and at the margin, no observables cause meaningful changes in these probabilities. Consistent, however, with the selection story we see throughout, married soldiers and African Americans are significantly less likely to find themselves in this group. The final column is the effect of demographics on both unit and soldier not deploying. Having children, being married, and being African American, made a soldier far more likely to land in this group.

Table 8 is for the USMC. For the Marines, the same patterns persist. While being African American was a less significant determinant, it still reduced the probability of being deployed and being in a deployed unit. Notably, Hispanic Marines were 7 percentage points *more likely* to deploy and be in a deployed unit than others.

The two biprobits confirm that personal status, race and ethnicity play powerful roles in the placement of personnel into units that were deployed to OEF/OIF. These factors significantly affected who was deployed with their units and who deployed with other units. The fact, however, remains that a large majority of first-term personnel deployed along with their units. Hence interunit assignments were much more important than intraunit deployment decisions.

We cannot, however, rule out the possibility that some of this interunit selection is actually intraunit sorting driven by pending deployments - more than half of first term personnel change units at least once during their first term of enlistment. To clarify this, we looked at the data to see if there was evidence that certain personnel were being reassigned due to their unsuitability for deployment. We find that there is little evidence that race, ethnicity, or personal status drive probability of reassignment.

The story of how both intra-unit and inter-unit selection occurs for those with families is an easy one to tell. But, how African Americans become less likely to deploy with their units and how African Americans sort into less deployable units within the same career field, remains a mystery. We explore several possible drivers of this selection story in the next section.

VI. Why Don't African Americans Deploy?

As we have seen, during the early days of OEF and OIF, African Americans soldiers and Marines were – like married soldiers with children - less likely to serve in units that were sent to Afghanistan or Iraq. They were – like married soldiers with children - less likely than others to deploy with their comrades when serving in units that where assigned to OEF or OIF. And if deployed to OEF or OIF, they were – like married soldiers with children - less likely to be in units that participated in intense combat.

Considering all this, it is hard to avoid the conclusion that the results are telling us something, perhaps something important, about race relations in the United States. The question is what? Given this study's limitations, we can offer no definitive explanation for the fundamental differences in the experiences of African Americans who served in the military during the early days of OEF/OIF when compared with those of other Americans. What we can do is offer several hypotheses and evaluate their credibility with logic, some statistics, and common sense.

First, the results are consistent with a pattern of systematic institutional bias or discrimination against African Americans in the US Armed Forces. For a number of reasons, we discount this possibility.

First, there is no evidence that Latino service members are less likely to deploy than White service members. If the deployment "gap" is the result of discrimination, it would have to be discrimination directed *exclusively* at African Americans, while Latinos are totally immune. This is possible – but it isn't very plausible.

Furthermore, steering African Americans away from the "toughest" units and preventing them from deploying alongside their comrades constitutes a very peculiar kind of racism. The popular perspective is that racism in the US military manifested itself in callousness towards African American suffering during military service. A 21st Century form of racism that shielded African Americans from the worst aspects of military service seems, well, odd.

Finally, we spoke to many serving officers of the USA and the USMC regarding our results. All - whether African American, Hispanic, or White – insisted that the kind of racial deployment gap identified in this paper could, not even have taken place until we showed them our results.

A second possibility is that the results may be evidence of fundamental differences in the motives that lead African Americans to join the Armed Forces when compared to other Americans. Ironically, the idea is that African Americans join the military precisely because it allows them to *avoid discrimination* that remains rampant in the civilian labor market. As a result, their motives differ from those of other recruits and that, in turn, affects the likelihood that they will be deployed to serve in a combat zone.

There is considerable evidence consistent with this argument. African Americans who join the military enjoy meaningful financial benefits over their lifetimes, while those of other ethnic groups do not. Papers that have identified this effect include Ornstein (1976),

Lopreato and Poston (1977), Poston (1979), Berger and Hirsch (1983), Hisnanick (2003), Hirsch and Mehay (2003), and Kleykamp (2007).

If African Americans who volunteer for military service can expect to enjoy substantially higher incomes, it would hardly be surprising if a disproportionate number of them were motivated by financial objectives when they joined the Armed Forces. Others – who could expect no lifetime financial gain from their service – would be more likely to be motivated by non-pecuniary objectives such as a desire to experience adventure.

This would explain some of the results that emerged in our analysis. African Americans were disproportionately represented in non-combat professions and African American combat soldiers were less likely to serve in the most expeditionary units.

To test the hypothesis that those with more to gain economically from military service were less likely to deploy than others, we consider whether personnel from low income backgrounds were less likely to deploy. Our assumption is that service members from low income homes are the most likely to have joined the military for pecuniary reasons.

To classify service members according to income, we matched the median income by zip code from the 1999 US Census with the zip code of each service member at the time of his enlistment. The data suggests that African Americans come from markedly poorer neighborhoods on average. African American personnel come from neighborhoods with median incomes around $37,000-$38,000 while non-African-American personnel come from neighborhoods with median incomes around $42,000-$43,000.

In Table 9 we report the results from logit regressions on the probability of deployment to test whether those who came from economically disadvantaged

backgrounds were less likely to deploy. We code a service member as coming from a low-income background if he enlisted from a zip-code with a median income one standard deviation lower than the mean. We interact this dummy variable with the African American dummy variable to test whether African Americans, in particular, from low income communities were less likely to deploy.

Looking at combat personnel, we find suggestive evidence that coming from a low-income community reduced one's likelihood of deployment. Specifically, a combat soldier was 13% percent less likely to deploy if he came from a low-income neighborhood. This impact is significant at the 99% level. For combat Marines, including low-income African Americans in the model makes the impact of being African American on the likelihood of deployment insignificant. Being *a low-income* African American reduced one's odds of deployment by 27%, which is significant at the 90% level. These results suggest that the enlisted combat personnel likely to benefit the most economically from military service were indeed less likely to deploy.

One final possibility was that morale amongst African American troops was lower than that for other service members during the early days of OEF/OIF. Specifically, this may have resulted from black soldiers and Marines being less supportive of America's war aims, and hence less likely to throw themselves wholeheartedly into the missions they had been assigned to fulfill. Rohall and Ender (2007) find in their study of attitudes towards OIF among service members – using data from a 2003 survey - that "specifically, being African American continues to be negatively associated with war support controlling for all other factors."

Perhaps African Americans soldiers and Marines simply did not support the invasion of Iraq to the extent that other service member did, and hence, were more likely than others in their units to seek out ways to avoid serving in that conflict? That could plausibly explain why African Americans were less likely to deploy than others serving alongside them. There is considerable evidence consistent with this hypothesis. African American constituted 18% of new recruits in the US Armed Forces in 2001, but that had declined to 14% by 2007. Dorn (2008) argues that "the Iraq War…is the major source of declining (African American) propensity" to join the military.

Lower morale could also manifest itself in shirking and disciplinary problems – and these in turn could lead to lower deployability. A 2011 report from the US Army War College raised concerns about high and growing numbers of soldiers who failed to deploy (Arnold et al 2011). The report cited three main reasons why soldiers become undeployable. - family status, disciplinary problems, and medical problems. We explore whether race and ethnicity influence the propensity to experience disciplinary or medical problems in the US Army.

Our data does not specify if someone was non-deployable for medical reasons. Instead, we used medical dismissals from the military as a proxy for medical conditions that might prevent deployment. The results in Table 10 suggest that African Americans and Hispanics were *less likely* than Whites to be dismissed from service on medical grounds.

Another possibility is that disciplinary actions account for the high rate of African Americans failing to deploy with their units, or being assigned to less deployable units. To test this explanation, we looked at the probability that someone had been deemed un-

deployable for disciplinary/legal reasons. Table 11 shows that African Americans were *significantly more likely* to receive a disciplinary exclusion from deployment when compared to Whites and Hispanics. We found a similar result when we looked at dishonorable discharges among this cohort (see Table 12), another indication of disciplinary problems.

VII. Conclusion

This study started out as an attempt to clarify whether deployment could be treated as a natural experiment. And the results reported in this paper make it very clear that selection for deployment to Afghanistan or Iraq was in no way random. Hence, any paper using an identification strategy to differentiate soldiers according to whether or not they were deployed must correct for this selection bias. Moreover, because of substantial interunit selection, an instrument variable approach that depends on unit assignment being random appears to be an invalid econometric strategy to fix this problem.[5] Simply put, when comparing service members who served in OEF and OIF with those who did not, the fact is that those that deployed were disproportionately single and childless, while those who did not deploy were disproportionately African American and from low-income backgrounds. Future studies must control for these observable characteristics in order to yield valuable insights for the policies that will define America's response to the needs of its combat veterans for decades to come.

[5] In Engel et. al. the sample used to determine that unit assignment was random was very different than the sample here. They were comparing the outcomes of school age children and therefore were looking mostly at professional soldiers who were married and by definition, had children. It is possible that unit assignment is more random amongst this more limited and very different cohort.

Over time, however, our view of what this paper was really "about" evolved. The results we found regarding African Americans shocked us. We quickly realized that this was the important story that the data had to tell. As we have seen, African Americans soldiers and Marines were less likely to serve in units that were sent to Afghanistan or Iraq. They were less likely than others to deploy with their comrades when serving in units that where assigned to OEF or OIF. If deployed to OEF or OIF, they were less likely to be in units that participated in intense combat. And they were far more likely to be excluded from deployment due to disciplinary infractions. Considering all this, it is hard to avoid the conclusion that the results are telling us something, perhaps something important, about race relations in the United States.

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Table 1
Variables

Variable	Value	Definition
Deployed	1,0	Value of 1 if service member was deployed during first term
Unit Mortality	1,0	Value of 1 if unit experienced a fatality while service member was deployed
AFQT Percentile	1 - 98	Percentile score on AFQT
Age 2001	17-35	Age in September 2001
Married 2001	1,0	Value of 1 if married as of September 2001
Children 2001	1,0	Value of 1 if service member had children as of September 2001
African American	1,0	Value of 1 if self identifies as Black
Hispanic	1,0	Value of 1 if self identifies as Hispanic
Unit 30% Deployed	1,0	Value of 1 if at least 30% of unit deployed in any year of first term
Disciplinary Action	1,0	Value of 1 if was exempted from deployment for disciplinary reasons
Dishonorable Discharge	1,0	Value of 1 if dishonorably discharged
Medical Separations	1,0	Value of 1 if medically separated from service

Table 2
All First Term Enlisted Personnel

	Army Combat		Army Non-Combat		Marines Combat		Marines Non-combat	
Variables	mean	sd	mean	sd	mean	sd	mean	sd
AFQT Percentile	58.76917	18.0367	57.92835	18.13802	55.37183	17.39606	59.722	17.76633
Age 2001	23.17297	3.546281	22.84714	3.495152	23.01764	3.197383	23.15882	3.334037
Married 2001	0.1825699	0.3863195	0.1974245	0.3980641	0.2009211	0.400697	0.2671206	0.4424594
Children 2001	0.1684475	0.374269	0.1844152	0.387831	0.0899227	0.2860766	0.132934	0.3395061
African American	0.1188169	0.3235784	0.1289717	0.3351767	0.0754668	0.2641488	0.1634055	0.3697386
Hispanic	0.1155564	0.3196972	0.115239	0.3193172	0.1330651	0.3396518	0.1509971	0.3580489
Deployed	0.2953328	0.4561993	0.0001319	0.0114821	0.3555928	0.4787019	0.2594115	0.4383153
Unit 30% Deployed	0.2893245	0.4534559	0.0403463	0.1967745	0.3157833	0.4648361	0.2487312	0.4322812
Disciplinary Actions	0.0159497	0.1252829	0.0403903	0.1968771	0.070096	0.2553137	0.0634395	0.2437538
Dishonorable Discharge	0.031249	0.1739927	0.024752	0.1553695	0.0987042	0.2982703	0.1020654	0.3027367
Medical Separations	0.0783239	0.2686847	0.0858788	0.2801911	0.0458981	0.2092681	0.0393165	0.1943484
Observations	29516		72916		22977		55298	

Standard deviations of individual observations are reported in the table, but to compare means across groups one builds confidence intervals using standard errors, that is the standard deviations divided by the square root of the number of observations.

Table 3
First Term Combat MOS

	Army Deployed		Army Non-Deployed		Marines Deployed		Marines Non-Deployed	
Variable	mean	sd	mean	sd	mean	sd	mean	sd
AFQT Percentile	60.77722	17.63183	57.92835	18.13802	55.29846	17.3529	55.4126	17.42039
Age 2001	23.9505	3.546636	22.84714	3.495152	23.2002	2.820593	22.9169	3.38327
Married 2001	0.1471267	0.3542507	0.1974245	0.3980641	0.1373066	0.3441896	0.2360245	0.4246503
Children 2001 Y/N	0.1303482	0.3367037	0.1844152	0.387831	0.0658545	0.2480411	0.1032039	0.3042343
African American	0.0946935	0.2928079	0.1289717	0.3351767	0.0710895	0.2569899	0.0779027	0.2680275
Hispanic	0.1163132	0.320617	0.115239	0.3193172	0.1367831	0.3436371	0.1310144	0.3374264
Dishonorable Discharge	0.0094379	0.0966945	0.0403903	0.1968771	0.0302931	0.1714019	0.1364545	0.3432809
Medical Separations	0.0602978	0.2380503	0.0858788	0.2801911	0.0435737	0.2041558	0.0471807	0.2120315
Unit 30% Deployed	0.8833893	0.3209727	0.0403463	0.1967745	0.8050708	0.3961679	0.0457877	0.2090306
Unit Mortality	0.1772232	0.3818775	0.0001319	0.0114821	0.494567	0.4999979	0.0000606	0.0077824
Observations	8744		20772		8215		14762	

Standard deviations of individual observations are reported in the table, but to compare means across groups one builds confidence intervals using standard errors, that is the standard deviations divided by the square root of the number of observations.

Table 4
First Term Non-Combat MOSs

	Army Deployed		Army Non-Deployed		Marines Deployed		Marines Non-Deployed	
Variable	mean	sd	mean	sd	mean	sd	mean	sd
AFQT Percentile	60.60358	17.8285	59.03074	18.30217	59.80794	17.7448	59.69163	17.77402
Age 2001	24.72774	3.846923	23.84532	4.040863	23.42292	2.818779	23.0663	3.491934
Married 2001	0.2130576	0.4094763	0.2798557	0.4489322	0.189636	0.3920251	0.2942618	0.4557151
Children 2001	0.1849959	0.3883021	0.2439469	0.429465	0.0963348	0.295059	0.1457538	0.3528631
African American	0.2250683	0.4176365	0.2790142	0.448519	0.1471284	0.3542461	0.169127	0.3748686
Hispanic	0.1130597	0.3166722	0.1145527	0.3184843	0.1589445	0.3656356	0.1482132	0.3553151
Dishonorable Discharge	0.0095702	0.0973599	0.0315728	0.1748614	0.0305225	0.1720254	0.1271253	0.3331168
Medical Separations	0.0580292	0.2338034	0.0895808	0.2855828	0.0307702	0.1726998	0.04231	0.2012977
Unit 30% Deployed	0.8685726	0.3378741	0.047259	0.2121943	0.7761268	0.416851	0.0639964	0.2447491
Unit Mortality	0.0804542	0.2720006	0	0	0.1553987	0.3622956	0	0
Observations	22682		50234		14382		40916	

Standard deviations of individual observations are reported in the table, but to compare means across groups one builds confidence intervals using standard errors, that is the standard deviations divided by the square root of the number of observations.

Table 5
Logit All-First Term for Probability Deployed

VARIABLES	Army Combat	Army Non-Combat	Marines Combat	Marines Non-Combat
AFQT Percentile	1.005***	1.001**	0.998**	0.999**
	(0.000764)	(0.000475)	(0.000816)	(0.000572)
Age 2001	1.125***	1.092***	1.094***	1.109***
	(0.00450)	(0.00247)	(0.00597)	(0.00415)
Married 2001	0.658***	0.628***	0.469***	0.516***
	(0.0295)	(0.0155)	(0.0213)	(0.0151)
Children 2001	0.581***	0.678***	0.823***	0.785***
	(0.0276)	(0.0176)	(0.0533)	(0.0309)
African American	0.749***	0.756***	0.892**	0.821***
	(0.0334)	(0.0152)	(0.0490)	(0.0234)
Hispanic	1.193***	1.025	1.323***	1.180***
	(0.0702)	(0.0368)	(0.0824)	(0.0468)
Constant	0.0235***	0.0657***	0.0904***	0.0426***
	(0.00235)	(0.00384)	(0.0119)	(0.00389)
Observations	29,021	71,345	22,658	54,333

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6
Logit of Unit with Deaths for those Deployed During First Term

VARIABLES	Army Combat	Army Non-Combat	Marines Combat	Marines Non-Combat
AFQT Percentile	1.003*	0.997**	0.997**	0.990***
	(0.00169)	(0.00144)	(0.00130)	(0.00135)
Age 2001	1.001	0.996	0.970***	0.958***
	(0.00906)	(0.00734)	(0.00834)	(0.00938)
Married 2001	0.822*	0.904	0.612***	0.689***
	(0.0892)	(0.0724)	(0.0493)	(0.0565)
Children 2001	0.943	0.931	1.038	1.142
	(0.108)	(0.0796)	(0.119)	(0.123)
African American	0.733***	0.924	0.798**	0.954
	(0.0807)	(0.0573)	(0.0708)	(0.0641)
Hispanic	0.804	1.216**	1.134	1.037
	(0.108)	(0.120)	(0.108)	(0.0921)
Constant	0.185***	0.125***	2.469***	0.928
	(0.0433)	(0.0243)	(0.521)	(0.221)
Observations	8,596	22,200	8,134	14,226

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7
Bi-Probit 30% of Unit Deployed and Individual Deployment Army Combat

VARIABLES	Unit Deployed	Individual Deployed	Margins Unit Deployed Indiv Deployed	Margins Unit Deployed Indiv Not	Margins Unit Not Indiv Deployed	Margins Unit Not Indiv Not
AFQT Percentile	0.00385***	0.00317***	0.00111***	0.000201***	-5.30e-05	-0.00125***
	(0.000454)	(0.000457)	(0.000141)	(5.01e-05)	(3.27e-05)	(0.000153)
Age 2001	0.0822***	0.0741***	0.0249***	0.00303***	-0.000238	-0.0277***
	(0.00235)	(0.00237)	(0.000699)	(0.000232)	(0.000150)	(0.000752)
Married 2001	-0.237***	-0.247***	-0.0744***	-0.00281	-0.00406**	0.0813***
	(0.0261)	(0.0264)	(0.00732)	(0.00275)	(0.00169)	(0.00816)
Children 2001	-0.328***	-0.318***	-0.0965***	-0.00826***	-0.00277	0.108***
	(0.0274)	(0.0277)	(0.00731)	(0.00266)	(0.00180)	(0.00821)
African American	-0.137***	-0.168***	-0.0484***	0.00319	-0.00536***	0.0506***
	(0.0257)	(0.0259)	(0.00745)	(0.00289)	(0.00157)	(0.00827)
Hispanic	0.0819**	0.108***	0.0320***	-0.00381	0.00482*	-0.0331***
	(0.0353)	(0.0354)	(0.0115)	(0.00371)	(0.00292)	(0.0123)
Constant	-2.523***	-2.348***				
	(0.0590)	(0.0594)				
athrho		2.257***				
		(0.0243)				
Observations	29,021	29,021	29,021	29,021	29,021	29,021

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8
Bi-Probit 30% of Unit Deployed and Individual Deployment Marines Combat

VARIABLES	Unit Deployed	Individual Deployed	Margins Unit Deployed Indiv Deployed	Margins Unit Deployed Indiv Not	Margins Unit Not Indiv Deployed	Margins Unit Not Indiv Not
AFQT Percentile	-0.00137***	-0.00104**	-0.000421**	-7.17e-05	4.23e-05	0.000450**
	(0.000504)	(0.000502)	(0.000167)	(5.33e-05)	(5.94e-05)	(0.000181)
Age 2001	0.0703***	0.0555***	0.0220***	0.00334***	-0.00175***	-0.0236***
	(0.00331)	(0.00332)	(0.00107)	(0.000347)	(0.000383)	(0.00116)
Married 2001	-0.465***	-0.463***	-0.150***	-0.00816***	-0.00994***	0.168***
	(0.0271)	(0.0270)	(0.00744)	(0.00257)	(0.00285)	(0.00858)
Children 2001	-0.136***	-0.113***	-0.0424***	-0.00550	0.00199	0.0459***
	(0.0386)	(0.0384)	(0.0121)	(0.00376)	(0.00466)	(0.0134)
African American	-0.0489	-0.0692**	-0.0202*	0.00271	-0.00477	0.0223*
	(0.0335)	(0.0334)	(0.0108)	(0.00362)	(0.00366)	(0.0119)
Hispanic	0.206***	0.173***	0.0685***	0.00801*	-0.00371	-0.0728***
	(0.0385)	(0.0385)	(0.0137)	(0.00456)	(0.00433)	(0.0143)
Constant	-1.829***	-1.487***				
	(0.0804)	(0.0805)				
athrho		1.956***				
		(0.0226)				
Observations	22,658	22,658	22,658	22,658	22,658	22,658

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9
Deployments

VARIABLES	Army Combat	Marines Combat
AFQT Percentile	1.010***	1.000
	(0.00081)	(0.00090)
Age 2001	1.130***	1.120***
	(0.0048)	(0.0070)
Married 2001	0.637***	0.493***
	(0.033)	(0.025)
Children 2001	0.591***	0.844**
	(0.030)	(0.062)
African American	0.758***	0.930
	(0.040)	(0.061)
Hispanic	1.191***	1.272***
	(0.073)	(0.088)
Low Income	0.873***	0.976
	(0.045)	(0.058)
Low Inc x Afr Amer	1.012	0.730*
	(0.114)	(0.118)
Constant	0.0194***	0.0668***
	(0.002)	(0.010)
Observations	25,093	17,589

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10
Medical Dismissals

VARIABLES	Army Combat	Army Non-Combat	Marines Combat	Marines Non-Combat
AFQT Percentile	0.994***	0.993***	0.994***	0.994***
	(0.00126)	(0.000792)	(0.00185)	(0.00126)
Married 2001	1.536***	1.446***	1.114	1.349***
	(0.0968)	(0.0529)	(0.100)	(0.0751)
Children 2001	1.404***	1.427***	1.371***	1.307***
	(0.0916)	(0.0537)	(0.161)	(0.0887)
African American	0.680***	0.828***	0.905	0.963
	(0.0511)	(0.0275)	(0.109)	(0.0570)
Hispanic	0.667***	0.603***	0.834	0.643***
	(0.0729)	(0.0419)	(0.123)	(0.0668)
Constant	0.109***	0.114***	0.0685***	0.0568***
	(0.00883)	(0.00606)	(0.00759)	(0.00469)
Observations	29,022	71,345	22,658	54,333

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11
Disciplinary Exclusions from Deployment

VARIABLES	Army Combat	Army Non-Combat	Marines Combat	Marines Non-Combat
AFQT Percentile	0.993***	0.987***	0.989***	0.986***
	(0.00271)	(0.00199)	(0.00160)	(0.00106)
Married 2001	0.937	0.831*	1.142*	1.098**
	(0.145)	(0.0833)	(0.0861)	(0.0519)
Children 2001	0.721**	0.938	0.420***	0.335***
	(0.120)	(0.0959)	(0.0574)	(0.0282)
African American	1.451***	1.384***	1.661***	1.451***
	(0.187)	(0.103)	(0.141)	(0.0650)
Hispanic	1.336	0.948	0.946	0.924
	(0.248)	(0.146)	(0.116)	(0.0712)
Constant	0.0252***	0.0256***	0.132***	0.145***
	(0.00435)	(0.00331)	(0.0124)	(0.00985)
Observations	29,022	71,345	22,658	54,333

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 12
Dishonorable Discharge

VARIABLES	Army Combat	Army Non-Combat	Marines Combat	Marines Non-Combat
AFQT Percentile	0.984***	0.987***	0.988***	0.987***
	(0.00198)	(0.00140)	(0.00134)	(0.000827)
Married 2001	1.223*	0.916	1.045	0.947
	(0.127)	(0.0641)	(0.0676)	(0.0365)
Children 2001	0.719***	0.765***	0.673***	0.547***
	(0.0822)	(0.0569)	(0.0675)	(0.0316)
African American	1.517***	1.469***	1.572***	1.593***
	(0.134)	(0.0764)	(0.114)	(0.0554)
Hispanic	0.653**	0.791**	0.863	0.757***
	(0.114)	(0.0928)	(0.0905)	(0.0491)
Constant	0.0821***	0.0543***	0.213***	0.256***
	(0.0101)	(0.00494)	(0.0168)	(0.0136)
Observations	29,022	71,345	22,658	54,333

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1