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ABSTRACT

A growing theoretical and empirical literature shows that public recognition can lead to greater effort amongst employees. At the same time, status competition can be associated with excessive expenditure on status goods, higher risk of bankruptcy, and more risk taking amongst money managers. In this paper, we look at the effects of recognition and status competition jointly: We focus on the spillover effects of public recognition on the performance and risk taking of peers. Using newly collected data on monthly victory scores of over 5,000 German pilots during World War II, we find corrosive effects of status competition: When the daily bulletin of the German armed forces mentioned the accomplishments of a particular fighter pilot, his former peers perform markedly better. Outperformance is differential across skill groups. When a former squadron peer is mentioned, the best pilots try harder, score more, and die no more frequently; average pilots win only a few additional victories, but die at a markedly higher rate. Our results suggest that the overall efficiency effects of non-financial rewards can be ambiguous in settings where both risk and output affect aggregate performance.

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I. INTRODUCTION

Humans crave recognition. In the *Theory of Moral Sentiments*, Adam Smith defined "bettering our condition" as "to be observed, to be attended to, to be taken notice of with sympathy… and approbation." From baseball's Hall of Fame to the Congressional Medal of Honor, from the fellowships of scholarly societies to the employee-of-the-month award, symbolic rewards exploit the human need for approbation as a motivating force. By creating an artificial scarcity, awards are meant to spur effort and increase output (Besley and Ghatak 2008; Moldovanu et al. 2007; Frey 2007; Bénabou and Tirole 2003, 2006).[1] Empirical evidence from the field and from experimental settings suggests that non-pecuniary rewards on the whole lead to lower absenteeism, greater effort, and higher accuracy (Markham et al. 2002; Chan et al. 2014; Kosfeld and Neckermann 2011; Ashraf et al. 2014). [2]

At the same time, "[a] medal glitters, but it also casts a shadow" (Winston Churchill).[3] Competing for awards and recognition is similar to other forms of status competition, from conspicuous consumption to prominent donations (Veblen 1973; Glazer and Konrad 1996; Layard 2005; Frank 1999). A growing literature has shown that relative status concerns are real and can have negative effects. Neighbors of lottery winners spend much more on cars (Kuhn et al. 2011) and face markedly higher risks of bankruptcy (Agarwal et al. 2016).[4] Consumers of financial services demand the products purchased by peers because of social learning and because of they are affected by the utility of what others have (Bursztyn et al. 2014). Similar effects have been documented in the workplace: Card et al. (2012) and Ashraf et al. (2014) show that job satisfaction and performance suffer from direct rankings and explicit comparisons with others in the same group.[5] The overall effects of competing for relative standing and symbolic awards may be ambiguous: They may crowd in effort, giving rise to social multiplier effects, or they may crowd it out, depending on relative rank or innate skill (Ariely et al 2009; Frey and Oberholzer-Gee 1997; Dohmen 2008; Apesteguia and Palacios-Huerta 2010).[6]

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[1] Both career concerns and a desire for reciprocity may be behind the incentive effects of symbolic awards (Fehr and Schmidt 1999; Dewatripont et al. 1999).

[2] Neckermann et al. (2014) find that employees continue to perform strongly after they received an award. The opposite emerges in the work of Malmendier and Tate (2009), who show that superstar CEOs significantly underperform after receiving major awards.

[3] Cited in Knowles 1999 (p. 215).

[4] Bertrand and Morse (2016) show that in US states with rising inequality, the bottom 80% spend a much higher proportion of their income.

[5] Relatedly, Charness et al. (2014) show that informing individuals of their relative performance may lead to more unethical behavior.

[6] Ashraf et al. (2014) find that explicit rankings undermine effort, while awards increase them. Schwarzwald et al. (1992) also find that social comparisons increase absenteeism, and Greenberg (1987) and Cohn et al. (2014) find that they lower effort. Similarly, competing with a superstar (like Tiger Woods in a golf tournament) may lower effort (Brown 2011).

In this paper, we look at the effects of recognition and status competition jointly: We focus on the spillover effects of public recognition on the performance and risk-taking of peers. We use new, monthly data on victory claims for the universe of German pilots with at least one claim, which includes the highest-scoring aces of all time. Fighter pilots constitute an ideal setting for analyzing the incentive effects of public recognition – the stakes are high, effort is very difficult to observe, and principal-agent problems are strong. In single-seater fighters, pilots operate alone; once battle is joined, there is no effective control of individual planes by superior officers. Each man had to decide whether to pursue victory or break off contact. Pilots could try to boost their score by flying more often, adding additional sorties in a day, and by taking extra risks during missions.

While status competition could a priori sharpen or dull incentives, there is ample anecdotal evidence that it was a key motivating force. For example, during the Battle of Britain in the summer of 1940, two German pilots – Adolf Galland and Werner Mölders – were neck-and-neck in terms of total victories (Galland 1993). When Mölders was ordered to confer with the head of the Luftwaffe, Hermann Göring, he went to Berlin for three days of meetings – but on the condition that Galland would also be grounded for the same number of days. Remarkably, at a time when the air battle against Britain hung in the balance, Göring (himself a WWI fighter ace) accepted that one of his top-scoring pilots would be grounded gratuitously.

Combining data on social distance in pre-existing networks with the timing of awards, we show that public recognition actually crowded in effort systematically: Fellow pilots tried harder at a time when another fighter pilot was recognized, increasing their score of aerial victories significantly during the month in question. This is particularly true among the best pilots, where competition was particularly intense, and of those who were closest in terms of social distance to the pilot receiving the award. To examine the effects of public recognition, we focus on mentions by name in the German Armed Forces daily bulletin (*Wehrmachtbericht)*.[7] This is for several reasons: Mentions were rare, and reserved for recognizing spectacular accomplishments such as a particularly high number of enemy ships sunk or fighters shot down. Second, mentions became known instantly over a wide area, being broadcast on the radio, published in the press, and distributed at command posts throughout German territory. Third, mentions in the daily bulletin were largely unexpected. There was no mechanical rule that entitled a pilot to being mentioned. Fourth, mentions in the *Wehrmachtbericht* are a fleeting form of recognition, providing the recipient with no tangible token of appreciation beyond elevating his status in the eyes of others. For all these reasons, we consider the mentions in the daily bulletin an ideal source of identifying variation for analyzing the effects of status competition.

[7] We draw from Wegmann (1982), which offers a collection of all issues of the *Wehrmachtbericht*.

The top panel of Figure 1 shows the average victory score for aces and non-aces, when a former peer (from the same squadron) is mentioned in the daily armed forces bulletin. To avoid contamination from correlated shocks, we exclude peers still serving in the same squadron. Aces always scored more, but they increased their monthly victory rate by 1.1 victories compared to a base of 1.9 when a fellow pilot was mentioned in the bulletin. Non-aces also scored an additional 0.12 victories, relative to a baseline of 0.23.

[*insert Figure 1 here*]

Since pilots are no longer serving in the same units, they are not exposed to correlated shocks. Results hold when we impose minimum distance requirements between the two units. We interpret these effects as being driven by competition for status, in the spirit of "keeping up with the Joneses". We provide evidence ruling out alternative interpretations such as learning about one's own type, common shocks to peers, joint learning of particular skills in the past, and differences in equipment available to pilots.

The rate of aerial victories by peers per month increased, and so did the casualty rate. This raises the question of whether social multiplier effects may have dented the *Lufwaffe's* overall fighting efficiency. The best pilots reacted to awards for their competitors by increasing their own performance, seeing their exit rate change only a little; average pilots also tried harder, but paid a high price in the form of much greater casualty rates (Panel B, Figure 1). While we cannot assess the overall efficiency impact of the mentions system, there is some reason to believe that it may have degraded the German air force's overall effectiveness.

We relate to the literature on tournaments, and on peer effects. There are strong theoretical reasons to believe that tournaments in a single shot setting can lead to higher effort (Lazear and Rosen 1981; Green and Stokey 1983; Nalebuff and Stiglitz, 1983a, 1983b). Many tournaments are, however, dynamic in nature. A growing literature examines the effects of information release in such a setting (Lizzeri, Meyer and Persico 2002, Yildirim 2005, Ederer 2010, Aoyagi 2007, Goltsman and Mukherjee 2011). In particular, Genakos and Pagliero (2012) show how risk-taking in professional weightlifting competitions follows an inverse U-curve as a function of relative standing. Fershtman and Gneezy (2011) also find that high-stakes tournaments can lead to both more effort but also to quitting amongst lower-ranked competitors. Our findings show that relative status concerns can indeed increase risk-taking, and we demonstrate this in a setting with high stakes (and no tangible financial upside). Far from leading to "giving up", however, we find additional effort and greater risk-taking with (deadly) consequences.

The rich literature on peer effects studies the consequences of collaborating with others on worker effort and performance (Mas and Moretti 2009; Falk and Ichino 2006; Bandiera et al. 2010). Peer effects are typically either driven by knowledge spillovers, task complementarities, or social pressure. In our setting, we can largely rule out the first two. Also, evidence for peer pressure is relatively strong amongst low-skilled, but it is distinctly mixed for highly-skilled individuals (Waldinger 2012; Azoulay et al. 2010; Jackson and Bruegmann 2009). We add an example where social interactions create greater incentives to perform amongst highly skilled (and motivated) individuals.

Finally, we also contribute to the literature on the determinants of military performance. Classic studies in military history have emphasized the importance of collaborative efforts (Van Creveld 2007; McPherson 1997; Stouffer 1949). Related to this, unit cohesion was higher where soldiers were more similar. For example, Costa and Kahn (2003) show that desertion rates were much lower amongst units with low occupational and birthplace fragmentation. They also show that survival rates in a POW camp were much higher for people with richer social networks (Costa and Kahn 2007). In contrast, we focus on the determinants of individual performance in a highly competitive setting.

While the setting of our study is highly specific, the results are of general interest. We present novel evidence that the effects of symbolic rewards depend on social context. Status competition can lead to a crowding-in of effort. Nonetheless, we show that high-powered incentives in the form of public recognition may backfire precisely because relative status concerns can lead to too much risk-taking. Here, there are obvious analogies with incentives in compensation schemes in financial institutions, for example, where the desire to be the "best" trader can lead to catastrophic losses.[8]

We proceed as follows. Section II provides background on the German air force during World War II and the data we use. Section III presents our main findings, and Section IV discusses alternative channels and interpretations.

II. Historical Background and Data

In this section, we discuss the setting of our study – the organization of the German air force in World War II, and its rise and fall as a fighting force. We also explain where our data come from, and the limitations of our source.

[8] The closest paper in spirit is Brown et al. 1996, who show that relative performance incentives can lead to excessive risk-taking in asset management.

A. The German Air Force during World War II

Aerial combat began during World War I. Initially, planes had been unarmed. They quickly evolved into specialized types, ranging from single-seat fighters to bombers. During World War, the highest-score ace, the "Red Baron" Manfred von Richthofen, had scored 80 victories (Castan 2007). By the time World War II started, both fighters and bombers had become faster and more powerful. The German air force had sent planes and men to participate in the Spanish Civil War on Franco's side, gaining valuable experience. There, the Luftwaffe carried out the first mass bombing of a civilian target at Guernica in 1936. German air support was important for the ultimate victory of the fascist forces (Westwell 2004).

The air force was organized into air fleets composed of several flying corps. The flying corps contained several wings (*Geschwader*), typically containing three groups which in turn consisted of three to four squadrons (*Staffel*) each. Each squadron had an establishment strength of 12 aircraft, but actual strength could be as high as 16 or as low as 4 or 5 (Stedman and Chappell 2002).

The German air force began the war in 1939 with 4,000 planes, including 1,200 fighters, and 880,000 men (Kroener et al. 1988). It had initially been designed for joint arms operations; during the "Blitzkrieg" campaigns, it mostly operated as close air support for the army. The wars against Poland, France, and Russia opened with successful attacks on enemy air forces, destroying many planes on the ground. This ensured that the Luftwaffe quickly achieved air superiority. Before 1943, the only exception was defeat in the Battle of Britain, when the German air force failed to dominate the skies – and the planned invasion of the British Isles was consequently called off.

By 1943, personnel and the number of planes had doubled, to 2,000,000 men and some 7,000 planes (Kroener et al. 1988). As the allied bomber offensive against the German cities gathered pace, ever more fighter units were called back to defend the Reich. Air attack on hydrogenation plants, airframe and aero-engine factories were a particular threat to the Luftwaffe, and from 1943 onwards, its main effort was trying to stem the growing tide of bomber incursions. Despite these efforts, German cities quickly turned to rubble as the strength of British and American air forces continued to increase.

Having started the war with modern planes and a large air fleet, Germany first lost its quantitative edge. Once the war in Russia began, and the US joined the fight, the Luftwaffe was heavily outnumbered in all theatres of war. Eventually, it also fell behind in terms of quality of equipment, keeping the outdated BF-109 plane flying as a main fighter until the end of the war. New planes with advanced technology, such as the ME-262 jet, arrived too late to make a difference. Pilot training suffered as well. Until 1942, German pilots received the same training or more than allied pilots; by 1944, German pilots received less than half of the flying hours of UK or US pilots before being sent off into combat (Murray 1996)

Loss rates became staggeringly high. In January 1942, the air force lost only 1.8% of its fighter pilots; by May 1944, it was losing 25% of them every month (Evans 2009). Destruction of planes was even more rapid. The Luftwaffe had lost 785 planes in combat during the six months between May and December 1940 (and another 300 in accidents, etc.); between January and June 1944, it lost 2,855 (plus another 1,345 in accidents). Actual planes available relative to authorized strength fell from 95% in January 1942 to 45% in September 1944 (Murray 1996).

Air attacks against German cities may not have dented morale as much as British planners had hoped; 'precision' daylight bombing by the US air force destroyed much less of the industrial capacity than planned. Nonetheless, it is clear that the Anglo-American air offensive was highly effective in degrading the capabilities of the German air force, to the point that the Normandy landings in the summer of 1944 were largely unopposed in the air (Neillands 2001).

While the Luftwaffe lost air superiority in the West from 1942/43 onwards, it continued to be a match for the Red Air Force almost until the end. Outdated planes like the *Stuka* dive bomber had to be withdrawn from the Western theatres after 1942; they continued to operate in the East until 1945. Better training and better equipment gave the German units an edge against Russian planes and pilots; when it made an effort, the Luftwaffe could establish temporary air supremacy on the Eastern Front. It was not until late 1944 that this ability decreased, as more and more units were switched to the Western Front.

B. *Public recognition*

Mentions in the daily bulletin were amongst the highest form of recognition used by the German armed forces. A typical report would only mention major events at the different fronts, listing gains and losses of territory or individual battles. Mentions were rare. During the entire war, fewer than 1,200 men were recognized in this way (Wegmann 1982), out of 18 million German men who served.[9] Mentions by name were introduced in April 1940. One of the first soldiers receiving this recognition was Erwin Rommel for his role in leading the German armored thrust into France in the spring of 1940. A typical example is Hans-Joachim Marseille's second mention on June 18, 1942:

> First Lieutenant Marseille shot down ten enemy planes in a 24 hour period in North Africa, raising his total score of aerial victories to 101. (Wegmann 1982)

The daily bulletin was produced by the propaganda department within the Operations Staff of the German armed forces, and directed by General Hasso von

[9] There are 1,182 individual surnames in the *Wehrmachtbericht.* Because first names are not always recorded, there are potentially as many as 1,739 soldiers who were mentioned (if each mention with an identical last name is for a different soldier).

Wedel. Like all propaganda produced under the Third Reich, it skillfully mixed truth and distortions to create support for the war and the regime (Klietmann 2004). Highlighting the superiority of German fighting men was an integral part of this strategy.

Mentions in the Wehrmachtbericht were embedded in an elaborate system of awards and medals operated by the German armed forces. Some were widely distributed, such as "campaign medals" handed out to every soldier who participated in a particular operation – such as the Russia 1941 campaign medal, commonly known as the "Order of the Frozen Flesh". Some recognized particular skills or feats of arms, such as the close combat badge and tank destruction badges. The major medals for valor were the Iron Cross 1st and 2nd class, and the Knight's Crosses. By the end of the war, there were five different Knight's Crosses, awarded cumulatively. The total number of recipients varied greatly – here were approximately 3.3 million Iron Crosses awarded, but only one of the highest Knight's Cross.

C. *Data*

The Air Force High Command (Oberkommando der Luftwaffe – OKL) received fighter claims throughout World War II. A special staff, for recognition and discipline, was in charge of receiving and validating claims of aerial victories. Pilots would have to file extensive documentation before a claim was recognized: The records contain, like a log book, information on every reported aerial victory of German fighter pilots during WWII by wing (Geschwader), unit (Gruppe), squadron (Staffel), the pilot's first and last name together with his rank, and the day, location (grid reference), type of damage, witnesses, and type of the claimed aircraft. German rules for counting a claim as an aerial victory were relatively demanding (Caldwell 2013). Each claim had to be accompanied by a witness confirming the destruction of the enemy aircraft (impact or explosion in the air), or that the enemy pilot had to be seen bailing out. Many claims were not accepted, and rightly so – comparison with combat records from the other side suggests that there is some evidence of over-claiming, sometimes by 100% or so on average, by both Western air forces and the German air force – cf. the case studies in Caldwell (2013). Often, claims would be investigated further before being finally accepted or disallowed.

Our database of German fighter pilots during WWII draws on two principal sources: Jim Perry's and Tony Wood's Oberkommando der Luftwaffe (OKL) combat claims list, and the Kracker Luftwaffe Archive.[10] The OKL fighter claims list were extracted from microfilm records showing the hand-written records of the Luftwaffe Personalamt stored at the German Federal Archives (Bundesarchiv) in Freiburg. As

[10] For more information about Tony Woods' combat claims and the Kracker Luftwaffe Archive, see https://web.archive.org/web/20130928070316/http://lesbutler.co.uk/claims/tonywood.htm and http://www.aircrewremembered.com/KrackerDatabase/.

some OKL fighter claims records did not survive WWII, Tony Wood supplemented the list by claims of other published sources, such as Donald Caldwell's (1996) JG26 war dairy, to obtain a comprehensive list of German fighter claims for the years 1939 to 1945.

We clean the Perry-Wood fighter claims records from typos, such as misspelled names, rank, and units, and then construct a monthly panel by aggregating the information for every pilot by month and year. This panel contains the number of monthly victories per pilot together with pilots' first and last name, rank, wing, unit and squadron. We then match the panel data with additional information from the Kracker Luftwaffe Archive. Kracker's archive collected detailed personal data of German fighter pilots, such as the pilot's war status (e.g., whether he was killed in action, a prisoner of war, or a WWII survivor), and for some pilots the starting point of their Luftwaffe career, using a variety of sources. With this information at hand, we have for every pilot in the sample the timing when he received an award, his war status, and how long he was active during WWII. We typically observe pilots for the first time when they file their first claim with the OKL; our database does not contain pilots that never scored during combat.

For our analysis we only use information on day fighter pilots. That is because the skills required of night fighter pilots were substantially different. While day fighters often battled against other fighter pilots, night fighters were principally used to intercept bombers (Murray 1996)

Our sample is unbalanced and consists of over 5,000 fighter pilots of the German Luftwaffe that made at least one combat claim during WWII. On average, pilots are in observation for 19 months, giving a total of 96,127 observations. Of the 5,081 pilots in our data, 3,242 (equivalent to 64%) exit our sample – meaning they are not in the dataset in the next month, and that month does not coincide with the end of the war. We count these as casualties. Spot checks suggest that the vast majority of cases thus identified do indeed refer to pilots either killed or severely wounded.[11]

D. *Pilot performance*

The German air force in WWII counted amongst its ranks the highest-scoring aces of all time. 409 pilots scored 40 victories or more in WWII; 379 were German, 10 from the USSR, 7 from Japan, 6 from Finland, 1 from the US, and zero from the UK. The best-scoring fighter pilot in history was Erich Hartmann, with 352 aerial victories.

[11] A more difficult issue arises for aces who were given desk jobs. They stay in our data set, but are effectively inactive for extended periods. Adolf Galland, for example, became General Inspector of Fighters in 1941, and clocked zero victories from Dezember 1941 to April 1945. In April 1945, after being sacked by Göring, he scored another 5 victories. In cases such as this one, we add an additional variable for inactivity, designed to capture vacations, recuperation periods in hospital, and transfer to staff duties.

The highest-scoring non-German ace was Ilmari Juutilainen from Finland, with 94 victories; the best-performing Soviet, British and American pilots were credited with 66, 40 and 38 kills, respectively. Figure 2 gives the distribution and nationality of aces in WWII:

[*insert Figure 2 here*]

The high concentration of aces in the German air force reflects three factors: First, the "fly till you die" rule – Western air forces rotated pilots out of active duty after a fixed number of sorties, but German pilots continued to fly until they were shot down.[12] Second, the poor quality of planes and training in the USSR at the start of WWII gave German pilots great opportunities to rack up victory claims. Third, German pilots had much greater experience vis-à-vis enemy air forces during the early stages of the conflict, reflecting German participation in the Spanish Civil War (Bungay 2001).

Overall, the German air force records document 53,008 claims of aerial victories. These are credited kills, not only claims. In an average month, an average German pilot scored 0.55 victories and faced a risk of 3.4% of exiting the sample permanently, synonymous in almost all cases with death. In the East (West), the victory rate was 0.97 (0.32) and the exit rate 0.029 (0.037). In other words, the exchange ratio in the East was 33 and in the West, 8.6.[13]

Scores were highly unevenly distributed. The top-scoring 110 pilots achieved as many aerial victories as the bottom 4,900 put together. In an average month, the vast majority of pilots (over 80%) failed to score even a single victory. Some, on the other hand, notched up large numbers of victories quickly: Emil Lang shot down 68 enemy planes in October 1943, and Hans-Joachim Marseille scored 17 victories in a single day, on 1. September 1942. Figure 3 shows the number of monthly victories per pilot, plotted against the quantiles of the distribution:

[*insert Figure 3 here*]

There was a large seasonal component to air combat. The summer season – when ground operations were common, and hours of daylight were long – also saw substantial spikes in aerial activity; the winter months saw a lull in fighting. Figure 4 plots mean victory and exit (death) rates over time. Peaks in both series mostly

[12] The number of total sorties is a key factor in generating highly skewed victory score distributions (Neillands 2001).

[13] Note that this is not the standard definition of the exchange ratio, which either measures planes for planes or pilots for pilots. We here calculate the number of enemy planes shot down in exchange for every pilot lost.

coincide, except for the end of the war when the victory rate plummeted and the exit rate spiked.

[*insert Figure 4 here*]

E. Organization and training

The Luftwaffe was divided into air fleets (*Luftflotten*). These were responsible for particular geographical areas. Their number rose from four to 7 during World War II. Air corps within each air fleet controlled the planes and men; air districts were responsible for infrastructure.

The air corps were composed of wings (*Geschwader*), with approximately 100 planes each. The wings were organized by function, with different *Geschwader* for fighter planes, long-range bombers, dive bombers, reconnaissance, etc. Each wing would contain several groups, all dedicated to the same specialized function. A wing had 3-4 squadrons (*Staffeln*), with an established strength of 12 planes each.

Pilots would first learn to fly, before receiving training in more specialized skills such as aerial combat. They would first attend "boot camp", with an emphasis on physical fitness and military discipline. After some basic training in aeronautics, they would then move on to an elementary flying school. Once they had their pilot's wings (after 100-150 hours), prospective fighter pilots were sent to air combat schools. Upon completion of their course there, they were attached to a squadron or group in an operational training unit at the front. The idea was that they would learned from experienced pilots before transferring to actual combat, but in many cases, and especially as the war situation for the Germans worsened, training units attached to fighter units were quickly sent into battle.

III. MAIN RESULTS: INDIRECT EFFECTS OF PEER RECOGNITION

In this section, we examine how recognition of outstanding performance influenced the monthly victory score of peers. We define peers as pilots who are either of similar quality, those who served together, or men coming from the same regions.

A. Results by pilot quality

We first examine if a good pilot being recognized being mentioned in the *Wehrmachtbericht* changed the performance of other "good pilots" at the same time, by estimating:

$$vic_{i,t} = C + \beta \cdot Mentionp_t + \gamma \cdot P_i + \delta \cdot P_i \cdot Mentionp_t + \tau \cdot X' + \epsilon_i \quad (1)$$

where $vic_{i,t}$ is the victory score of pilot i at time t, Mentionp equals one if a Luftwaffe pilots is mentioned in month t in the bulletin, and zero otherwise, P_i is the performance bracket to which a pilot belongs (top 1%, next 4%, 90th-95th, 80th-90th, bottom 80%), X' is a set of controls, and δ is the variable of interest – the interaction of pilot quality with mentions periods. We control for experience, aircraft type, time variation, and the fact that the mention month itself may have been unusual itself, by using a dummy variable. The variable of interest is the interaction between the pilot quality percentile dummy and the mention period dummy. If δ is large and significant, pilots in bracket P_i scored more in a month in which one of their fellow pilots was recognized. We exclude the mentioned pilot himself from our data.

Table 1 gives the results. We find that all the ranks of pilots upwards are showing greater performance in periods when an ace is mentioned in Wehrmacht dispatches. The additional outperformance – on top of their average outperformance reflecting higher quality – is substantial. Note also that the relative increase in performance is greatest for the highest-ranked pilots. For example, the top 1% increase their score in months of mentions by about 2/3rd of their average monthly score; pilots in the 90th-94th percentile, by about 1/5th.

At the lower end of the skill distribution we find that pilots (a) perform better overall during periods when aces are mentioned but (b) underperform even more relative to higher ranked-pilots during mention periods.[14] Next we document that the exit rate of low-ranked pilots increased sharply during periods when peers were mentioned.

[*insert Table 1 here*]

B. Past peers

The definition of fellow pilots in Table 1 is based on performance tiers only. The key threat to identification is that the returns to being highly- skilled (or highly risk-tolerant) may have been strongly time-varying; and pilots with high average skill may be doing very well in particular months, which leads them to have high scores – and one of them simultaneously gets mentioned in the bulletin.

Figure 5 illustrates our identification strategy. Instead of calling everyone a peer who flies at the same time, and distinguishing them by their overall rank in the quality distribution, we focus on pilots who flew with the mentioned pilot in the past (but have now been posted to another unit). Figure 5 presents the example of two pilots, Günther Rall – one of the highest-scoring aces of World War II – and Karl Gratz.

[14] To see this, note that the mention period effect is negative and also larger than the interaction effect. Average pilots perform less well than top pilots in average months, and that difference grows in months of mentions – with the net effect still positive.

From Autumn 1941 until March 1943, they served together in Squadron 8 of Fighter Wing 52. Rall remained in the squadron while Gratz got transferred to the "Stab" of group II, fighter wing 2. Eventually Rall was moved to the "Stab" of Group III, Fighter Wing 52. In August 1943, Rall was mentioned in the Wehrmachtbericht. We classify Gratz as a 'past squadron peer', and compare his performance in the month of Rall's citation with other months.

[*insert Figure 5 here*]

Because we focus on past peers, our strategy has the advantage of not being contaminated by correlated shocks that may increase victory scores for everyone in the same unit (such as a major offensive, or good flying weather). We estimate:

$$vic_{i,t} = C + \beta \cdot Mentionp_t + \gamma \cdot Pastpeer_i + \delta \cdot Pastpeer_i \cdot Mentionp_t + \tau \cdot X' + \epsilon_i \quad (2)$$

where Pastpeer takes the value of unity if pilot i was a peer of the pilot(s) mentioned at time t, and zero otherwise. Again, we exclude pilots in the same squadron at the time of the mention.[15] In the aggregate, pilots who are peers of mentioned pilots do not perform markedly better or worse than those who never flew with mentioned pilots (cf. Figure A5).

Table 2 shows first that past peers from the same squadron reacted markedly during periods when a former comrade is mentioned in the *Wehrmachtbericht*. The variable survives adding a large set of controls, as well as squadron and time fixed effects (col. 2-4). Using the most demanding specification, we examine if pilots in the same group also saw a bump in performance. Groups were larger units comprising 3 or 4 squadrons. They would typically be operating from the same airfield, but not necessarily so. We find outperformance for 'group peers', but a smaller effect. Finally, we form even broader comparison groups by tracking the location of every airfield from which German fighter units operated during World War II. We use this information to create a dummy for 'base peers'. Many of these would have been in the same group, but other groups would also sometimes have operated from the same airfield. We continue to find an effect, but the effect is again smaller -- as the intensity of (past) interaction declines, we obtain smaller effects from the mention in the daily bulletin.

[*insert Table 2 here*]

[15] Peers of pilots who will be mentioned in the daily bulletin do not necessarily outperform, as the distribution of fixed effects makes clear (cf. Figure A.4).

C. Birthplace peers

We interpret the effects of peer recognition as driven by a desire to keep up with one's peers. In other words, the increase in the number of victories is compatible with an interpretation emphasizing competition over status.

To examine further if status competition is a likely explanation for our findings, we test if those born in towns close to each other react more to a mention in dispatches. For a total of 352 aces, we are able to determine their birthplace. We already know that among the aces, the average effect is relatively large. How much bigger is the increase in the number of victories when someone from the same region is mentioned?

Figure 6 shows that for those born close to each other, the effect of a mention in dispatches is particularly large. At a distance of less than 100 miles, the extra "bump" during the mention month amounts to 5 extra victories. Further away, at a distance of 300 miles, say, performance declines to less than 3 victories.[16]

[*insert Figure 6 here*]

D. Risk

Fighter pilots faced high risks -- every aerial victory had to be bought at the cost of possible death. We do not have exact data on death, but we can construct a proxy based on exit from our sample. In those cases where it was possible to check (i.e. the subsample of 352 aces where we have additional information), in the overwhelmingly majority of cases, the pilot actually died. Any analysis of the efficiency of the Luftwaffe incentive system has to consider both dimensions, the number of enemy fighters downed and the number of own men lost.

To examine the effects, we repeat the analysis in tables 1 and 2, using the risk of exit from the sample as the dependent variable. We use survival analysis, performing Cox regressions on our data. Table 3 shows the hazard ratios for pilots, conditional on whether or not a past squadron peer is mentioned in the daily bulletin. Experience has only a limited effect on exit rates. On the Eastern Front, rates of death are clearly much lower.

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[16] Overall levels are high because the small subset of 352 pilots with detailed biographical data is dominated by aces with very high overall performance. We also perform regression analysis to demonstrate the statistical strength of our findings. In Figure A1, we plot the marginal effect of a being a peer of a mentioned pilot in the month of the mention, as a function of (log) birthplace distance.

For the sample as a whole, we find a markedly higher coefficient during such periods – with the risk of exit being twice as high. The effect is even larger for pilots below the 80th percentile of overall war performance (col 2). Using the estimates with controls from Panel B, for pilots above the 80th percentile, there is only an insignificant, 25% increase in the hazard rate; for those below, of 119%. For the best pilots (90th percentile or above), the effect is even smaller (plus 1.3%), and not different from zero.

[*insert Table 3 here*]

The findings in Table 3 put the results on performance improvements in context. While performance increased for pilots on average in months when a former peer was mentioned, this increase in performance was bought at the cost of higher exit rates. This effect differs by overall ability. Pilots below the 80th percentile of overall scores saw their victory rate decline by 0.36 victories in a month of a former peer being mentioned; and at the same time, their exit rate increased by a factor 2.2. In contrast, top pilots (above the 90th percentile) saw their victory rate increase by 2.5 victories; at the same time, their exit rate is not significantly higher during the month in question.

IV. Additional Results and Alternative Interpretations

Next, we attempt to rule out potential confounding mechanisms, and we examine the robustness of our findings.

A. Correlated shocks

A natural confounding factor is the presence of unobserved, correlated shocks simultaneously affecting the outcomes of peer groups. To deal with the most likely correlated shocks, we focus on peers who are not part of the same squadron at the time of measurements. This approach deals with contemporaneous, squadron-level shocks. Nonetheless, we need to consider whether other omitted variables may be driving our results.

One direct way to deal with the risk of correlated shocks is to re-examine our findings by excluding pilots from nearby units. Here, we impose minimum distance requirements for the airfields from which pilots' squadrons operated. During World War II, German forces were fighting from the Arctic Circle to the deserts of North Africa, and Stalingrad to the Spanish frontier with France. The minimum distance between units in our data is 9 miles; the maximum, 2,600 miles (cf. Figure A2 in the Appendix).

Next, we impose minimum distance requirements on our data. Figure 7 plots the coefficients as we impose increasingly stringent distance requirements. A distance of 100 miles would typically already lead to a marked change in combat conditions – the Northern and Southern sectors at the Battle of Kurk and Orel were approximately 100 miles apart. At a distance of 500 miles, units would be operating with different Army Groups on the Eastern front (North, Center, South). 1,000 miles would separate units flying bomber incept missions over Germany from the Eastern front.

As Figure 7 shows, coefficient size actually increases as we impose increasingly stringent distance requirements. This is true of squadron peers, group peers, and base peers. This strongly suggests that correlated shocks in space are not driving our findings.

[*insert Figure 7 here*]

Another potential issue could be differential but correlated upgrades in aircraft equipment. Since performance in aerial combat is a function of both pilot ability and the quality of equipment, changes in performance could in principle be explained by changes in planes. It is possible that sudden increases in the number of aerial victories could be driven by similar aces receiving simultaneous upgrades in their planes, for example.

This is unlikely to drive our findings. We have information on the type of aircraft used for 83,000 observations out of 96,000 in total. Figure A3 in the appendix shows the distribution of aircraft types used. The greatest part of missions was flown in just four aircraft types – the BF 109 E, F, and G, and the FW 190. Combined, they accounted for 86% of all aircraft types used.

Did correlated upgrades of equipment contribute to the increase in performance during mention months? First, we define as peers those pilots who shared the same squadron *in the past*. The Luftwaffe typically upgraded entire squadrons, to facilitate maintenance and training. Typically, squadrons would be recalled to Germany, re-equipped, and sent back to the front. There is no anecdotal evidence of aces being given special treatment. To the contrary, in one case at least, an ace – Hans-Joachim Marseille – was forced to 'upgrade', to the BF 109G. This occurred despite his protests because his entire squadron was being re-equipped. Marseille promptly died when the (more powerful, but not very reliable) new engine failed on one of his first missions.

Finally, we directly control for the effect of aircraft type. The results in Tables 1-3 include dummy variables for the different aircraft types. Any systematic increase in performance as a result of aircraft upgrades should be captured in our data. Finally, we examine directly if the probability of flying a similar type of aircraft is systematically higher in months during which one ace is mentioned in the *Wehrmachtbericht.*

B. Social learning

There could be a general co-movement of scores among pilots who belonged to the same squadron in the past. Assume that pilots learned some specific skills from other pilots or in special circumstances in their area of operation while flying together in the past, and that that skill became particularly useful in a specific period. In one month, outstanding pilots to do particularly well, leading to a mention in the daily bulletin. At the same time, pilots with past exposure whom they trained, or who developed similar skills in the same environment, do better, too. Then we would find higher performance by past peers, in periods when aces get mentioned in the daily bulletin – but the reason would be correlated learning 'on the job', rather than motivation effects.

We again do not believe this alternative mechanism is likely to drive our results. First, we can control for past squadron fixed effects. This does not affect our results. Nonetheless, it could be that what matters is having been part of a squadron at a specific point in time -- for example, during a particular campaign, or at the same time as a particular pilot. To deal with this empirically, we examine directly the hypothesis that past exposure to a particular pilot (the one that will be mentioned in dispatches) improves performance in all periods. We add a dummy variable for the peer in question that takes the value of 1 for all periods after having served jointly. Adding this variable to our estimation does not change results. The variable of interest – mentionedperiod*pastpeer – is unaffected. Also, the fixed effects of having served together with a pilot who will eventually be mentioned vary from -0.7 to 1.01, with an average of 0.11. In other words, in 44% of all cases, the fixed effect of having flown with an ace who will be mentioned in dispatches is actually negative (cf. Figure A4). There is no evidence that those who flew with pilots who will eventually be mentioned are markedly better pilots.

This leaves open the possibility that pilots may have picked up skills by flying together that become useful in particular, novel situations. If the mentioned pilot has a particularly good month – and gets mentioned in dispatches – his former peer could possibly also put his acquired skill to good use. If correlated performance across peers is to be explained by these alternative mechanisms, we should expect correlated performance to also occur when dispatch mentions were *not* made.

To examine this possibility, we first restrict the sample to former peers, i.e. pilots who flew at some point in the past with a pilot who will be mentioned in the daily bulletin during the war. We then regress the log of victories by pilot i (+.01) on the log of victories of the mentioned pilot (+.01), allowing us to estimate elasticities of performance directly:

$$log(vic_i + .01) = C + \alpha \cdot log(vic_{mi} + 0.01) + \beta \cdot M_{mi} + \gamma \cdot M_{mi} \cdot log(vic_{mi} + .01) + \delta \cdot X' + \epsilon \quad (3)$$

where C is a constant, α measures the correlation of victory scores between pilot i and his mentioned-in-dispatches peer m, β is the average change in log victories in a mention month for pilot m, and γ is the coefficient of interest – the change in the co-movement between pilot i's victory score and that of his former peer who is mentioned. An increase in the correlation during the mention period constitutes a demanding test. By definition, the mentioned pilot had an exceptionally good month when he is cited in the daily bulletin. For his former peer to show an even greater correlation in mention periods requires a very sharp change in fortunes.

This is exactly what we find in Table 4: In non-mention periods, the correlation between former peers (one of whom will eventually be mentioned) is 0.117; in mention periods, it is 0.17, or more than 50% higher (col. 1). The effect holds up when controlling for front, experience, and aircraft type (col. 2) as well as time FE (col. 3). Here, the results suggest that the correlation during mention periods is more than twice as strong as during quiet periods. If we exclude pilots from the same group, because they might be subject to correlated shocks, we find a large increase in correlations during mention periods, compared to a small, negative baseline correlation (col. 4).

[*insert Table 4 here*]

C. *Learning about one's own ability vs status competition*

Pilots who knew that their former peer had just been recognized may have updated their beliefs about their own skill and potential – and all the more so if they considered the rewarded pilot as someone similar to themselves. This in turn could lead pilots to exert more effort and/or take more risk, generating time-varying correlation in victory scores – but not because of status concerns.

We do not believe that this story is likely. We tackle this problem empirically by separating our data into two categories – mentions of a former peer with a monthly victory score that exceeds the treated pilot's own past performance, and those that are within the range of the treated pilot's own accomplishments. To use an example, when Rall is mentioned with a monthly score that far exceeds Gratz's, Gratz may be learning about his own type – having been through similar experiences himself during his time as a squadron peer of Nowotny. If, however, Gratz had already scored as much as Rall does in August 1943 (the month of the *Wehrmacht* bulletin mention), then it is more likely that status competition motivated Adameit to do better.

Table 5, Panel A, columns (1) and (2) performs this comparison. As we can see, the effect is present in both samples – but it is clearly stronger among pilots who had already performed at the same level as the mentioned peer. The difference is clear for all definitions of peer group – from squadron peers to base peers.

[*insert Table 5 here*]

D. Placebo tests and Monte Carlo simulations

It is reasonable to ask about the statistical properties of our estimators. Both squadron membership and victory scores are observed with error; coding of the former affects the explanatory variable, as we form peer groups based on who flew with whom in the past.

We perform two exercises to address potential concerns. First, we generate "fake mentions" for pilots who satisfy performance criteria that are similar to pilots who are actually mentioned in dispatches. To this end, we create a dummy for "fake mention" equal to one if a pilot had either more than 59 victories, and scored more than 11 victories in a single month, or if they had more than 59 victories and scored a "round number" of victories (100, 150, 200, 250, 300). We chose these cut-offs based on the average characteristics of mentioned pilots.

Col. 5 in Table 4 gives the results, using the most rigorous specification. We actually find a negative and insignificant coefficient for placebo mentions. Table A.2 in the appendix gives results for all specifications. While some are positive, none is significant.

To examine the statistical properties of our estimation more broadly, we also perform some Monte Carlo exercises. To this end, we draw 0.01% of observations randomly and designate them as placebo mentions. This results in 93 instances, similar to the actual number of mentions (84). We use these mentions to code new peer variables, and then run regressions of pilot performance against these as in Table 2, col (4). This simulation we repeat 100 times. Figure A.6 in the appendix shows the results. There is a slight skew to the right for coefficient sizes. The actual coefficient estimated in Table 2, col (4) is larger than the fake one in 93 out of 100 cases; the actual t-statistic is greater than in 95 percent of all simulated cases. Overall, while there may be some upward bias in our data, we find no evidence from placebo tests or our Monte Carlo simulations to suggest that this is driving results.

E. Stability by front

Next, we examine if results hold equally in the East and in the West. Air superiority was never firmly established in the West after the Battle of Britain; it lasted a substantial period of time in the East. Table 5, Panel A, col. 3 and 4 shows the coefficients for the various categories of peer by front. There are positive coefficients for both theatres of combat operations, but the ones on the Western front are uniformly lower. For past base peers, we find no significant result. This does not necessarily reflect a smaller willingness or ability to respond to a peer's recognition. Rather, the ratio of performance increases in months of a peer's mention reflect average monthly score differences. In the East, the average pilot scored 0.98 victories per month; in the West, 0.33. Hence the ratio of 1:3 as reflected in the differential outperformance for squadron peers in Table 5, col. 3 and 4, closely mirrors the difference in 'background' performance.

F. *Officer vs other pilots' reaction*

Status is a multi-faceted concept. Ex ante, it is not clear if those with higher pre-existing status should react more or less to a former peer being recognized. In Table 5, Panel B, columns 1 and 2, we replicate our main analysis, stratifying the sample by officer status. We find that officers in general show larger increases in performance when a former peer is mentioned in the daily bulletin. In the baseline specification, the difference in coefficients is 0.39 vs 0.69 (not reported – equivalent to column 1 in Table 2); in the most demanding specification, 0.28 vs 0.41. Part of the difference in performance increases reflects lower average scores for non-officers (officers score an average of 0.49 victories per month; non-officers, 0.369). But even if we scale the jump in performance by former peers by their base rate of aerial victories, there is an additional, substantive increase in the victory rate for officers – (0.69/0.49) vs (0.39/ 0.36).

These results suggest that higher-ranked pilots reacted more strongly to recognition. Officer status reflected different social background, education, and career choice as much as performance. In this sense, officers were under pressure to demonstrate their ability in a tournament-like setting, racking up victory scores in accordance with their rank. In this sense, it appears that social status from officer rank was not a substitute for status from performance, but a complement.

G. *Stability by period*

Next, we split the data-set into observations before and after August 1942. This month approximately signals the start of the second half of the war (month 35 of 69 months in our data-set). August 1942 is also very close to the turning point of the war.

Table 5, Panel B, columns 3 and 4, replicates the peer-analysis for the second and first half of the war. During the first half of the war, effects are smaller and less significant. This is partly a result of having fewer observations on peers – as the war goes on, pilots accumulate more past peers, which increases the strength of our statistical tests. As a matter of fact, two thirds of our observations lie in the second half of the war.

We find that the peer-effects are more pronounced during the period after August 1942 than for the full sample. This is true for all definitions of the peer-group.

H. Lags and Leads

For our analysis, it is crucial that pilots do not react to their peers' performance *before* it actually occurs. Using lags and leads is a simple way to test the assumption of identical counterfactual trends for treatment and control pilots (Angrist and Pischke 2009). Estimating our main equation with lags and leads is complicated by the fact that many peers of a mentioned pilot are also peers of *other* pilots who are mentioned previously or afterwards. To simplify the analysis, we align observations in event time (t=0 – time of peer mention), and a. drop all pilots who are never the peer of a mentioned pilot, b. drop all pilots who are also peers in any preceding period during the twelve-month event window. In this way, we can show results driven exclusively by performance changes of the same pilots during mention periods, uncontaminated by other mentions.

Figure 8 shows the average performance in event time (controlling for front, experience, and time fixed effects). We differentiate between the top 20% of pilots and the rest. As the left panel of Figure 8 clearly shows, there is no positive pre-trend prior to the mention of a peer amongst pilots; if anything, the trend is downwards. The same is true after the mention of the peer. The only period that truly stands out is the period of the mention itself, where we see outperformance of an additional 1.5 victories per month amongst the best pilots. The results for the bottom 80% are much less impressive visually. Here, the month of mention shows some outperformance, too, but it is markedly smaller; there is also an upward shift in the subsequent month. The trend around the mention period is mostly flat. For neither subgroup is there evidence for a clear upward trend leading up to the mention of a former peer.

[*insert Figure 8 here*]

I. Effects by time since joint service

Our analysis is based on the assumption that pilots who served together in the past typically thought of themselves as peers. This common bond should be relatively weak for those who flew together a long time ago; it should be stronger for those who shared the same officers mess, commanding officer, and missions recently. To examine if the channel we hypothesize for differential outperformance is operative, we examine effect size by how recently ago pilots last served together.

In Table 6, we replicate our results for two subgroups – those whose time since joint service was above the median time in our sample (6 months), and those who were below that cut-off. The results show markedly smaller effects for past squadron peers who served together in the most distant past (but slightly larger effects for past group and base peers). While differences in magnitude are themselves not significant, the results for squadron peers point in the direction of our hypothesis.

[*insert Table 6 here*]

V. CONCLUSION

Social comparisons can demotivate employees, leading to lower job satisfaction and higher quit rates (Card et al. 2012). There is also strong evidence that status competition is a potent force in human behavior, especially when it comes to consumption (Bertrand and Morse 2016; Kuhn et al. 2011).

In this paper, we examine if status competition can induce greater effort and more risk-taking in a high-stakes setting, using data from the German Air Force during World War II. We focus on pilots who flew together in the past, and were then assigned to different squadrons. When one of them is mentioned in the daily bulletin of the German Armed Forces for his outstanding accomplishments, former colleagues on average 'try harder' and score more. The effect varies by skill group. The performance gains are concentrated amongst highly skilled pilots. Average pilots also score more victories, but their gains are small (and may even be negative).

Importantly, we find that risk increased markedly for the low-skilled pilots. While better pilots do not die at a higher rate when their peer is recognized, this is not true for those below the 80th percentile of skill. Their rate of dying increases markedly when former colleagues are publicly recognized. Our findings suggest that status competition can be a key motivator for individuals in a high-risk setting with severe principal-agent problems. High-powered incentives may, however, backfire, creating the potential for efficiency losses in a context when risk matters.

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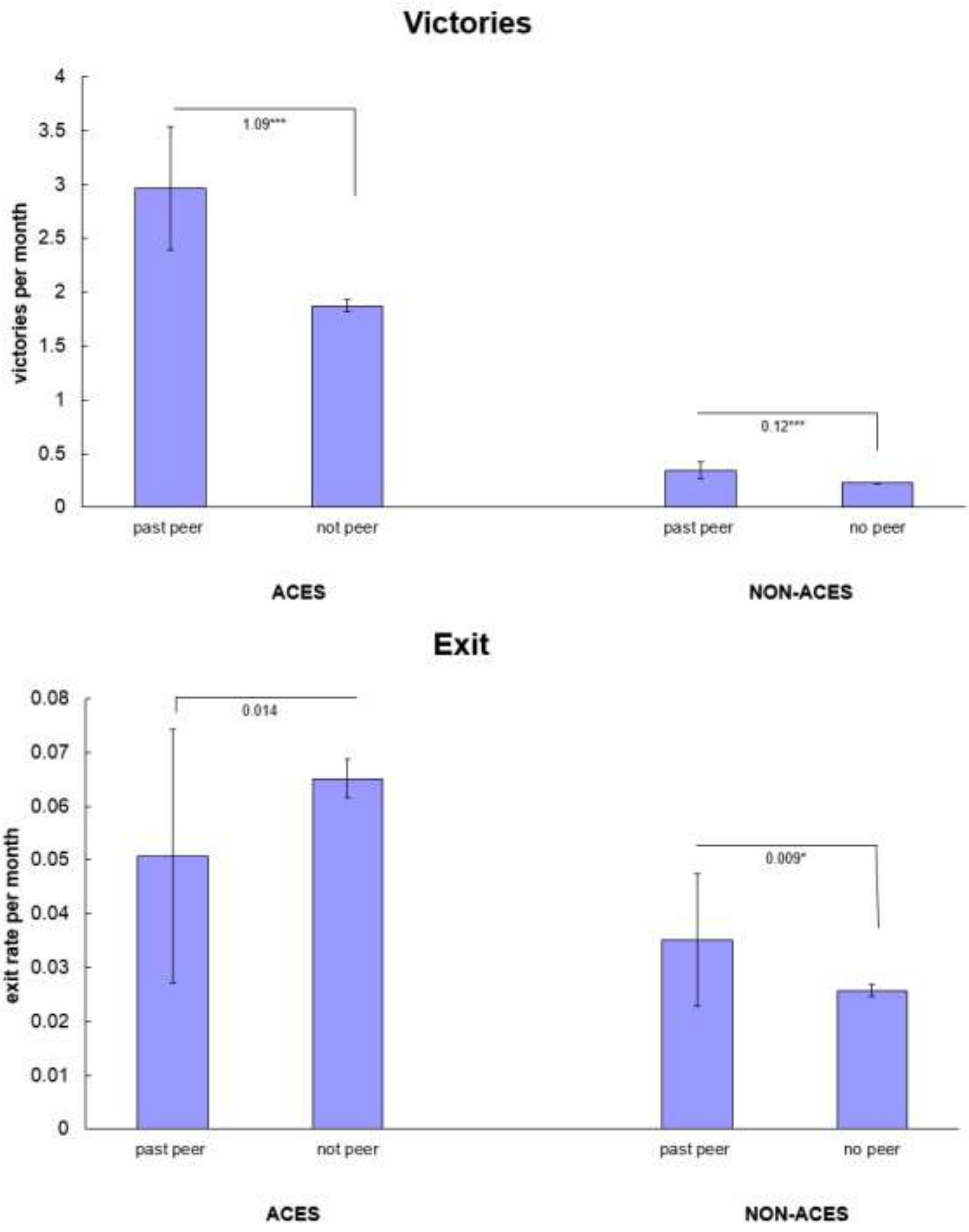
FIGURES



<u>Note</u>: The figure shows mean monthly victory and exit rates, for aces and non-aces (without any additional controls). Aces are defined as being in the top 20% of the average monthly victory rate during all of World War II. Pilots are past peers if they previously in the same squadron as a pilot in mentioned in the German Armed Forces Daily Bulletin (*Wehrmachtsbericht*), but no longer do at the time of mention. Mentions in the bulletin are restricted to cases of victory mentions only.

Figure 1: Victory and Exit Rates per Month for Fighter Pilots, Aces and Non-Aces, during Periods of Fighter Pilot Mentions

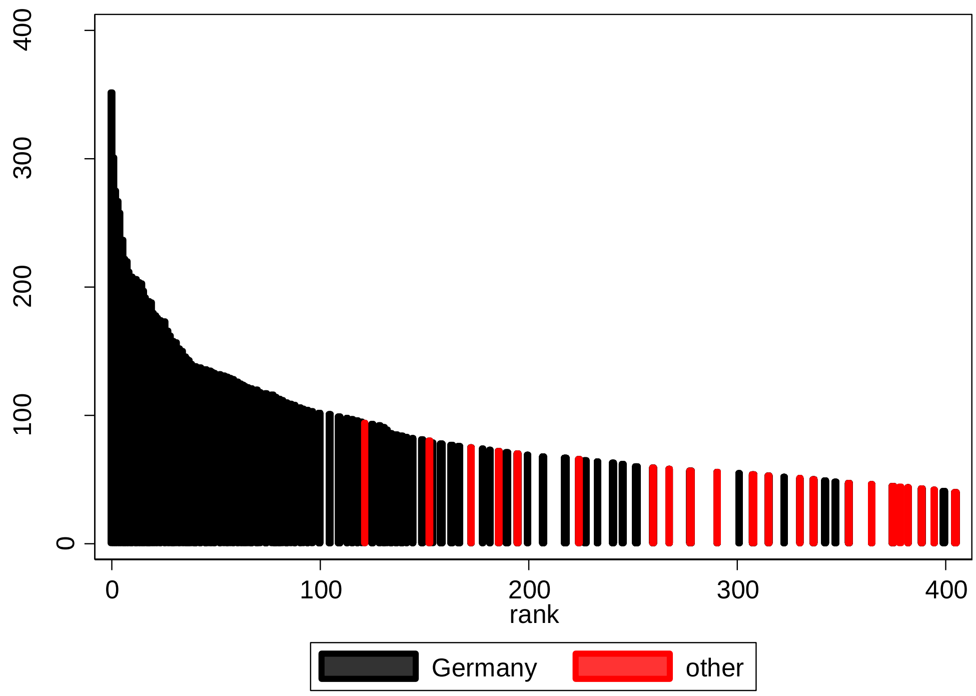


Figure 2: Aerial victories, total for WWII, by rank (gaps=ties)

Note: The figure shows the overall score, by pilot, for pilots ranked 1 through 400 during World War II. Black bars are for German pilots; red ones, for those of other nations.

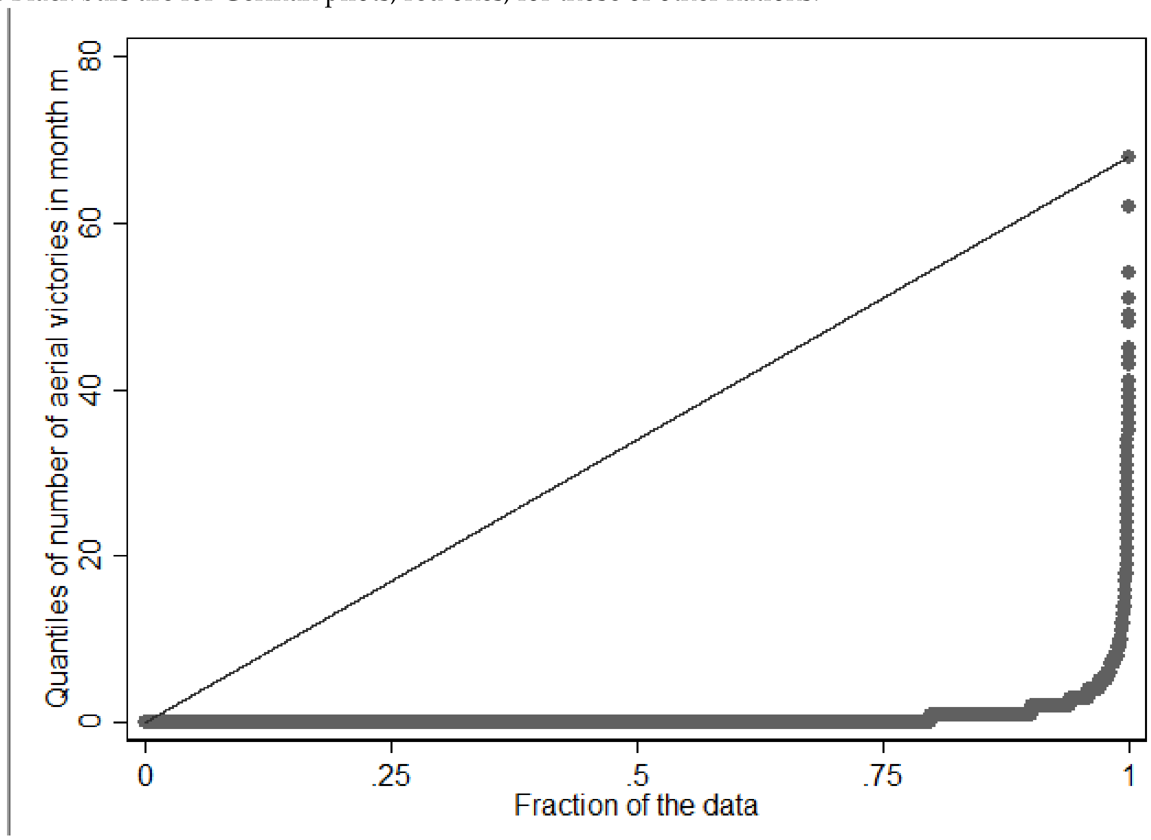


Figure 3: Cumulative Distribution of Monthly Victory Scores

Note: The figure shows the cumulative distribution of monthly victory scores by German pilots in our dataset, during the whole of World War II.

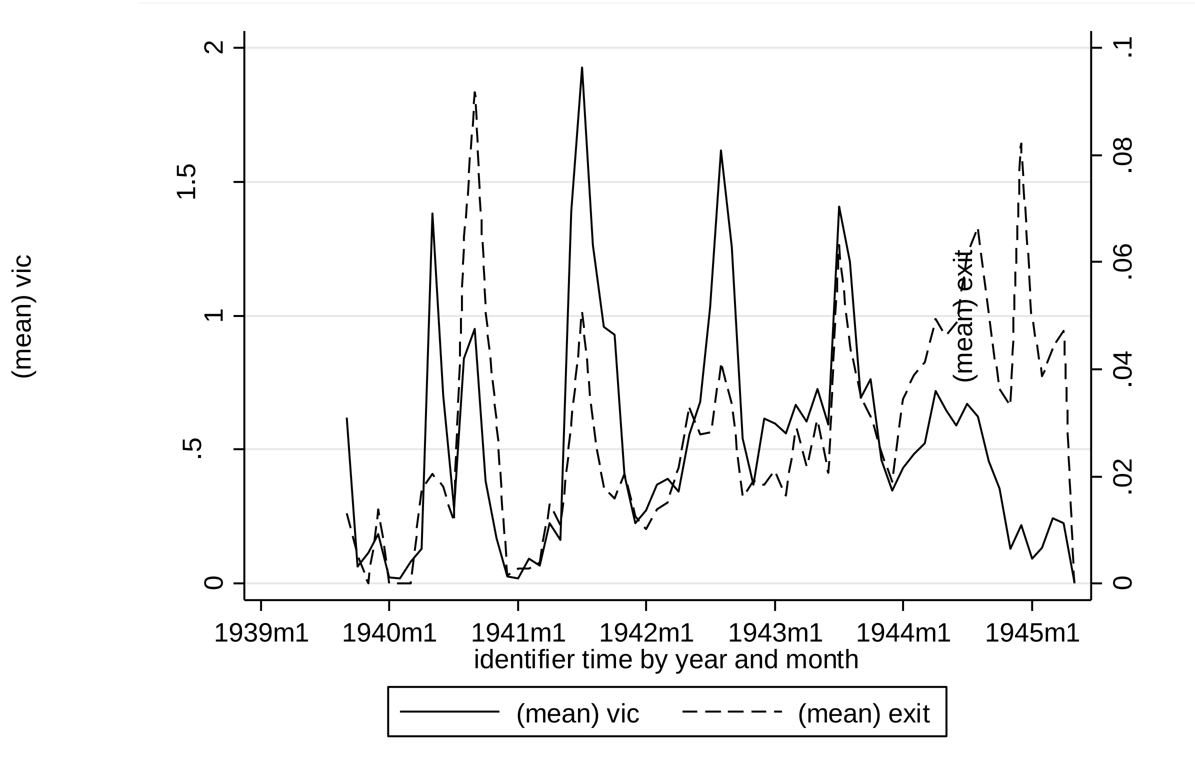


Figure 4: Mean Victory Rate per Pilot and Month – 1939/9 to 1945/4

Note: The figure shows the average monthly victory score, per pilot (left-hand side), and the average exit rate per month (right-hand side y-axis)

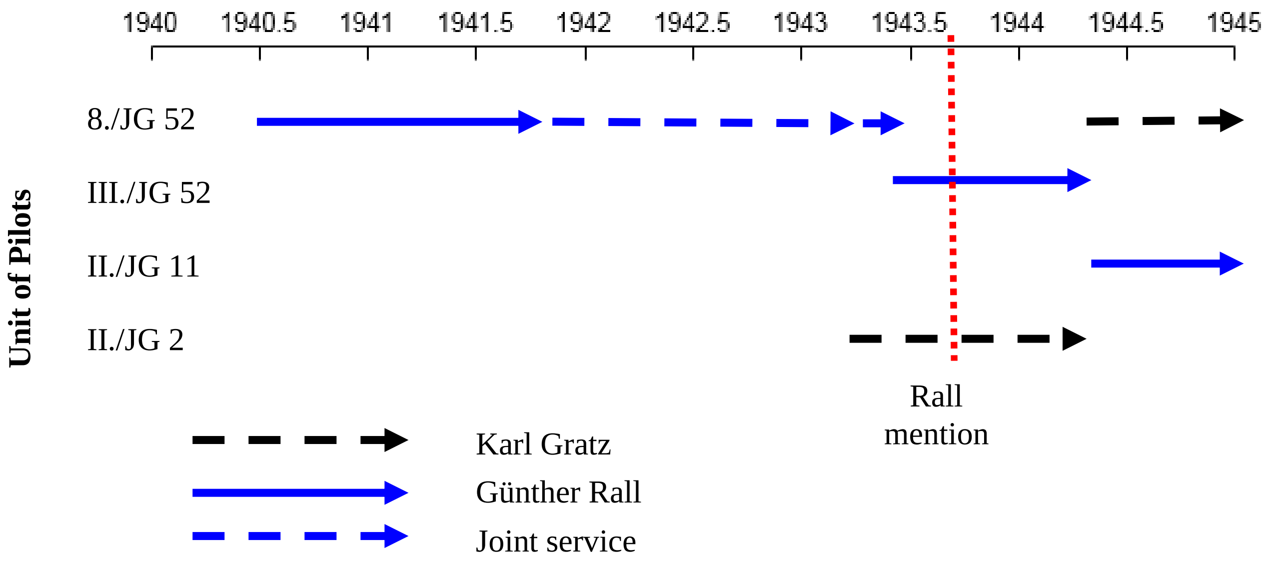


Figure 5: Identification strategy.

Note: red dashed line indicates mention in the *Wehrmachtbericht* for Günther Rall

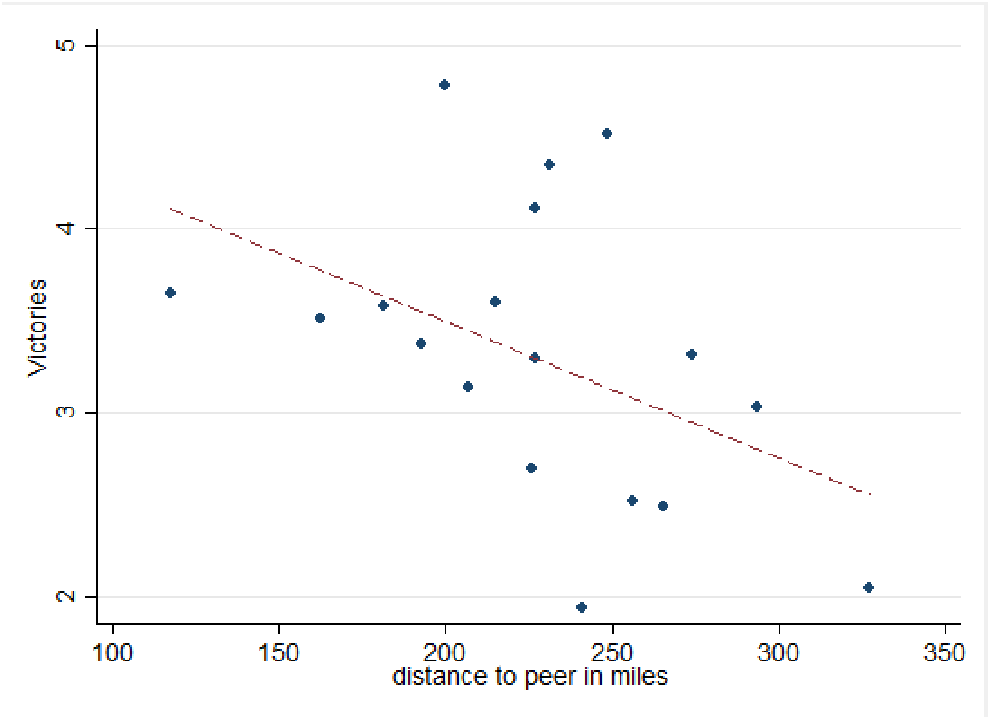


Figure 6: Victory score during mention periods, past squadron peers only, as a function of birthplace distance

Note: The figure shows a binscatter of the number of additional victories of peers of a mentioned past peer, during mention periods of that particular pilot, as a function of birthplace distance (mentioned pilot – pilot in question). Mentioned past peers are former squadron peers who are no longer serving in the same unit. Analysis based on data from 352 aces for which birthplace location is available.

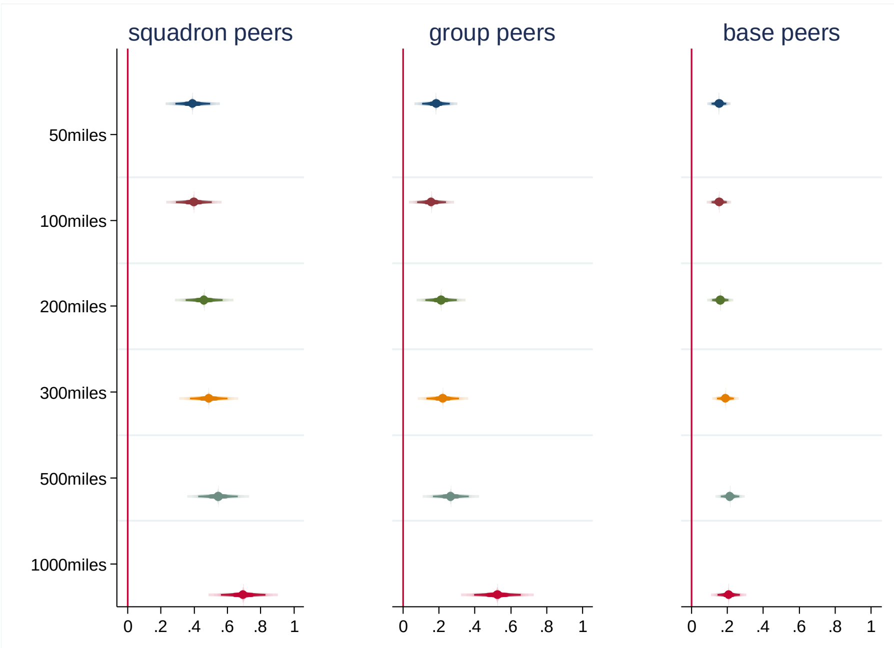


Figure 7: Peer Effects by Minimum Distance

Note: The figure plots the coefficient for outperformance during mention months, of peers of mentioned pilots, as a function of minimum distance (y-axis), for squadron, group, and base peers.

Panel A: Top 20% **Panel B: Bottom 80%**

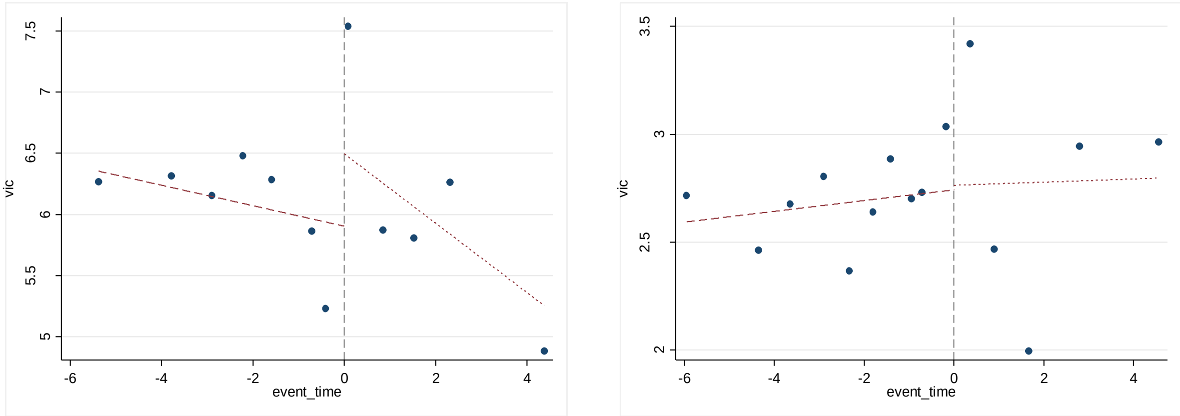


Figure 8: Pilot Outperformance in Event Time, by Quality Group

Note: Both panels plot the coefficient for outperformance of past peers of a mentioned pilot in event time (t=0 – pilot is mentioned in the Wehrmachtbericht). The left panel shows results for past peers in the top 20% of overall performance (as defined by average monthly victory score); the right panel, for pilots in the bottom 80%.

TABLES

Table 1: Percentile of Pilot's Rank and Mention in Dispatches of Other Pilots – By Overall Performance

percentile	(1) p99+	(2) p95-99	(3) p90-94	(4) p80-89	(5) p90-100	(6) p0-80
Mentionperiod	0.132***	0.116***	0.101***	0.0861***	0.0956***	0.443***
	(0.0130)	(0.00978)	(0.00769)	(0.00580)	(0.00787)	(0.0696)
Pilots nth pcn	3.387***	2.086***	1.205***	0.778***	1.823***	-1.345***
	(0.361)	(0.127)	(0.0708)	(0.0323)	(0.0830)	(0.0503)
Mentionperiod x Pilots nth pcn	2.583***	0.625***	0.253**	0.122**	0.605**	-0.362**
	(0.665)	(0.207)	(0.113)	(0.0501)	(0.126)	(0.0697)
Eastern front	0.511***	0.356***	0.222***	0.127***	0.361***	0.364***
	(0.0305)	(0.0226)	(0.0165)	(0.0116)	(0.0225)	(0.0233)
Experience	-0.00388***	-0.00362***	-0.00429***	-0.00460***	-0.00405***	-0.00426***
	(0.000736)	(0.000571)	(0.000458)	(0.000326)	(0.000591)	(0.000603)
Constant	0.272***	0.249***	0.247***	0.208***	0.199***	1.459***
	(0.0228)	(0.0190)	(0.0157)	(0.0115)	(0.0195)	(0.0511)
N	96030	95063	91244	86272	96030	96030
R^2	0.099	0.109	0.081	0.086	0.146	0.132

Note: Mentionperiod is a dummy variable that takes the value zero if no Luftwaffe fighter pilot is mentioned in the *Wehrmachtsbericht* during a month, and 1 otherwise. Pilots nth pcn is a dummy for whether a pilot belongs to the n^{th} percentile (indicated by the column heading), capturing average outperformance by quality-percentile. We define pilot quality by ranking pilots based on their average monthly victory score during the entire conflict. Mentionperiod x Pilots nth pcn gives the outperformance of pilots in the n^{th} percentile during periods when a Luftwaffe fighter pilot is mentioned. Eastern front is a dummy for pilots serving on the Russian front. Experience is the number of months of wartime service since the start of World War II, beginning with the first victory claim in our records (except for veterans of the Spanish Civil War, for whom we add months of service there after the first victory claim). In col. (1) – (4), we exclude higher-ranked pilots from the comparison group. Example: In col (2), for pilots in p95-99, we compare pilot performance for pilots in the 95^{th} to 99^{th} percentile with pilots in the 0^{th} to 94^{th} percentile, but exclude the top 1%. In the next column, we drop all pilots ranked 95^{th} to 100^{th} percentile.

Table 2: Peer Effects during Mention Periods

	(1) OLS	(2) controls	(3) +SqFE	(4) +TimeFE	(5) +TimeFE	(6) +TimeFE
Mention period	0.221***	0.206***	0.208***			
	(0.0129)	(0.0136)	(0.0128)			
Past squadron peer of mentioned	0.570***	0.473***	0.416***	0.382***		
	(0.126)	(0.123)	(0.0621)	(0.0615)		
Past group peer of mentioned					0.203***	
					(0.0436)	
Past base peer of mentioned						0.147***
						(0.0242)
Eastern Front		0.617***	0.627***	0.551***	0.551***	0.547***
		(0.0364)	(0.0195)	(0.0197)	(0.0197)	(0.0197)
Experience		-0.00502***	-0.0053***	-0.0028***	-0.0028***	-0.0030***
		(0.0008)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Constant	0.418***	0.246***	0.279***	-0.430	-0.431	-0.423
	(0.0139)	(0.0254)	(0.0226)	(0.516)	(0.516)	(0.516)
N	96043	96043	96043	96043	96043	96043
R^2	0.004	0.033	0.051	0.079	0.079	0.079

Note: Standard errors in parentheses. * p < .1, ** p < .05, *** p < .01. Dummy variables for aircraft type included. Mentionperiod is a dummy variable that takes the value zero if no Luftwaffe fighter pilot is mentioned in the *Wehrmachtsbericht* during a month, and 1 otherwise. Past squadron peer is a dummy for pilots who, in the past (but not at the moment of the mention), served with the mentioned pilot in the same squadron ("Staffel"). Past group peers are pilots who served in the same group ("Geschwader") in the past, but not at the time of mention. Past base peers are all pilots who served in units flying from the same airfield as the mentioned pilot at any point in the past (but not at the time of mention). Eastern front is a dummy for pilots serving on the Russian front. Experience is the number of months of wartime service since the start of World War II, beginning with the first victory claim in our records (except for veterans of the Spanish Civil War, for whom we add months of service there after the first victory claim).

Table 3: Risk of Death – Peer Performance Effects

	(1)	(2)	(3)	(4)
		Performance percentile:		
	Full sample	<80	80+	90+
Panel A: Estimates without controls				
Mention period	1.192***	1.195***	1.228***	1.035
	(3.93)	(3.15)	(2.69)	(0.30)
Past squadron peer of mentioned	2.100***	2.492***	1.344	1.119
	(4.32)	(4.28)	(1.00)	(0.30)
N	95890	76774	19116	9743
Panel B: Estimates with controls				
	(1)	(2)	(3)	(4)
	Full sample	<80	80+	90+
Mention period	1.111**	1.101*	1.181**	1.042
	(2.37)	(1.75)	(2.15)	(0.35)
Past squadron peer of mentioned	1.852***	2.189***	1.250	1.013
	(3.54)	(3.62)	(0.75)	(0.03)
Experience	0.998*	1.002	0.994***	1.002
	(-1.78)	(1.16)	(-2.59)	(0.64)
Eastern Front	0.870***	0.672***	0.916	0.791***
	(-3.30)	(-6.79)	(-1.42)	(-2.62)
N	95890	76774	19116	9743

Note: Exponentiated coefficients. Estimates of hazard ratios from Cox regressions. T-statistics in parentheses. * p < .1, ** p < .05, *** p < .01. Panel B estimates also control for aircraft type (dummy variables for FW and BF models). Mentionperiod is a dummy variable that takes the value zero if no Luftwaffe fighter pilot is mentioned in the *Wehrmachtsbericht* during a month, and 1 otherwise. Past squadron peer is a dummy for pilots who, in the past (but not at the moment of the mention), served with the mentioned pilot in the same squadron ("Staffel"). Past group peers are pilots who served in the same group ("Geschwader") in the past, but not at the time of mention. Past base peers are all pilots who served in units flying from the same airfield as the mentioned pilot at any point in the past (but not at the time of mention). Eastern front is a dummy for pilots serving on the Russian front. Experience is the number of months of wartime service since the start of World War II, beginning with the first victory claim in our records (except for veterans of the Spanish Civil War, for whom we add months of service there after the first victory claim).

Table 4: Correlation of Pilot Performance, Mention Periods

	(1) Baseline	(2) Controls	(3) +TimeFE+SqFE	(4) Samegroup=0	(5) Placebo
$\text{Log}(\text{vic}_{mi} + 0.01)$	0.114***	0.0902***	0.0407***	-0.00473	0.00842
	(0.00406)	(0.00402)	(0.00400)	(0.00551)	(0.00610)
Mention period	-0.128**	-0.137**	-0.178***	-0.154*	0.314
	(0.0629)	(0.0622)	(0.0636)	(0.0905)	(0.776)
Mention period * $\text{Log}(\text{vic}_{mi} + 0.01)$	0.0618***	0.0723***	0.0709***	0.0747**	-0.0453
	(0.0229)	(0.0226)	(0.0227)	(0.0338)	(0.269)
Eastern Front		0.476***	0.600***	0.461***	0.310***
		(0.0239)	(0.0365)	(0.0491)	(0.0525)
Experience		-0.0151***	-0.0177***	-0.0111***	-0.0206***
		(0.000806)	(0.000974)	(0.00136)	(0.00150)
Constant	-3.129***	-3.023***	-2.135***	-3.055***	-1.514
	(0.0155)	(0.0349)	(0.311)	(0.467)	(0.986)
N	41737	41737	41737	22115	19339
R^2	0.023	0.049	0.152	0.183	0.178

Note: Standard errors in parentheses. * p < .1, ** p < .05, *** p < .01. Dummy variables for aircraft type are included from col (2) onwards. $\text{Log}(\text{vic}_{mi}+0.01)$ is the natural logarithm of the pilot i's victory score in month m (+.01). Mention period is a dummy variable that takes the value one if a past squadron peer is a dummy for pilots who, in the past (but not at the moment of the mention), served with the mentioned pilot in the same squadron ("Staffel"). In col (4), we only keep those observations for which pilots and their eventually mentioned squadron peer are not in the same group. Col (5) uses the same specification as the preceding column but is based on placebo mentions (cf. Appendix for details). Eastern front is a dummy for pilots serving on the Russian front. Experience is the number of months of wartime service since the start of World War II, beginning with the first victory claim in our records (except for veterans of the Spanish Civil War, for whom we add months of service there after the first victory claim).

Table 5: Sample Splits

Panel A

	(1) ≥ mentioned	(2) < mentioned	(3) East	(4) West
Past squadron peer of mentioned	0.982***	0.149**	0.545***	0.169***
	(0.115)	(0.0680)	(0.126)	(0.0461)
Past group peer of mentioned	0.288***	0.167***	0.385***	0.0727**
	(0.111)	(0.0452)	(0.101)	(0.0293)
Past base peer of mentioned	0.209***	0.128***	0.242***	0.0211
	(0.0768)	(0.0245)	(0.0535)	(0.0173)

Panel B

	(1) Officers	(2) Non-Officers	(3) After Aug. 42	(4) Before Aug. 42
Past squadron peer of mentioned	0.412***	0.279***	0.636***	0.0141
	(0.100)	(0.0743)	(0.0929)	(0.0699)
Past group peer of mentioned	0.226***	0.142***	0.226***	0.0926**
	(0.0719)	(0.0521)	(0.0734)	(0.0456)
Past base peer of mentioned	0.114***	0.163***	0.174***	-0.0191
	(0.0411)	(0.0282)	(0.0351)	(0.0297)

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Note: Each entry in this table shows the coefficient of interest from a regression as specified in Table 2, col. 4-6. Hence the first entry in column 1 here is the coefficient on past peer of mentioned, using the specification from Table 2, col. 4, etc. For variable definitions cf. Table 2.

Table 6: Time Since Joint Service

	(1) ≥ median time since exposure	(2) < median time since exposure
Past squadron peer of mentioned	0.310***	0.412***
	(0.0800)	(0.0858)
Past group peer of mentioned	0.241***	0.193***
	(0.0459)	(0.0475)
Past base peer of mentioned	0.153***	0.136***
	(0.0244)	(0.0246)

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Note: Each entry in this table shows the coefficient of interest from a regression as specified in Table 2, col. 4-6. Hence the first entry in column 1 here is the coefficient on past peer of mentioned, using the specification from Table 2, col. 4, etc.

APPENDIX

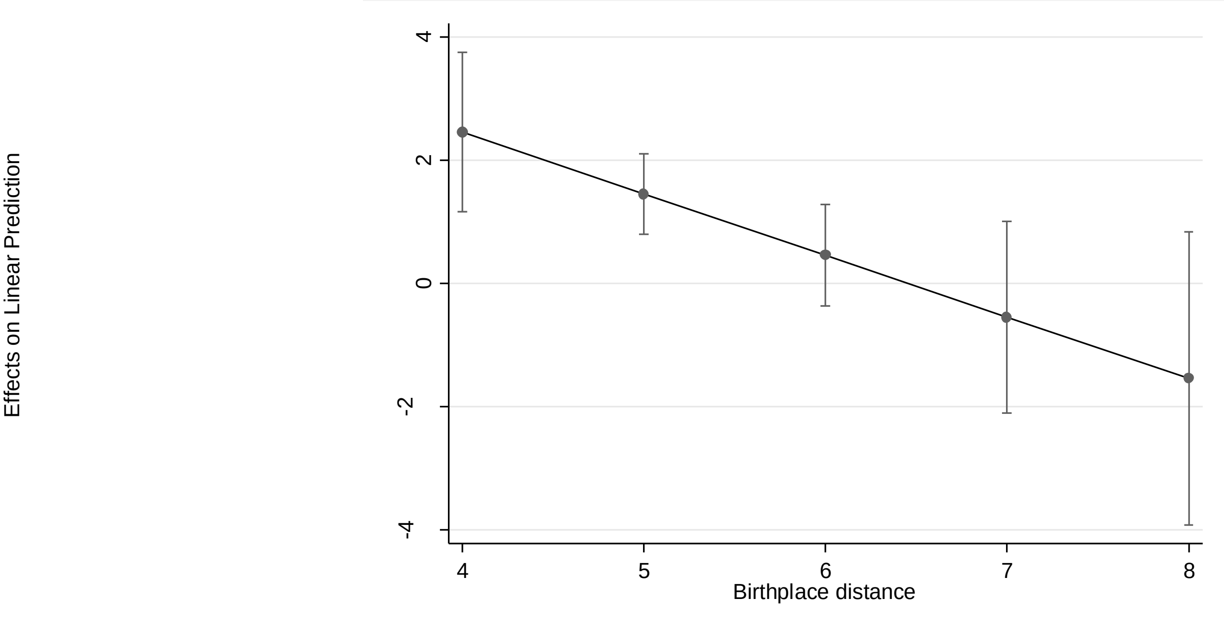


Figure A1: Marginal effect of being a past peer of a mentioned pilot, as a function of birthplace distance (natural logarithm of distance in miles).

Note: The figure plots the marginal effect of a being a peer of a mentioned pilot in the month of the mention, as a function of (log) birthplace distance. Regression specification based on Table 2, col (4).

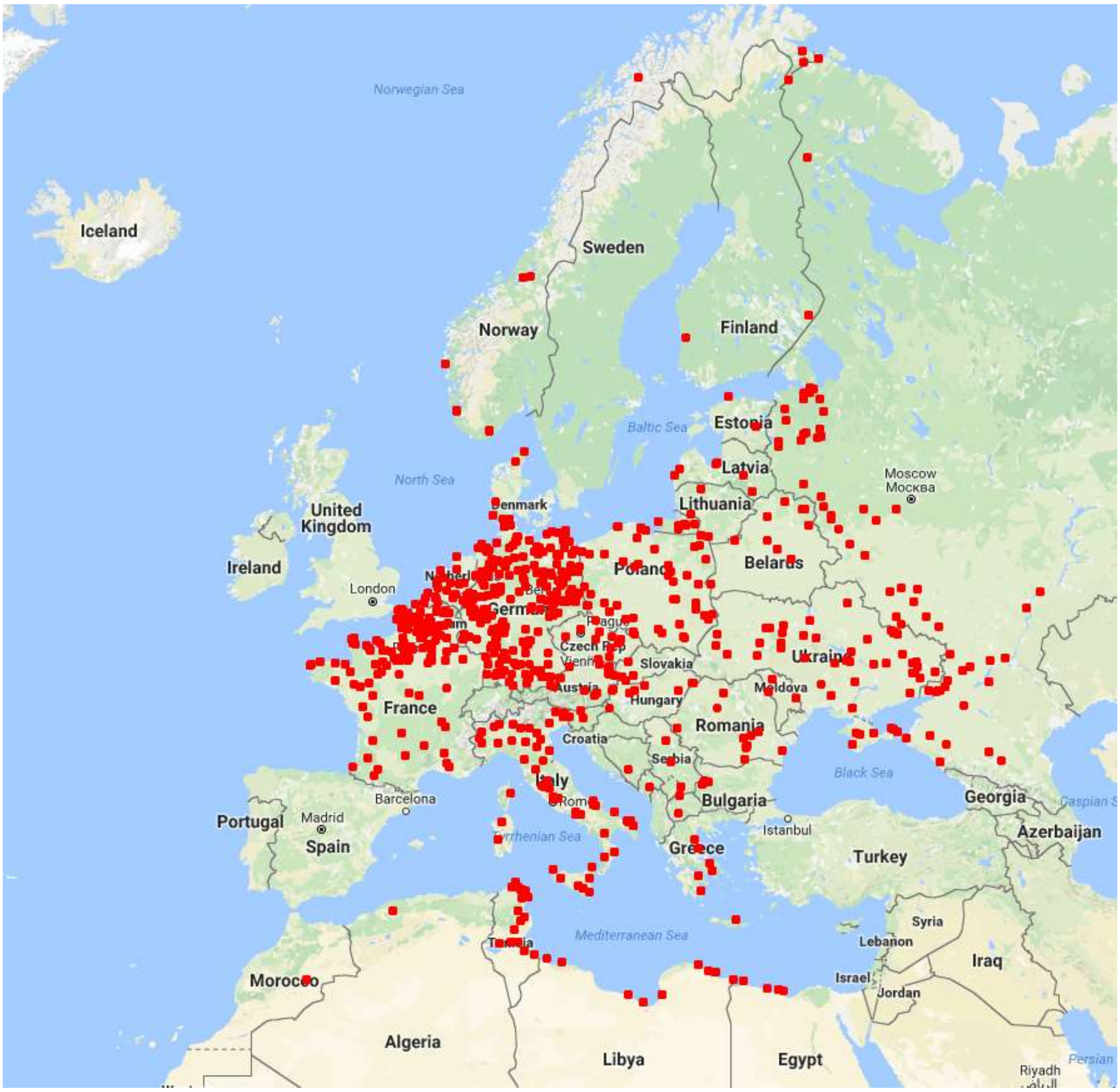


Figure A2: Airfield locations of Luftwaffe squadrons, 1939-45

Note: The map plots the geocoded location of every airfield from which pilots in our dataset flew at least once during the period September 1939 to May 1945.

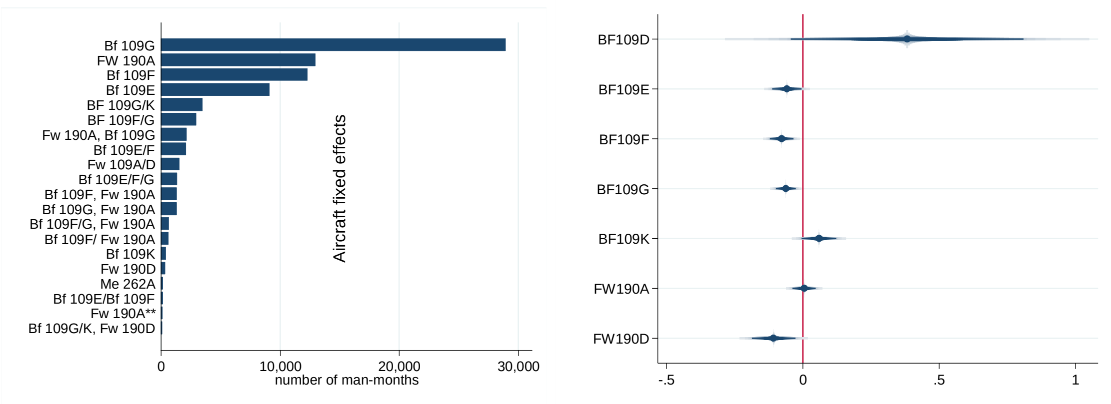


Figure A3: Aircraft type – usage and fixed effect (95 and 99% CI) on victory scores

Note: The left panel of Figure A3 plots the number of man-months in our dataset of different aircraft types (or combinations) flown by squadrons. The right panel plots the fixed effects for the main aircraft types in a baseline regression without time- or squadron fixed effects.

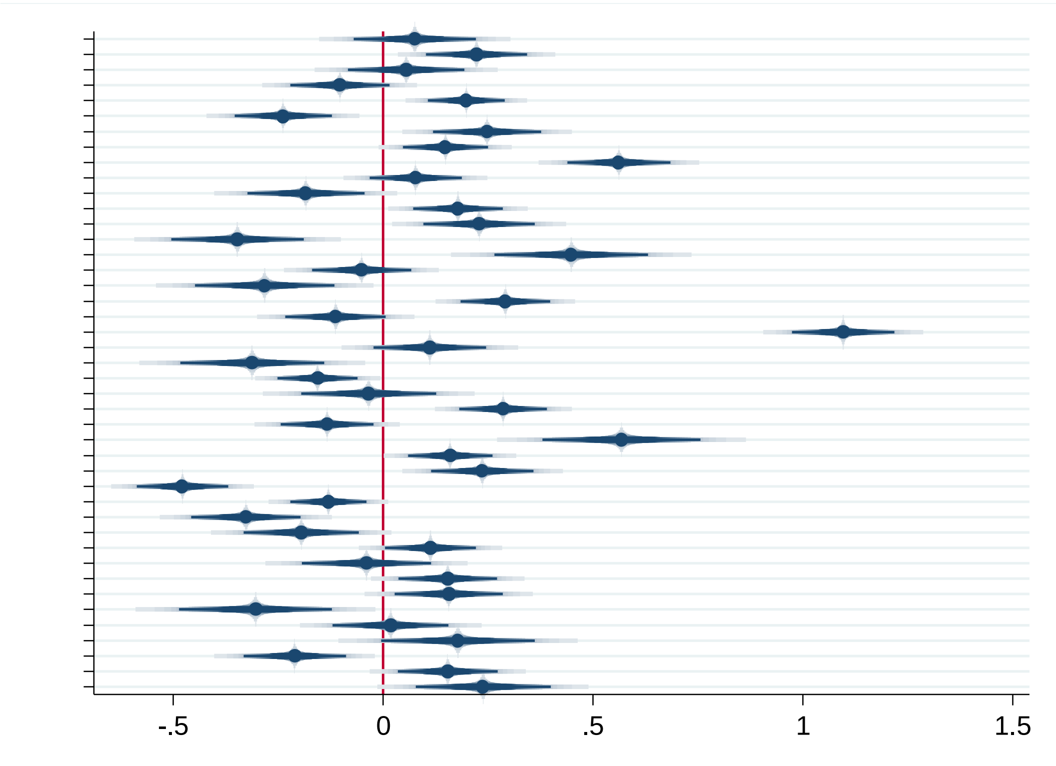


Figure A4: Fixed effects of pilots who are/become peers of mentioned pilots

Note: Each point represents the estimated fixed effects for pilots who become peers of a pilot who is eventually mentioned in the *Wehrmachtsbericht* (estimated for the sample as a whole).

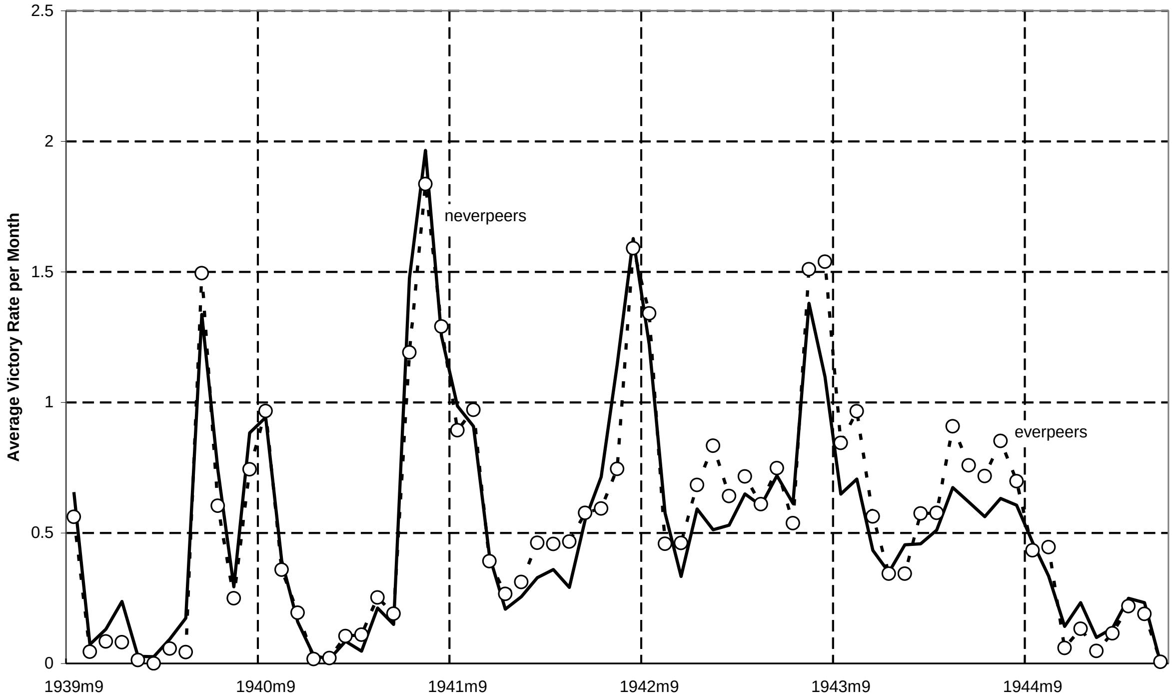


Figure A5: Average score over time: Neverpeers vs Everpeers

Note: The graph plots mean monthly victory scores, for pilots who never flew with a mentioned pilot ("Neverpeers") and those who flew with one at least once ("Everpeers").

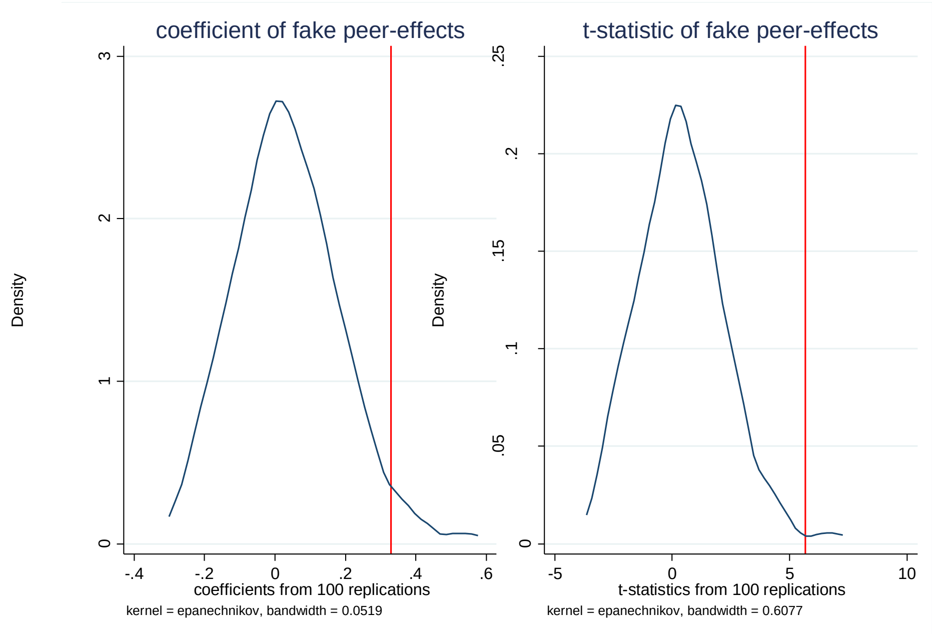


Figure A6: Monte Carlo Simulations – Distribution of Coefficients and T-statistics

Note: The left panel shows the distribution of coefficients for the variable Pastsquadronpeer, based on the specification in col. (5), Table A.1. We randomly draw 0.01% of observations and designate them placebo mentions. The distribution gives values after 100 simulations. The red line indicates the estimated coefficient using actual mentions (col. 5, Table A.1). The right-hand side panel shows the corresponding t-statistics, and the red line show the estimated t-statistic using actual mentions.

Table A.1: Including fixed effects for pilots' past squadrons and pilot FE

	(1) OLS	(2) controls	(3) +SqFE	(4) +TimeFE	(5) +PilotFE	(6) +PilotFE	(7) +PilotFE
Mention period	0.221***	0.206***	0.200***				
	(0.013)	(0.014)	(0.013)				
Past squadron peer of mentioned	0.570***	0.473***	0.220***	0.188***	0.281***		
	(0.126)	(0.123)	(0.061)	(0.061)	(0.058)		
Past group peer of mentioned						0.063	
						(0.041)	
Past base peer of mentioned							0.077***
							(0.023)
Eastern Front		0.617***	0.512***	0.445***	0.783***	0.783***	0.782***
		(0.036)	(0.017)	(0.018)	(0.030)	(0.030)	(0.030)
Experience		-0.005***	-0.016***	-0.013***	-0.013***	-0.013***	-0.013***
		(0.001)	(0.000)	(0.001)	(0.002)	(0.002)	(0.002)
Constant	0.418***	0.246***	-0.120***	0.040*	-0.252***	-0.255***	-0.251***
	(0.014)	(0.025)	(0.023)	(0.022)	(0.097)	(0.097)	(0.097)
N	96043	96043	96043	96043	96043	96043	96043
R^2	0.004	0.033	0.091	0.118	0.271	0.271	0.271

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Note: The first two columns of this table replicate the results of Table 2, col. 1-2. Starting with column 3, specifications additionally include dummies for all past squadrons of a pilot. Column 4 (5) and those afterwards include time (pilot) fixed effects.

Table A2: Placebo mentions, conditional on peer performance (correlations dataset)

	(1) Baseline	(2) Controls	(3) +TimeFE+SqFE	(4) Samegroup=0
$\text{Log}(\text{vic}_{\text{mi}} + 0.01)$	0.129***	0.104***	0.0423***	0.00842
	(0.00394)	(0.00392)	(0.00408)	(0.00610)
Mention period	-0.575	-0.401	-0.404	0.314
	(0.624)	(0.604)	(0.510)	(0.776)
Mention period * $\text{Log}(\text{vic}_{\text{mi}} + 0.01)$	0.173	0.109	0.173	-0.0453
	(0.219)	(0.212)	(0.178)	(0.269)
Eastern Front		0.553***	0.759***	0.310***
		(0.0246)	(0.0338)	(0.0525)
Experience		-0.0298***	-0.0298***	-0.0206***
		(0.000797)	(0.000972)	(0.00150)
Constant	-3.022***	-2.717***	-2.019***	-1.514
	(0.0146)	(0.0437)	(0.735)	(0.986)
N	42882	42882	42882	19339
R^2	0.027	0.080	0.166	0.178

Note: Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Columns 1-4 show all coefficients of interest from regressions as specified in Table 4, columns 1-4.

All results are based on placebo mentions instead of real mentions.