

In-group bias in natural groups of soldiers[☆]Janina Kraus^a, Fabian Paetzel^b,*^a Leuphana University Lüneburg, Department of Economics, Universitätsallee 1, Lüneburg 21335, Germany^b Clausthal University of Technology, Department of Economics, Julius-Albert-Str. 2, Clausthal Zellerfeld, 38678, Germany

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ABSTRACT

This study examines whether soldiers identify as soldiers rather than civilians and whether soldiers' in-group bias is a function of their military unit (horizontal level), military rank (vertical level), or both in interaction. Our unique dataset consists of 512 German soldiers categorized by branch of service (air force, navy, and army) and status (officer candidates and officers). Based on a series of modified dictator games, our results reveal intriguing patterns. We find strong in-group bias among soldiers and robust identification as members of the military rather than civilians. Additionally, identification across branches of service is consistent and tremendously high. Furthermore, we observe an interaction between identifications across branches of service and status. Low-status groups of officer candidates exhibit significantly higher in-group bias than higher-status officers at the horizontal level (between branches of service).

1. Introduction

In the social identity literature, soldiers feature as one of the most prominent examples of high in-group identification (Akerlof & Kranton, 2000, 2010), as “military organizations actively promote [...] military identity [...] turn outsiders to insiders” (Akerlof & Kranton, 2000, p. 45). Identifying as a soldier can lead to the ultimate sacrifice: the giving of one's life for another soldier. However, the empirical evidence documenting soldiers' identification is scant. The seminal work of Goette et al. (2006) uses a simultaneous prisoner's dilemma scenario, where subjects are randomly assigned to platoons during a specific Swiss Army officer training program; the results highlight that soldiers' cooperation is significantly higher when they interact with members of the same platoon. Although Goette et al. (2006) demonstrate substantial differences in cooperation between homogeneous and heterogeneous groups of soldiers, they cannot directly measure soldiers' specific identification with their public goods game. In contrast, our study explicitly measures soldiers' in-group bias through allocation decisions, as introduced by Chen and Li (2009), who incorporate social identity into Charness and Rabin's (2002) social preference model. This approach allows us to directly estimate soldiers' identification as soldiers (as opposed to civilians), as soldiers of a specific branch (as opposed to another branch), and as soldiers of a specific military rank (as opposed to another rank).

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In social identity theory, identity “refers to a person’s sense of self, derived from perceived membership in social groups. When we feel that we belong to a group, we may very well derive at least a portion of our sense of identity from that group” (Charness & Chen, 2020, p. 692). Thus, membership of a group is essential for people, influencing their behavior in accordance with group norms and values. People tend to favor those within their own group and discriminate against those outside of it – a phenomenon commonly referred to as *in-group bias* (among others, see Paetzel & Sausgruber, 2018; Shih et al., 1999; Tajfel & Turner, 1979).

Most of the experimental literature testing the effects of group identity on behavior toward in- and out-group members supports the predictions that in-group favoritism exists (for good overviews of recent approaches, results, and related issues of identity in economics, we refer to Charness & Chen, 2020; Hewstone et al., 2002). In addition to nonstrategic environments, such as the one we have in our setting, in-group favoritism occurs in strategic bargaining, as in the prisoner’s dilemma or public goods game (among others, see Ahmed, 2007; Bernhard et al., 2006; Brewer & Kramer, 1986; Chen & Li, 2009; McLeish & Oxoby, 2011; Yeo & Zhuo, 2024).

While the influence of social identity on behavior and the resulting in-group favoritism is well established in the (experimental) literature (see, e.g., Akerlof & Kranton, 2000; Chen & Li, 2009; Drouvelis & Nosenzo, 2013; Konow et al., 2020), there is limited research on the impact on social identity of social status, social distance, or their interaction. In relation to this, we follow Shayo (2009) and define identification in terms of preferences, taking two different levels into account. First, we consider the vertical level, which encompasses the social status of different groups (officers as opposed to officer candidates in our sample). Second, as a horizontal dimension, we consider social distance, which refers to the perceived similarity to group members (branches of service in our sample). Social identity theory posits that individuals tend to favor groups with higher status because it is easier and more beneficial to make social comparisons (Tajfel, 1972, 1978; Tajfel et al., 1971; Tajfel & Turner, 1979). Studies have supported this argument, indicating that individuals with higher social status exhibit stronger in-group bias than those with lower status, especially on dimensions advantageous to their group (Brewer & Kramer, 1986). We follow Ball et al.’s (2001, p. 161) definition of status as “a ranking in a hierarchy that is socially recognized and typically carries with it the expectation of entitlement to certain resources” such as competence, power, or material resources (Huberman et al., 2004).

In the economics literature, only a few papers address how in-group bias changes with an individual’s or group’s status. Although one might expect an additive impact of social distance and status on social identity, empirical evidence suggests that group status moderates in-group favoritism in relation to social distance. Paetzel and Sausgruber (2018) find that the in-group bias of minimal groups is high and significant among participants with relatively low performance but nonsignificant and not present among participants with high performance. However, when identification (group matching) is based on performance, in-group bias is strong for groups composed of high-performing members and weak for groups composed of low-performing members. Furthermore, Hett et al. (2020) note that participants generally prefer to belong to groups with lower social distance and higher social status. They may even be willing to sacrifice financial resources to remain in their preferred group.

The study by Hong et al. (2022) is closely related to our research approach. They vary group membership within minimal groups, that is, at the horizontal level, and simultaneously at the vertical level by introducing experimental endowment differences to analyze in-group bias when social identity is multidimensional. They find that both dimensions affect behavior. We expand upon Hong et al.’s (2022) findings by examining the impact of both dimensions using a unique sample of natural groups of soldiers. As we mentioned above, the example of soldiers is frequently referenced in the literature, but to the best of our knowledge, no studies so far have directly tested both vertical and horizontal dimensions of in-group bias among soldiers.

As with Hong et al. (2022) and Paetzel and Sausgruber (2018), most studies randomly assign subjects to artificial minimal or near-to-minimal groups. Even between minimal groups to which people are more or less randomly assigned and across which any differences are as meaningless as possible, in-group favoritism is still evident (Tajfel et al., 1971). As our study focuses on identification in natural groups, it is closely related to the emerging literature on in-group bias in “real” social groups and extends existing findings (among others, see, e.g., Bernhard et al., 2006; Chen et al., 2022; El-Bialy et al., 2022; Tanaka & Camerer, 2015). A comparison of the in-group bias between artificial and natural groups reveals that, in the context of allocation decisions, the outcomes for the former lie between those for the strong and weak real group conditions (Eckel et al., 2022). Similarly, a meta-study by Lane (2016), highlights that discrimination by artificial groups lies in the range of the discrimination by groups with different natural identities, such as ethnic, social, or geographic groups, with the latter discriminating the most.

This study contributes to the literature by further exploring the interaction between social distance and status in natural groups. In contrast to the aforementioned studies that introduce status via performance in experiments (see, e.g., Hong et al., 2022; Paetzel & Sausgruber, 2018), this study introduces status in the form of actual military rank (officer candidate or officer). In addition to this general contribution, we explicitly analyze soldiers’ social identities at different levels.

The participants in our experiment are officer candidates and officers from different branches of the German Armed Forces (army, air force, and navy). In a wide variety of real-world settings, higher status is likely to correlate with differences in ability and preferences, making it difficult to isolate variation in status in natural groups (Rustichini, 2008). In contrast, the institutional peculiarities of the Bundeswehr, discussed in more detail below, mean that military status is primarily derived from rank and, to a much lesser extent, from income or other factors. Income differences between officer candidates and officers are rather small among students, so officer candidates and officers predominantly differ in status but are not expected to differ substantially in cognitive ability or preferences. Our unique sample of 512 soldiers thus allows us to take advantage of the real – rather than experimentally induced – differences in status between military units and ranks. Clearly, selection into the German Armed Forces occurs, as does selection for the military branches to a lesser extent. With this approach, we can analyze identification along three different dimensions, holding other factors, such as cognitive ability, social background, and preferences, almost constant (in expectation).

We use a series of dictator games to measure how individuals identify themselves on the basis of how they give to others. Specifically, we investigate how they allocate resources to members of different groups and whether they favor their in-group over their out-group. In doing so, we (i) investigate the extent to which soldiers identify as soldiers rather than civilians. Additionally, we test (ii) whether and to what extent soldiers identify with their own branch of service relative to other branches and (iii) whether this identification varies with their status as officer candidate or officer. In the dictator game, efficiency considerations are irrelevant to the distribution, as the total amount is fixed. Furthermore, reciprocity is not a factor, as the receiver is passive, so the giving can be understood as a prosocial rather than selfish act. Thus, our design and dataset enable us to analyze clear-cut in-group bias at the horizontal and vertical levels and the interaction of identification at both levels.

We find that soldiers strongly identify as soldiers: They transfer 26% more to fellow soldiers than to civilians. Additionally, there is a high level of identification within branches of service. Members of a specific branch give over 50% more to a member of their own branch than to a member of a different branch. To the best of our knowledge, the magnitude of this in-group-bias between natural groups makes it one of the largest documented effects in the literature. Additionally, horizontal identification and status interact, as officers give approximately 25% less than officer candidates to soldiers in their own branch (although the differences in giving behavior are still significant for officers). We find no differentiation in officers' transfer behavior between status groups. However, officer candidates give less to officers than to other officer candidates (40%). Consequently, our results confirm that status interacts with social distance, as proposed by Shayo (2009) and documented by e.g. Paetzel and Sausgruber (2018), Hett et al. (2020) and Hong et al. (2022).

Our paper is structured as follows. Section 2 describes the data and institutional background in further detail before our experimental design and hypotheses are presented in Section 3. The results are addressed in Section 4. Finally, Section 5 provides a general discussion of our findings and a brief conclusion.

2. Institutional background

The Bundeswehr (German Armed Forces) offers university degrees through attendance of one of their universities in Munich and Hamburg. These universities offer various study programs and are moderately ranked among national universities. The majority of students at these universities are officer candidates or officers, with a minority being civilians. Approximately 80% of German officer candidates are required to obtain at least a bachelor's degree, and over half of them are required to obtain a master's degree. Prior to attending university, soldiers complete their basic training as officer candidates in their branch of service (army, air force, or navy) and subsequently attend the university as *Fahnenjunker*, the first rank of officer candidates. After 21 months of study, soldiers are promoted to the rank of lieutenant, the first officer rank. Consequently, promotion to officer status is, for the vast majority, automatic after a certain period of time and does not depend on specific performance, such as attainment of a bachelor's degree. The attrition rate for promotion from officer candidate to officer status is about 10%. The usual term of military service for regular soldiers is 13 years.

In addition to the two Bundeswehr universities, there is also the Leadership Academy of the German Armed Forces *Führungsakademie der Bundeswehr* (FüAk) in Hamburg. It is the highest military training center for the education and training of staff officers and future generals. Students come from all occupational units of the military, such as aviation, medical, managerial, and engineering corps, and belong to one of the three branches of service. FüAk graduates are considered the military elite, with the highest rank (status) within the Bundeswehr, outranking graduates of Helmut Schmidt University (HSU). For the purposes of this analysis, the two subgroups have been merged into a single category of officers, as no significant behavioral differences are identified between them. It should be emphasized that officer candidates and officers differ in not only military rank but also duration of service. A comparison of the officers from HSU (who spend approximately 5 years in the military) and officers from FüAk (who spend approximately 12 years in the military) shows no differences in behavior despite the differences in duration of service. Therefore, we conclude that the different behavior of officer candidates at HSU (who have spent about 3 years in the military) and officers at HSU (who have spent about 5 years in the military) cannot be predominantly attributed to their different durations of service. We also argue that officer candidates and officers do not differ in expected cognitive abilities or preferences because the recruitment process is always very similar and, again, officers are automatically promoted after approximately 21 months of study, with approximately 10% dropping out before promotion.

The income differences between officers and officer candidates are also not fundamentally different. An unmarried officer candidate earns initially €2440 gross per month, with incremental increases following promotions and ensign during the first two years of training, all of which remain within the officer candidate status. Upon promotion to lieutenant after roughly 3 years of service (about one year of basic military training and 21 month of study), the individual is formally considered an officer, earning about €3083 gross per month. Thus, this rather small salary difference between officer candidates and officers should not drive the differences we find.

However, we do not argue that there are no selection effects at all. In addition to selection into the military profession, there is some degree of selection into the different branches of service and, to a lesser extent, into officer ranks. Furthermore, the status differences within the military hierarchy in our sample may be rather small in comparison to the status differences between officers, noncommissioned officers, and privates. It is to be expected that these groups also differ in other aspects, such as cognitive abilities, income, and preferences.

Fig. 1 provides an overview of the distribution of officer candidates and officers across the three branches of service in our sample. For data protection reasons, it was not feasible to obtain the specific ranks within the branches. Consequently, the scope is limited to officer candidates and officers. Not surprisingly, the sample of participants nicely represents the relative size of the three

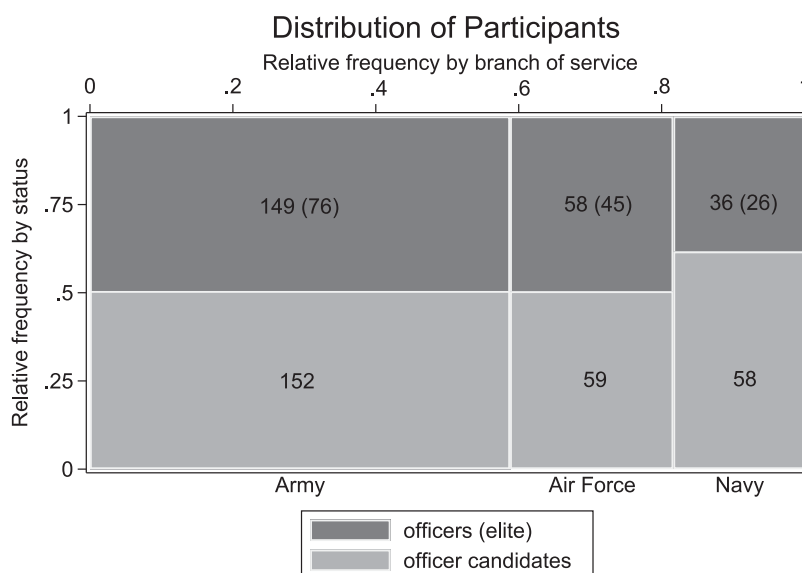


Fig. 1. The figure presents the distribution of participants by branch of service (army, air force, or navy) on the horizontal axis and status (officer candidate or officer) on the vertical axis. The absolute number of participants is displayed in each of the six cells. Numbers in brackets are officers from the FüAk (elite).

branches of service in the entire Bundeswehr. Overall, the Bundeswehr had 178,179 employees in 2020. About 104,000 employees are soldiers, and the remaining employees are classified as civilians. Among soldiers, 57.48% are part of the army, 26.99% are part of the air force, and 15.53% are part of the navy. The relative size of each branch is comparable to the participant shares by branch in our experiment. Moreover, the overall proportion of women in the Bundeswehr (civilian and military) is approximately 20%. Consequently, our sample, 17.40% of which is women, is also comparable to the Bundeswehr as a whole. The sample size was determined by two factors: We required a minimum of 20 soldiers per cell (see Fig. 1) and that all students in the courses participated in the experiment.

3. Experiment and hypotheses

3.1. Design and procedure

The experiment uses seven modified dictator games combined at the within-subject level. In each game, the dictator has a €10 endowment and decides how much to give a recipient, who differs in each dictator game. The seven dictator games were presented in three “decision situations” – *blue*, *yellow*, *gray* – as visualized in Table 1.

Thus, we varied the recipients on only one dimension (soldier, branch, or status). The order of the decision situations was random and varied between individual sheets. After participants made their decisions, a short questionnaire on sociodemographic information, such as gender, current degree, and field of study followed. Additionally, participants were asked to provide their military rank (officer candidate or officer) and branch of service (army, air force, or navy). All participants acted as dictators and decided how much of the endowment to give the recipient for all seven decisions by marking their decision on a €0–€10 scale, with only integer amounts allowed (see Online Appendix D for more details on our experimental setup).

The modified dictator game experiment was conducted as a pen-and-paper classroom experiment during several lectures at HSU and FüAk. During the lectures, students from different branches and status groups are mixed. Furthermore, there is a small

Table 1
Decision situations.

	Blue	Yellow	Gray
Giving to	a soldier a civilian	an officer candidate an officer	an army soldier an air force soldier a navy soldier
Measures	Identification as a soldier	Vertical dimension (status group)	Horizontal dimension (branch of service)

Table notes. For each decision, the dictator has an endowment of €10.

proportion of students who are civilians in the courses. At the beginning, the experimenter distributed sheets containing instructions, the experiment, and a questionnaire. The instructions were read aloud, and participants were given the opportunity to ask questions about the general procedure of the experiment. Furthermore, the instructions informed participants that speaking during the experiment was not allowed. It was ensured that all participants could make their decisions anonymously and without interruptions from others. Most participants completed the experiment and the questionnaire in less than fifteen minutes. After data had been collected from all courses in that term, all the sheets were gathered, and a student assistant randomly selected every 10th sheet for payout. This cost-effective, pragmatic design choice was based on findings from the literature. Clot et al. (2018) examine the impact of random payment schemes on giving behavior in the dictator game. They investigate not only the probability that an individual's decision receives a payout (1/1 vs. 1/10 chance) but also the magnitude of the endowment (€10 vs. €100). They find no discernible difference in average giving behavior with a €10 endowment whether a payout is received for every decision or for every 10th decision. The meta-analysis by Umer (2023) supports this result, as no differences in giving behavior are found between single-incentivized decisions and decisions from which some are randomly selected for a payout. Additionally, Beattie and Loomes (1997) specify that subjects may perceive each decision to be independent from the others, which would minimize potential effects of multiple decisions. We assume that their conclusions are applicable to our design employed in our study. Furthermore, one could argue that the financial incentives are very low given that only one in ten people receives a payout and only one of the seven decisions results in one. This means that the expected value is just a few cents. However, the stakes are small in all decision situations. Since our primary interest lies in comparing giving behavior across situations for different subgroups rather than absolute levels of giving, the differences in giving among subgroups should not be substantially affected by the low stakes. Additionally, there is evidence from two meta-analyses that the outcome in a dictator game is unaffected by whether it is hypothetical or involves a financial payout (Cochard & Flage, 2024; Engel, 2011). Consequently, we do not expect a different payment mechanism to lead to substantially different results.

There was always one participant in the dictator and another in the recipient's role. The sheets drawn for payout were always assigned alternately to the role of the active decision-maker and the role of the recipient, meaning that each player drawn for a payout had an equal chance of being dictator or receiver. The game situation that determined the payoff was chosen by the rolling of a dice (with an equal chance for each of the three decision situations). For instance, if a dice roll selected *situation blue* and the recipient was a soldier, the payoff was determined by the amount given to a soldier in that situation. The payoff determination and procedure were common knowledge and explained in the instructions. For each decision situation, the player's actual characteristic determined the payoff. Therefore, we utilized the strategy method introduced by Selten (1967). In a meta-analysis, Brandts and Charness (2011) compare behavior under the strategy method with behavior under the direct response method and find that treatment effects occur regardless of the method used and, if anything, the threshold at which they occur is somewhat lower with the strategy method. Additionally, Cason and Mui (1998) show in a sequential dictator game that there are no significant differences between the methods used. Given these findings, we consider our design to be not only cost-effective and pragmatic, but also suitable for addressing our research questions. We argue that, due to the low incentives and the use of the strategy method, our procedure measures in-group bias conservatively relative to other procedures.

The data were collected between 2017 and 2019 at HSU and FÜAk in Hamburg over three years. In 2017, only HSU students participated, while in 2018 and 2019, data from HSU and FÜAk students were gathered. Overall, the dataset comprises 523 participants, including 373 HSU students (eight of whom are civilians) and 150 FÜAk students (three of whom are civilians). Although civilians' own behavior is not analyzed in this paper, we do analyze giving to civilians, which required the presence of a certain proportion of civilians in the sample. The experiment ensured complete anonymity; names of participants were not recorded, and payouts were provided through anonymized numerical identification codes. Participants who received a payout were informed through subsequent lectures and the university homepage using their anonymized numerical identification code. Each participant took part in the experiment only once. At the time of the study, it had not yet become customary to obtain an ethical review or preregister the study's design/hypotheses. Nevertheless, the study was conducted in concordance with the president of the HSU Hamburg.

3.2. Hypotheses

Given the extensive documentation of in-group bias in the experimental literature on group identity (e.g., Chen & Li, 2009), our first hypothesis is that soldiers are likelier to give higher amounts to in-group members (other soldiers) than to out-group members (civilians). Drawing from the literature on soldier identification (e.g., Akerlof & Kranton, 2000, 2010; Goette et al., 2006), we derive [Hypothesis 1](#).

Hypothesis 1 (Soldier-Civilian).

- (1) Soldiers give more to other soldiers than to civilians.

Drawing on the literature on social identity (e.g., Akerlof & Kranton, 2000; Chen & Li, 2009) and status (e.g., Ball et al., 2001; von Essen & Ranehill, 2011; Weiss & Fershtman, 1998), we formulate [Hypothesis 2](#). Shayo (2009) considers two different levels of identification, so our second hypothesis is twofold. First, it deals with the horizontal distinction between groups of soldiers, specifically their different branches of service (army, navy, and air force). Second, it captures the vertical level of differentiation by status (officer candidates and officers).

Hypothesis 2 (Soldier-Soldier).

- (2a) Soldiers give more to members of the same military branch of service.
 (2b) Soldiers give more to soldiers of the same rank.

Our conjecture about the interaction-specific effects of social distance and social status on in-group bias is presented in [Hypothesis 3](#) ([Hett et al., 2020](#); [Hong et al., 2022](#); [Paetzel & Sausgruber, 2018](#)). According to [Paetzel and Sausgruber \(2018\)](#), in-group bias within minimal groups (horizontal level) is pronounced and statistically significant among participants with low performance (low status). Conversely, this bias does not exist among high-performing participants (those with high status). These findings suggest that horizontal in-group bias is less prevalent among individuals with high status. Hence, it is reasonable to posit that military personnel of a higher status (i.e., officers) are less likely to identify with their respective military branch on a horizontal level. More specifically, we are interested in whether higher status reduces in-group bias because of social distance. In [Hypothesis 3](#), this relationship is reversed and associated with lower-status soldiers.

Hypothesis 3 (Interaction of Social Distance and Social Status).

- (3) Soldiers of lower status show higher horizontal in-group bias.

4. Results

This section's organization follows the order of the hypotheses above. Section 4.1 examines the extent to which soldiers identify as such, as opposed to as civilians ([Hypothesis 1](#)). Section 4.2 focuses on horizontal identification ([Hypothesis 2a](#)), and Section 4.3 addresses identification at the vertical level ([Hypothesis 2b](#)). Section 4.4 addresses whether there is an interaction effect between the horizontal and vertical levels ([Hypothesis 3](#)).

4.1. Identification as a soldier

Following the literature on social identity (e.g., [Akerlof & Kranton, 2000](#); [Chen & Li, 2009](#)), we define in-group bias in a broader sense as the preferential treatment of in-group members over out-group members. In our setting, this relates to differences in giving to the in- and out-groups, as also used by e.g. [Chen and Li \(2009\)](#) and [Paetzel and Sausgruber \(2018\)](#).

[Table 2](#) presents the giving behavior of soldiers toward civilians and other soldiers. Online Appendix A presents bar charts and histograms illustrating the distribution of giving behavior. On average, soldiers give €3.78 to a civilian and €4.77 to another soldier; this difference is statistically significant (t -test, $p < 0.001$). A χ^2 -test confirms a significant difference in the distributions of soldiers' giving to civilians and their giving to other soldiers ($p < 0.001$). The corresponding test statistics (and those for subsequent tests) are presented in [Table 5](#) in Online Appendix B.

We interpret soldiers' giving more to other soldiers (in-group) than to civilians (out-group), as seen in [Table 2](#), as evidence of in-group bias among soldiers. To validate the results of the descriptive analysis, we also perform a regression analysis, with the amount given as the dependent variable and sociodemographic variables as control variables (see [Table 6](#) in Online Appendix C). Since the results of the descriptive analysis are validated, we will not discuss the regression analysis any further here.

It is evident that soldiers give significantly more to soldiers than to civilians, showing a strong and highly significant in-group bias. Consequently, [Hypothesis 1](#) is clearly supported, leading to our first result:

Result 1 (Soldier-Civilian). *Soldiers give significantly more to other soldiers than to civilians. Soldiers show an in-group bias and thus strongly identify as soldiers rather than civilians.*

It is worth noting that the soldiers in our sample give nearly 40% of their endowment to civilians, despite giving less to civilians than to other soldiers on average. This giving rate is higher than the mean giving rate of 28.35% documented in a meta-analysis of dictator games by [Engel \(2011, p. 588\)](#). It could be inferred that the soldiers in our sample both are generous and have a strong identification with their in-group. Because this experiment was conducted in a classroom setting, the level of giving may have been influenced by an experimenter demand effect. The social distance between participants (students) and the experimenter (professor) may have been relatively small in this setting, which could have led to more generous giving behavior ([Hoffman et al., 1996](#)). Additionally, as previously mentioned, the stakes in our setting were very low, which could have led to more generous behavior. However, a potential experimental demand effect would work against our hypotheses on in-group biases because lower prosociality toward out-group members is perceived as undesirable.

Table 2
Soldiers' giving to civilians and other soldiers.

Recipient	Mean	SE	t -test (p -value)
Civilian	3.78	0.13	$p < 0.001$
Soldier	4.77	0.13	

Table notes. The table presents the giving behavior of soldiers when the recipient is a civilian and when the recipient is another soldier. Participants had €10 for each giving decision and could distribute integer amounts. $N = 512$.

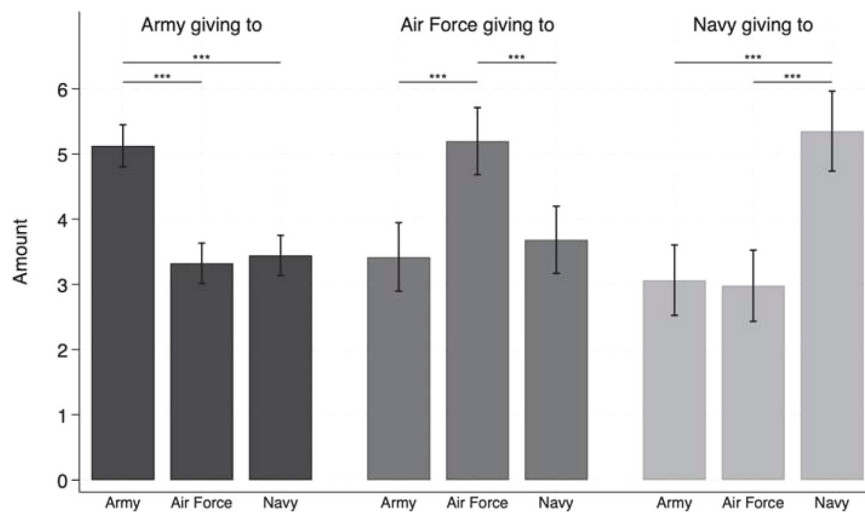


Fig. 2. Horizontal identification.

Notes: The figure presents soldier giving toward members of the three different branches by the soldier's own branch membership. Participants had €10 for each giving decision and could distribute integer amounts. $N = 512$.

4.2. Horizontal identification – In-group bias between military branches

This subsection focuses on identification with the military branch and addresses [Hypothesis 2a](#). Specifically, the analysis examines whether a soldier gives more to a member of the same branch of service, where the social distance is lower and identification is higher, than to members of other branches. [Fig. 2](#) illustrates giving toward members of the same branch and toward members of different branches in three panels, each for a specific branch. Histograms illustrating the distribution of giving behavior are presented in Online Appendix A in Figures 5, 6, and 7 for each branch.

The left panel of [Fig. 2](#) illustrates the giving behavior of members of the army toward the three branches. On average, soldiers in the army give €5.12 to a member of their own branch, while airmen and sailors receive €3.32 and €3.45, respectively. The difference in the average amount given by an army soldier to a member of another branch is highly significant (t -test, $p < 0.001$), as is the distribution of giving to an airman or sailor (χ^2 -test, $p < 0.001$). In Table 5 in Online Appendix B, the test statistics are displayed for all three branches of service.

A very similar pattern emerges when we turn to the airmen in the middle panel of [Fig. 2](#). On average, airmen give €5.20 to other members of the air force, while soldiers in the army and sailors receive significantly less (€3.42 and €3.68, t -test, $p < 0.001$). The right panel of [Fig. 2](#) displays the average giving behavior of sailors. Like soldiers and airmen, a sailor gives significantly more (€5.35) to another sailor than to a member of the other branches (t -test, $p < 0.001$). The distributions of giving to members of the same branch and to members of a different branch are significantly different for both airmen and sailors ($p < 0.001$). Consequently, we find clear evidence of in-group bias here: On average, members of a particular branch give more than 50% more to a member of their own branch than to a member of another branch. This effect among natural identity groups is among the highest documented in the literature (for a meta-analysis, see [Balliet et al., 2014](#); [Lane, 2016](#)).

To summarize, in situation gray ([Fig. 2](#)), focusing on horizontal identification between military branches, we find support for previous findings on natural identities. The high level of identification with one's own military branch, corresponding to the highest level of in-group bias reported in the literature to date, is particularly striking. Consequently, we confirm [Hypothesis 2a](#) and specify our next result.

Result 2 (Soldier-Soldier). *Social distance matters: Soldiers give significantly more to members of the same military branch. There is strong horizontal identification.*

Notably, soldiers in our sample give approximately 30% of their endowment to out-group members. This rate is similar to the aforementioned average rate of 28.35% documented by Engel (2011). This could be interpreted as mild evidence that in-group love rather than out-group hate determines such a strong in-group bias.

4.3. Vertical identification – In-group bias between military ranks

Next, we focus on the vertical dimension, that is, differences in social status, by comparing the giving behavior of officer candidates with that of officers. More specifically, we analyze whether a soldier gives more to a member of the same rank with the same social status than to a member of a different rank ([Hypothesis 2b](#)).

Table 3
Giving behavior by military status.

Giver status	Receiver status	Mean	SE	<i>t</i> -test (<i>p</i> -value)
Officer Candidate	Officer Candidate	4.43	0.17	$p < 0.001$
	Officer	3.12	0.17	
Officer	Officer Candidate	4.66	0.18	$p = 0.347$
	Officer	4.42	0.17	

Table notes. The table presents giving behavior toward officer candidates and officers. Participants had €10 for each giving decision and could distribute integer amounts. $N = 512$.

Table 3 shows that officer candidates give significantly more to members of the same rank, i.e., other officer candidates, than to members of a different rank, i.e., officers. Bar charts and histograms illustrating the distribution of giving behavior are presented in Online Appendix A in Figures 8, 9 and 10. The differences across recipients are relatively large, with officer candidates giving 40% more to fellow soldiers of their own rank than to those of another (higher) rank (€4.43 vs. €3.12, *t*-test, $p < 0.001$).

For officers, however, we see a different picture. On average, officers do not give more to other officers, i.e., members of the same status, than to officer candidates (€4.42 vs. €4.66). Consequently, strong identification based on military rank has an effect only in low-status groups, not high-status groups. Thus, vertical identification is less strong for high-status officers than for low-status officer candidates. Given that we have natural groups and that status is not determined artificially, this result is particularly compelling.

Vertical identification is thus significant and strong only for low-status officer candidates. High-status officers are generally more generous but do not act in line with in-group favoritism. Therefore, the behavior of low-status groups offers partial support for Hypothesis 2b. The following result specifies our findings regarding in-group bias among soldiers, focusing on the vertical dimension.

Result 3 (Soldier-Soldier). *Social status matters but not for everyone: Officer candidates give significantly more to other officer candidates, whereas no in-group favoritism is visible among officers.*

Of course, one could argue that an officer earns more than an officer candidate, so income inequality could explain this effect to some extent. However, since the pay gradient in the German Federal Army is not as severe as in other work contexts and since officer candidates are quasi-automatically promoted after a certain period of service, the influence of income differences is unlikely to be the only reason for the differences in giving behavior (see Section 2).

4.4. Interaction of horizontal and vertical identification

In this subsection, we examine the interaction between social distance and social status, i.e., identification on the horizontal and vertical dimensions. More precisely, we hypothesize that low-status soldiers show higher horizontal in-group bias (as stated in Hypothesis 3).

Table 4 breaks down the giving behavior of the three branches and, within each branch, by rank. The columns show the branch of the giving person (army, air force, navy), divided into officer candidates and officers, and the *t*-test for the difference between ranks. The rows show the branch of the recipient (army, air force, navy), each with the average amount given and the standard error. At the bottom of the table are results from *t*-tests of the differences between the three recipient groups (army vs. air force, army vs. navy, air force vs. navy), separated by rank for each giver group.

The previous results are also evident here: Both officer candidates and officers give more to members of their own branch than to members of other branches. The difference in giving behavior is significant in all comparisons (see last three rows of Table 4). Interestingly, the difference between what officer candidates and officers give to their own branch is not significantly different, whereas officers give significantly more to other branches than do officer candidates. An army officer candidate gives €5.01 to a soldier in the army, whereas an army officer gives €5.25, which is not significantly different (*t*-test, $p = 0.474$). An army officer

Table 4
Giving behavior by military branch and status.

		Giver status								
		Army			Air force			Navy		
Receiver Status		O.Candidate	Officer	<i>t</i> -test O.C vs. O.	O.Candidate	Officer	<i>t</i> -test O.C vs. O.	O.Candidate	Officer	<i>t</i> -test O.C vs. O.
Army	Mean (SE)	5.01 (0.25)	5.24 (0.21)	$p = 0.474$	2.73 (0.35)	4.12 (0.38)	$p = 0.008$	2.62 (0.35)	3.78 (0.41)	$p = 0.038$
Air Force	Mean (SE)	2.91 (0.22)	3.74 (0.22)	$p = 0.008$	4.97 (0.36)	5.43 (0.37)	$p = 0.373$	2.52 (0.35)	3.72 (0.42)	$p = 0.032$
Navy	Mean (SE)	3.01 (0.23)	3.89 (0.21)	$p = 0.004$	2.90 (0.33)	4.48 (0.37)	$p = 0.002$	5.33 (0.41)	5.39 (0.47)	$p = 0.924$
<i>t</i> -test	Army vs. Air Force	$p < 0.001$	$p < 0.001$		$p < 0.001$	$p = 0.015$		$p = 0.835$	$p = 0.925$	
	Army vs. Navy	$p < 0.001$	$p < 0.001$		$p < 0.001$	$p = 0.499$		$p < 0.001$	$p = 0.012$	
	Air Force vs. Navy	$p = 0.755$	$p = 0.626$		$p = 0.726$	$p = 0.075$		$p < 0.001$	$p = 0.010$	

Table notes. The table presents the giving behavior of an army/air force/navy officer candidate and an army/air force/navy officer to a army, air force, and navy soldier. Participants had €10 for each giving decision and could distribute integer amounts. $N = 512$.

candidate, on the other hand, gives €3.18 to an airman, whereas an army officer gives €3.74, which is significantly different (t -test, $p = 0.008$). Very similar results can be found for officer candidates and officers in the air force and navy.

Two main points emerge. First, strong horizontal identification leads to high in-group bias, as officers and officer candidates give significantly more to member of their own branch. Second, officers identify less with their branch than officer candidates because they also give more to members of other branches. We also perform a regression analysis where we use only situation gray – giving to the three branches – and incorporate the interaction between social status and social distance (see Table 7 and descriptions in Online Appendix C). The results of the descriptive analysis are confirmed by the regression analysis, so we will not discuss it further here.

Thus, there is in-group bias across all branches, with officer candidates having stronger in-group bias at the horizontal level. This result fits perfectly with the theoretical model of Shayo (2009), in which identification is observed across both horizontal and vertical levels, and with key findings of Paetzel and Sausgruber (2018) and Hong et al. (2022). For example, Paetzel and Sausgruber (2018) find that low performers, as determined by a performance test, exhibited significantly larger in-group bias at the horizontal level with minimal identity groups.

Result 4 (Interaction). *Officer candidates and officers give significantly more to members of their own military branch, while officers also give significantly more to member of other branches than do officer candidates. In-group bias at the horizontal level is stronger for low-status soldiers.*

5. Discussion and conclusion

Since in-group favoritism has been documented in many experimental settings, its far-reaching implications are not in question. However, some blind spots in the social identity literature remain. In the theoretical literature, soldiers are the primary example of groups with strong identification (e.g., Akerlof & Kranton, 2000, 2005), but ultimate empirical verification is still lacking. In our setting, we investigate social identification in natural groups of soldiers, providing empirical evidence for the theoretical predictions. The 512 soldiers in our experiment are officer candidates and officers from different branches of the Bundeswehr (army, air force, and navy).

We find that identification as a soldier is strong insofar as soldiers share, on average, half of their endowment with other soldiers while civilians receive 26% less. To the best of our knowledge, we are the first to provide direct empirical evidence of the theoretical predictions of Akerlof and Kranton (2000; 2005). Additionally, members of a specific branch (army, air force, and navy) give more than 50% more to an in-group member than to an out-group member from a different branch. In short, we observe astonishingly high in-group bias at the horizontal level (between military branches). To our knowledge, this is one of the largest documented effects between natural identity groups in the literature. In terms of the vertical dimension, there is no differentiation in officers' transfers between status groups. However, officer candidates give less to officers than they do to other officer candidates. Turning to the interaction between social distance and social status, we find that both officer candidates and officers give significantly more to members of their own military branch. However, officers also give significantly more than officer candidates to members of other branches. Consequently, horizontal identification is higher for soldiers with lower status. These findings align with those from laboratory experiments with minimal identity groups and different status determinations (e.g., Hong et al., 2022; Paetzel & Sausgruber, 2018).

Overall, among the soldiers in our sample, identification with one's military branch (horizontal level) is most relevant, as indicated by high in-group bias. Interestingly, identification as a soldier as opposed to a civilian does not interact with horizontal identification with one's military branch.

To facilitate execution of the experiment, it was important that the soldiers could carry it out quickly and with pen and paper. Therefore, we kept the experiment as simple and straightforward as possible. As the instructions and decision sheets in Online Appendix D reveal, we consistently asked about "giving to the in-group" and "giving to the out-group" in each of the three decision situations. One could argue that emphasizing both groups could have contributed to an increased in-group bias by means of framing effects. However, our specification of the in-group and out-group constructs could also have made discriminatory behavior observable, which could have decreased the behaviors we interpret as indicators of in-group bias. This is an empirical question.

Note that we employed the strategy method in our design, as in Chen and Li (2009), and that we used small incentives. According to the literature in Section 3, neither design choice is expected to lead to different giving behavior. In fact, because of the small incentives and use of the strategy method, one might expect in-group bias to be lower than with alternative procedures. In addition, the within-subject design employed could have revealed the nature of our inquiry to the participants, thereby inducing a demand effect. Nevertheless, the salience of this information remains ambiguous: It is uncertain whether it would augment in-group bias or attenuate differentiation.

Finally, the status differences within the military hierarchy in our sample are rather minor. Considerably greater status differences exist among officers, noncommissioned officers, and privates. We might expect that with larger gaps in status, even higher in-group biases might be exhibited by the lower-status group.

In summary, while our design emphasizes the presence of both in-group and out-group members, which could lead us to overestimate in-group bias, the use of the strategy method, low incentives, and the specific choice of officers and officer candidates as the sample may, conversely, lead to underestimation of this bias. For military hierarchies, lower horizontal identification with increasing status seems appropriate, as cooperation with other units becomes more important with increasing status. It is also conceivable that increasing status is associated with more responsibility and horizontal identification is therefore less relevant.

There may also be more interaction among higher-status soldiers, so officers may have more contact with other status groups than officer candidates do. It would be interesting to examine the extent to which these findings apply in other (natural) group contexts, such as workplaces.

In times of changing social identities and increasing polarization, it is important to understand how different identities interact and who identifies how. In principle, if our experimental results can be extrapolated, one implication for policy to counteract increasing polarization might be that high-status individuals should engage in intergroup interactions because they tend to identify (discriminate) less at the horizontal level.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at <https://doi.org/10.1016/j.joep.2026.102907>.

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