

Does Guilt Affect Performance?*

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Abstract

Does guilt affect performance? Exploiting a novel measure of the justification of penalty calls as part of an analysis of a database on 1,388 penalty kicks from the top five European football leagues, we find suggestive evidence for the existence of a negative “guilt effect”: unjustified penalty calls negatively affect penalty conversion rates. Interestingly, our results show that the guilt effect varies between leagues, and depends on the origin of the kicker: it is strongly evident in the German Bundesliga and among European kickers. This heterogeneity is consistent with previously documented measures of norms and values across countries and continents, suggesting these affect performance.

Keywords: D81, L83.

JEL classification: Guilt, performance, soccer, football, penalty kicks, Europe.

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"There was all the talk of 'did he dive or didn't he' but I just lost momentum when I jumped over [David Seaman] and fell over. [...] It wasn't a penalty and because he was my mate from the England side, I just said it wasn't a penalty. [...]. I didn't miss the penalty on purpose, it was just a bad penalty but they all are when you don't score them..."

– Robbie Fowler.²

1. Introduction

March 24, 1997. Liverpool travels to meet Arsenal at Highbury, London. Liverpool were leading 1-0 against Arsenal early in the second half when Liverpool's striker Robbie Fowler appears to be brought down in the box by the Arsenal goalkeeper David Seaman, and is awarded a penalty. Much to everyone's surprise, Fowler went to the referee, Gerald Ashby, to correct the decision, claiming the keeper had not touched him. Ashby was unmoved by Fowler's honesty and stuck by his original decision. Fowler's penalty was saved by David Seaman though Jason McAteer scored the rebound, and Liverpool went on to win the game 2-1. Fowler later received a Fair Play award from UEFA for his honesty.

The case of Fowler's penalty, however, seems to deviate from the common analysis of rational strategies, suggesting that other determinants should be considered. Our study explores the relationship between culture and penalty-kicks performance, and specifically the mechanism of trust and guilt aversion. As Arrow (1972, p. 357) put it, "*Virtually every commercial transaction has within itself an element of trust.*" Societies characterized by high levels of trust are less dependent on formal institutions to enforce agreements. Instead, social norms act as constraints on egoism, through internal sanctions, such as guilt, and external sanctions, such as shame and ostracism. Several studies have documented the effects of trust on economic performance. Narayan and Pritchett (1996) find that higher levels of associational memberships are

² Kelly (2015, March 25).

related to higher incomes in Tanzania. Knack and Keefer (1997) found evidence that “social capital” affect economic performance, using indicators of trust and civic norms from the World Values Surveys (WVS).

Individuals are defined as guilt-averse if their values satisfy what their conscience or what other individuals expect of them. Not doing so causes a feeling of guilt which decreases the individual’s utility and therefore affects decision making.³ While studies in experimental economics have found evidence for guilt aversion (Charness and Dufwenberg, 2006) and quantitated the importance of guilt aversion for players (Bellemare et. al, 2011), these studies have some causal inference limitations. Participants reported beliefs might be affected by the participants' intended decisions rather than the other way around. Furthermore, laboratory experiments are usually conducted on a homogenous and selective population, mostly students, which prevents the analysis of a heterogenic response based on cultural and social background. Finally, these kinds of experiments do not have any ramifications on the experimenter's life, making moral decisions much easier.

Our study exploits a unique dataset on penalties in 5 major European soccer leagues in order to overcome the casual inference challenge using a natural experiment framework. Our dataset includes information on whether the penalty was rightly awarded. We surmise that the penalty kicker's performance would be negatively affected by his guilt aversion if the penalty has not been rightly awarded. Refuting several alternative explanations, we find a causal negative effect of guilt on the probability of scoring the penalty. This evidence was found only among players who play in or come from countries with a relatively high trust value, as reported to the WVS.

³ People are also unfavorable to lying, and often avoid it even in situations, in which lies cannot be noticed. When the moral cost of lying is offset by engaging in normatively acceptable behavior, such as collaborating with others, people lie more than in comparable settings in which they work alone. Soraperra et al. (2017) find that the frequency of dyads in which both players are honest is lower in collaboration than in the norm exposure setting.

Exploiting the variance arising from players who do play outside of their countries of origin, we can also analyze the culturally heterogeneous effect. Importantly, we can decompose the constraints on egoism into internal sanctions, such as guilt, and external sanctions, such as shame. That is because the external sanctions being imposed by the fans and the media should affect foreign players and local players evenly, while each group should be affected differently by its own internal guilt sanction.

Economics literature usually analyses penalty kicks in a game theory framework. Chiappori and Groseclose (2002) studied penalty kicks as an application for mixed strategies. They report that they cannot reject the assumption that players optimally choose strategies, conditional on their opponent's behavior. Palacios-Huerta (2003) discusses the implications of the "Minimax Theorem" using penalty kicks as natural data. He reports that the results are consistent with equilibrium play.

Empirical studies on penalty-kicks performance usually explore the game strategies or the link between the players' quality and the chance of scoring a penalty. Some of the recent publications are Bar-Eli et al. (2007), Baumann et al. (2011), and Buzzacchi and Pedrini (2014). Empirical studies that are more related to non-rational effects on penalty kicks' performance is scarce, and none of them explore the effect of guilt aversion. Jordet et al. (2007) did explore the relationship between stress and performance on shootouts in the World Cup, European Championships, and Copa America between 1976 and 2004. They found that stress seems to be negatively related to the outcomes of the kicks, whereas skill and fatigue were either less related or unrelated to performance. The authors concluded that psychological components are highly influential on the outcome of penalty kicks. Dohmen (2008) also provides some empirical evidence for the effect of psychological pressure on penalty-kicks performance.

This article is constructed as follows: section 2 describes the data and offers some descriptive statistics; section 3 is the estimation part, containing results from multivariate analysis; section 4 concludes.

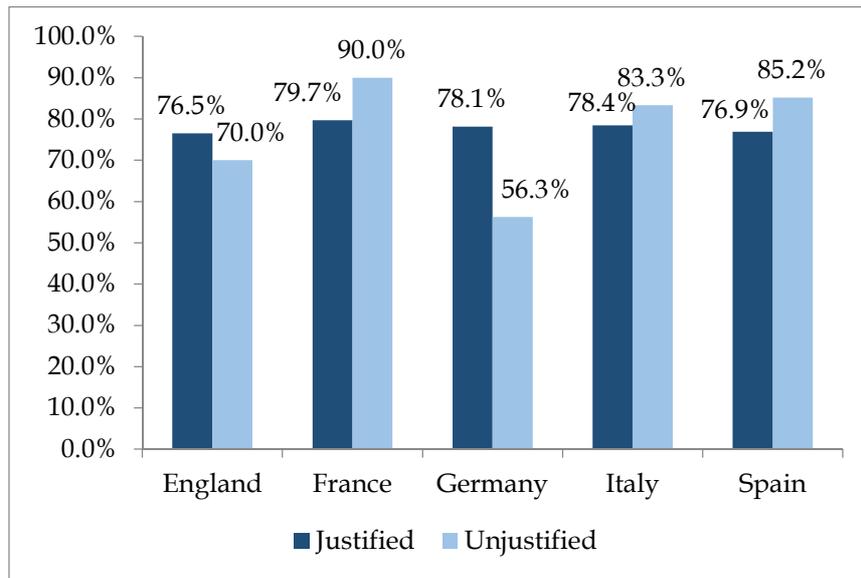
2. Data and Descriptive Statistics

The data we use was provided by Redwood International Sports. The company specializes in data gathering from sporting events, football being among the sports covered, For the purpose of this research, each penalty kick was examined thoroughly to decide either if it was a justified call, an ambiguous one or clearly a wrong one. This is our variable of interest.

Our data consists of 1,388 penalty kicks taken in league matches in the five biggest leagues in Europe (Italy, Germany, England, Spain, and France) between the 2006-07 and 2013-14 football seasons. For technical reasons, not all penalty kicks taken in these seasons were coded, but since the omitted penalty kicks do not have any special characteristics, our data does not suffer from selection bias.

Each penalty kick was analyzed, and the analyst decided whether it was a justified, marginal or incorrect call. We transform this variable into a dichotomous one, labeled INCORRECT, that takes 0 for a justified or marginal call and 1 for an incorrect one. We summarized these penalties and their outcomes in Figure 1 and Table 1. 103 calls (7.4%) were incorrect calls, while the rest are marginal or justified (hereafter we use the term justified for all non-incorrect calls). The rate of success (meaning: goal) is independent of the nature of the call and is quite similar to the rate found in all penalty researches, which is around 80%.

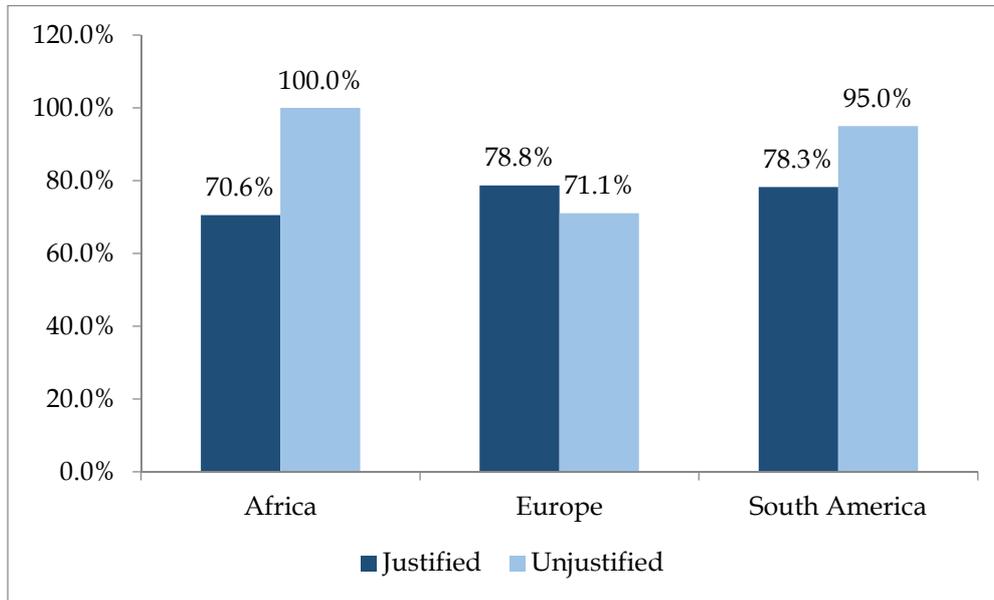
Figure 1: Conversion rates of justified and unjustified penalty kicks, by league



Notes: The rates in the figure are the raw conversion rates of 1,388 penalty kicks. We gathered both justified and marginal calls under the title "Justified." Source: Authors' calculations.

The first differences appear when we look at penalty kicks by league. While the rate of incorrect calls is similar and moves between 6.3% and 9%, and so is the total conversion rate (76.5%-79.7%), the rate of success in incorrect calls is highly volatile and runs between 56.3% in the German Bundesliga to 90% in the French Ligue 1. Since non-local players are quite common, we calculate the rate of success in relation to the kicker's continent of origin and find that while among the three main continents (Europe, South America and Africa) the rate of success of all penalties are similar, this rate differs dramatically when there is an incorrect call. European kickers succeed in only 71.1% of incorrect-call kicks, while their South American colleagues have a 95% success rate (Figure 2 and Table 1). Since this univariate analysis is clearly not enough to establish causality, we will strengthen it with a multivariate analysis later.

Figure 2: Conversion rates of justified and unjustified penalty kicks, by kicker's continent of origin



Notes: The rates in the figure are the raw conversion rates of 1,388 penalty kicks. Only kickers from continents in which at least one unjustified penalty was taken were included. Both justified and marginal calls are included under the title "Justified." Source: authors' calculations.

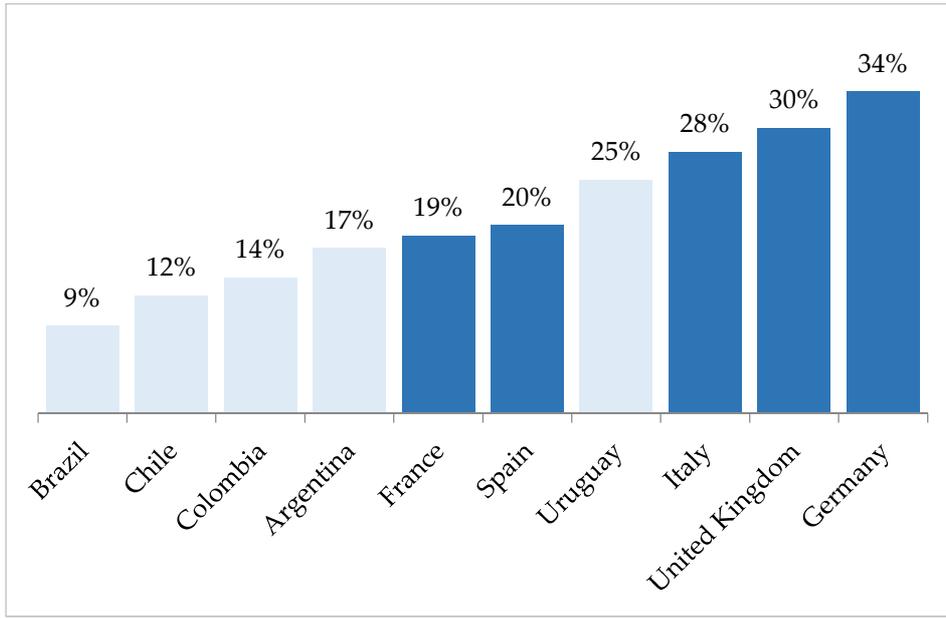
As already mentioned, societies characterized by high levels of trust use social norms as constraints on egoism. We therefore expect to find the strongest effect of guilt on the probability of scoring a penalty in countries with high levels of trust. We do so using data from the World Values Survey (WVS). The WVS has recorded people's values and beliefs over time in nearly 100 countries since 1981.

Table 1: *Penalty kicks conversion rates, by league, kicker's continent and the justification of the call*

	All calls		True or marginal calls		Incorrect calls	
	<i>N</i>	conversion rate	<i>N</i>	conversion rate	<i>N</i>	conversion rate
Total	1,388	77.7%	1,285	77.7%	1,03	77.7%
<i>By league</i>						
England	314	76.1%	294	76.5%	20	70.0%
France	158	80.4%	148	79.7%	10	90.0%
Germany	176	76.1%	160	78.1%	16	56.3%
Italy	410	78.8%	380	78.4%	30	83.3%
Spain	330	77.6%	303	76.9%	27	85.2%
<i>By kicker's continent of origin</i>						
Africa	126	72.2%	119	70.6%	7	100.0%
Asia	21	81.0%	21	81.0%	0	-
Europe	989	78.2%	913	78.8%	76	71.1%
North America	6	33.3%	6	33.3%	0	-
South America	246	79.7%	226	78.3%	20	95.0%

Figure 3, based on data from the WVS, shows that Germany has the highest levels of trust among the five countries whose leagues we analyze. Figure 3 shows that European countries are also usually characterized by higher levels of trust than South-American countries. Since an unjustified penalty call can be seen as a specific case in which norms and values affect performance, the correlation between our results and the WVS results is not surprising. It suggests that values and norms affect performance.

Figure 3: Can most people be trusted?



Notes: The share of positive answers in European (blue) and in South-American (pink) countries. Source: <http://www.worldvaluessurvey.org/WVSONline.jsp>

3. Multivariate Analysis

Clearly, the analysis above could be misleading, since many other factors can affect the probability of scoring and might affect the probability of making an incorrect call. To this end, we gathered a wide range of control variables to formally establish a casual effect and to test whether our conclusions are statistically significant and robust.

Our multivariate analysis follows a conditional Probit model for the success rate of penalty i :

$$P(y_i|\mathbf{X}_i) = \Phi(D \times IS_INCORRECT_i + \boldsymbol{\beta}'(kicker_i) + \boldsymbol{\gamma}'(goalkeeper_i) + \boldsymbol{\delta}'(match_i) + \varepsilon_i) \quad (1)$$

where y_i is a binary outcome variable that takes the value of 1 if penalty i was scored and zero otherwise. The variable $IS_INCORRECT$ is our main interest; $kicker$ and $goalkeeper$ include kicker and goalkeeper attributes, respectively; while $match$ includes variables that are related to the match itself. We later

add some interactions between the justification and other variables, including the nationality of the kicker and the country of the league.

Most of the data we use was kindly provided to us by Redwood International Sports, while the remaining was collected from online archives, especially *transfermarkt.com*. Basic descriptive statistics are shown in Table 2, while a detailed description of the data and its source is given in Table A.1 of the appendix.

A set of t-tests (not included in this article) that we ran to test whether the averages of the explanatory variables are independent of the justification level of the call clearly show that the assumption of no difference in averages cannot be rejected at a 5% significance level. This result strengthens our critical assumption that the justification of a penalty is random and is not correlated with any observable—and probably also unobservable—variable. We are therefore justified in referring to the following results in a causal manner.

Table 2: *Descriptive statistics of the variables*

variable	all penalties			good			miss		
	N	mean	std	N	mean	std	N	mean	std
<i>penalty scored</i>	1,388	0.78	0.42	1,079	1	0	309	0	0
<i>IS_INCORRECT</i>	1,388	0.07	0.26	1,079	0.07	0.26	309	0.07	0.26
<i>German Bundesliga</i>									
<i>dummy</i>	1,388	0.13	0.33	1,079	0.12	0.33	309	0.14	0.34
<i>France Ligue 1 dummy</i>	1,388	0.11	0.32	1,079	0.12	0.32	309	0.10	0.30
<i>England Premier league</i>	1,388	0.23	0.42	1,079	0.22	0.42	309	0.24	0.43
<i>Italy Serie A</i>	1,388	0.30	0.46	1,079	0.30	0.46	309	0.28	0.45
<i>Spain La Liga</i>	1,388	0.24	0.43	1,079	0.24	0.43	309	0.24	0.43
<i>German league X</i>									
<i>IS_INCORRECT</i>	1,388	0.01	0.11	1,079	0.01	0.09	309	0.02	0.15
<i>French league X</i>									
<i>IS_INCORRECT</i>	1,388	0.01	0.08	1,079	0.01	0.09	309	0	0.06
<i>English league X</i>									
<i>IS_INCORRECT</i>	1,388	0.01	0.12	1,079	0.01	0.11	309	0.02	0.14
<i>Italian league X</i>									
<i>IS_INCORRECT</i>	1,388	0.02	0.15	1,079	0.02	0.15	309	0.02	0.13

(continued)

variable	all penalties			good			miss		
	N	mean	std	N	mean	std	N	mean	std
<i>Spanish league X IS_INCORRECT</i>	1,388	0.02	0.14	1,079	0.02	0.14	309	0.01	0.11
<i>Crowd behind GK Supports kicker</i>	1,388	0.55	0.50	1,079	0.56	0.5	309	0.5	0.5
<i>Crowd behind GK Supports GK</i>	1,388	0.28	0.45	1,079	0.28	0.45	309	0.31	0.46
<i>No crowd behind GK</i>	1,388	0.07	0.26	1,079	0.07	0.25	309	0.07	0.26
<i>Mixed crowd behind GK</i>	1,388	0.03	0.18	1,079	0.03	0.18	309	0.03	0.16
<i>Kicker's market value</i>	1,388	14.53	19.87	1,079	15.23	20.87	309	12.08	15.68
<i>GK's market value</i>	1,388	5.16	5.61	1,079	4.96	5.43	309	5.85	6.17
<i>Kicker's club market value</i>	1,388	162.27	142.89	1,079	164.83	145.33	309	153.32	133.88
<i>GK's club market value</i>	1,388	123.77	108.83	1,079	122.24	106.68	309	129.14	116.07
<i>Kicker's home match dummy</i>	1,388	0.61	0.49	1,079	0.61	0.49	309	0.59	0.49
<i>Kicker's age</i>	1,388	27.78	3.84	1,079	27.76	3.78	309	27.87	4.03
<i>Kicker's penalty performance history</i>	1,362	0.81	0.21	1,063	0.87	0.13	299	0.6	0.29
<i>number of penalty kicks taken by kicker</i>	1,362	11.06	11.68	1,063	11.46	11.82	299	9.66	11.05
<i>GK's age</i>	1,388	28.89	4.79	1,079	28.86	4.87	309	28.99	4.48
<i>GK's penalty performance</i>	1,331	0.22	0.14	1,026	0.19	0.12	305	0.3	0.18
<i>number of penalty kicks taken against GK</i>	1,331	17.04	12.53	1,026	16.82	12.58	305	17.78	12.36
<i>minute in the match</i>	1,388	52.44	26.21	1,079	52.17	26.28	309	53.41	25.97
<i>round in the season</i>	1,388	17.96	10.49	1,079	17.98	10.48	309	17.88	10.56
<i>Kicker-GK goals difference during the penalty</i>	1,388	-0.01	1.30	1,079	0.02	1.31	309	-0.09	1.26
<i>African kicker dummy</i>	1,388	0.09	0.29	1,079	0.08	0.28	309	0.11	0.32
<i>European kicker dummy</i>	1,388	0.71	0.45	1,079	0.72	0.45	309	0.7	0.46
<i>North American kicker dummy</i>	1,388	0.00	0.07	1,079	0	0.04	309	0.01	0.11
<i>South American kicker dummy</i>	1,388	0.18	0.38	1,079	0.18	0.39	309	0.16	0.37
<i>Asian kicker dummy</i>	1,388	0.02	0.12	1,079	0.02	0.12	309	0.01	0.11

Notes: The table includes descriptive statistics of all the variables included in our multivariate analysis. An elaborated description of the variables and their source can be found in Table A.1 in the Appendix.

Now, we examine the effect of the explanatory variables on the chances of scoring a penalty, with the variable of interest *IS_INCORRECT*. For this we estimate the above model using a probit model, and we present the marginal effect of the variables in Table 3.

The first column indicates that without controlling for the different leagues there is no effect of the penalty's justification on the probability of scoring. In the second column we add dummy variables for each league, with the base being the Spanish league. Although the parameters are significant, their magnitudes are negligible.

In the third column we control for the five different leagues and their interaction with *IS_INCORRECT*, and again, the comparison is in relation to the Spanish league. The results show that the greatest influence is in the German league, where the chance to score an unjustified penalty is 38.5 percentage points lower than a justified penalty when compared to the Spanish league and 26.5 percentage points lower than a justified penalty in the German league itself. In other words, given that the raw probability of scoring a penalty is 80 percent, the probability of scoring an unjustified penalty is cut by about one quarter. In the other leagues, there is no effect of the justification penalty on the probability of scoring a goal.

Column 4 describes a model in which we include all control variables that were found to have a significant effect on the probability of scoring, and found that even after including those, our results regarding our variable of interest are robust. However, the estimated effects of the control variables include some interesting results. The player's and the goalkeeper's market value monitors the quality of the players and in the regressions we use the difference between them, divided by its standard deviation.⁴ We found that the value gap has a positive effect on the probability of scoring: a one-standard-deviation increase in the quality gap between the kicker and the

⁴ Results do not change if we include both market values or if you divide the values by the kicker and goalkeeper age.

goalkeeper will increase the kicker's chances of succeeding by about 6 percentage points. When we include both market values, instead of their difference (not shown) we find that any increase of one standard deviation of the player's value increases the chances of scoring a goal by 5 percentage points, and any increase of one standard deviation of the goalkeeper's value reduces the chance by 2.6 percentage points. This provides evidence that the chance of a penalty kick depends more on the quality of the player than on the quality of the goalkeeper. We did not find that there is a connection between the effect of the justified penalty and the quality of the player and/or the goalkeeper on the chances of being rewarded with a penalty (interaction variables).

This finding is in line with other findings in the literature. Bar-Eli and Azar (2009) show that kicks to the upper area of the goal are almost unstoppable, and that probability that a highly skilled player will score a penalty is high and is not conditional on the goalkeeper's abilities. The relative importance of the kicker's performance heightens the interest of our research question, which focuses on the kicker's state of mind.

Since we do not have data in the table on the teams' position at the time the match was played, we instead use the difference between the market value of the kicker's and of the goalkeeper's teams, since it is well-documented that, on average, higher market value is correlated with higher league rank, so this variable controls the importance of the game. We find that the higher the difference, the lower the chance of scoring, and that any increase of one standard deviation in the value difference reduces the chance by 2.7 percentage points (3.5 in other specifications). Our interpretation is that, after controlling for the kicker's and the goalkeeper's quality, this variable implies that the lower the importance of the match – i.e. the bigger the difference – the lower the probability of scoring, probably because the kicker is less motivated to score. We did not find a significant effect of the interaction between unjustified penalty and team's value difference.

Table 3: Probit model for penalty conversion rates

Dep. Variables	(1) goal	(2) goal	(3) goal	(4) goal	(5) goal	(6) goal	(7) goal	(8) goal
<i>IS_INCORRECT</i>	-0.0007 (0.0426)	0.00049 (0.0426)	0.0822 (0.0718)	0.0846 (0.0714)	0.0872 (0.0703)	0.232*** (0.0337)	0.232*** (0.0273)	0.226*** (0.0449)
<i>German Bundesliga dummy</i>		-0.0143 (0.0395)	0.0120 (0.0396)	0.0343 (0.0380)	0.0337 (0.0392)	0.0330 (0.0391)	0.0330 (0.0451)	0.0288 (0.0356)
<i>France Ligue 1 dummy</i>		0.0282 (0.0386)	0.0279 (0.0396)	0.0460 (0.0381)	0.0566 (0.0383)	0.0764** (0.0376)	0.0764** (0.0387)	0.089*** (0.0331)
<i>England Premier league</i>		-0.0144 (0.0332)	-0.0036 (0.0338)	0.0262 (0.0343)	0.0158 (0.0354)	0.0240 (0.0351)	0.0240 (0.0367)	0.0250 (0.0266)
<i>Italy Serie A</i>		0.0121 (0.0305)	0.0150 (0.0314)	0.0427 (0.0310)	0.0527* (0.0318)	0.0525* (0.0319)	0.0525 (0.0345)	0.0525 (0.0365)
<i>German league X IS_INCORRECT</i>			-0.341* (0.178)	-0.349* (0.179)	-0.354** (0.179)	-0.342* (0.185)	-0.342** (0.138)	-0.325 (0.252)
<i>French league X IS_INCORRECT</i>			0.0395 (0.167)	0.0286 (0.175)	0.0209 (0.181)	-0.0553 (0.232)	-0.0553 (0.180)	-0.0636 (0.219)
<i>English league X IS_INCORRECT</i>			-0.176 (0.166)	-0.172 (0.167)	-0.160 (0.166)	-0.186 (0.175)	-0.186 (0.138)	-0.174 (0.214)
<i>Italian league X IS_INCORRECT</i>			-0.0398 (0.135)	-0.0404 (0.136)	-0.0434 (0.137)	-0.0913 (0.153)	-0.0913 (0.148)	-0.0769 (0.188)
<i>Kicker-GK value gap / 1 standard deviation</i>				0.060*** (0.0186)	0.065*** (0.0195)	0.063*** (0.0195)	0.063*** (0.0179)	0.063*** (0.0239)
<i>Kicker-GK team value gap / 1 standard deviation</i>				-0.0273 (0.0179)	-0.0345* (0.0185)	-0.0358* (0.0184)	-0.0358** (0.0146)	-0.0385* (0.0208)
<i>Home game dummy</i>					-0.0252 (0.0322)	-0.0280 (0.0323)	-0.0280 (0.0301)	-0.0237 (0.0335)
<i>Kicker's age</i>					0.00161 (0.0031)	0.00127 (0.0031)	0.00127 (0.0030)	0.00152 (0.0038)
<i>GK's age</i>					-0.00187 (0.0024)	-0.00192 (0.0024)	-0.00192 (0.0021)	-0.00229 (0.0029)
<i>minute in the match</i>					-0.00056 (0.0004)	-0.00053 (0.0004)	-0.00053 (0.0004)	-0.00046 (0.0003)
<i>round in the season</i>					0.00080 (0.0011)	0.00098 (0.0011)	0.00098 (0.0011)	0.00105 (0.0015)
<i>Kicker-GK goals difference during the penalty</i>					0.00661 (0.0091)	0.00744 (0.0091)	0.00744 (0.0084)	0.00900 (0.0071)
<i>Crowd behind GK Supports GK</i>					0.0404 (0.0483)	0.0328 (0.0488)	0.0328 (0.0426)	0.0399 (0.0397)
<i>No crowd behind GK</i>					0.0311 (0.0541)	0.0259 (0.0547)	0.0259 (0.0517)	0.0176 (0.0531)

Table 3 (cont.): Probit model for penalty conversion rates

Dep. Variables	(1) goal	(2) goal	(3) goal	(4) goal	(5) goal	(6) goal	(7) goal	(8) goal
<i>Mixed crowd behind GK</i>					0.106*	0.0963*	0.0963**	0.0963**
					(0.0549)	(0.0572)	(0.0442)	(0.0477)
<i>Crowd behind GK Supports kicker</i>				0.0401*	0.101**	0.0976**	0.0976**	0.101**
				(0.0228)	(0.0472)	(0.0472)	(0.0391)	(0.0394)
<i>Year dummy</i>					-0.0126	-0.0151	-0.0151	-0.0139
					(0.0092)	(0.0093)	(0.0095)	(0.0102)
<i>European kicker dummy</i>						0.0249	0.0249	0.0246
						(0.0331)	(0.0274)	(0.0362)
<i>African kicker dummy</i>						-0.0653	-0.0653	-0.0563
						(0.0543)	(0.0566)	(0.0535)
<i>North American kicker dummy</i>						-0.406*	-0.406***	-0.407***
						(0.213)	(0.151)	(0.149)
<i>Asian kicker dummy</i>						0.0367	0.0367	0.0741
						(0.0887)	(0.101)	(0.0573)
<i>European kicker dummy X IS_INCORRECT</i>						-0.477***	-0.477***	-0.477**
						(0.174)	(0.156)	(0.198)
Controls var.	No	No	No	Partial ^a	Yes	Yes	Yes	Yes
Observations	1,388	1,388	1,388	1,388	1,388	1,388	1,388	1,362

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

This finding is also consistent when we monitor (in column 5 and further) the score in the game the minute the penalty was taken (*Kicker-GK goals difference during the penalty*) and/or the minute of play. The latter two, incidentally, were not statistically significant in any specification.

Finally, we also examined the effect of the crowd located behind the goalkeeper. We found that if the crowd that supports the kicker's team is behind the goalkeeper and thus facing the kicker, the probability of scoring increases by 4 percentage points (and even higher in the later specifications). We also found that a mixed crowd increases the probability of scoring, as well. Other crowd compositions have no significant effect.

The 5th column presents a multivariate estimation when we control for all the variables together, even if they are not significant. This is mainly in order to examine the robustness of the interesting variables and out of a desire to refine as much as possible the marginal influence of the league's identity on

the chance of being scored as a function of the justifications of the penalty. In this model, the stability and durability of the negative coefficients for Germany are once again evident.

In the 6th column, we add to the model the continent of origin of the player – Asia, Africa, North America, South America and Europe – and the interaction between the Europe dummy variable and *IS_INCORRECT*. The baseline now is a South American kicker⁵ that kicks a justified penalty in the Spanish league. First note that the parameters of the interactions are still stable, meaning that the source of the difference between the leagues is not a result of a different composition of players' continents of origin. The main finding of this specification is that the probability that a European kicker will score an unjustified penalty is 47.7 percent lower than the probability that a South American kicker will score one, *ceteris paribus*. This finding suggests a clear practical application: if a team is given an unjustified penalty kick, the coach should call for a South American kicker to kick the penalty, even if the usual penalty kicker is European.

The 7th and 8th columns estimate the regression when we cluster the errors according to the kicker's team and the penalty kicker himself, respectively. In both cases, the result for the German league remains the same, even though in the final specification it is not statistically significant.

We also tried to replace our quality measure of market value with the penalty history of the kicker and goalkeeper; that is, direct control over the quality of the penalty kicks and saves of the kicker and goalkeeper, respectively. When we control these variables, we lose the significance of the variables of interest and their magnitude is cut by about half. It should be noted, however, that although this variable seems ideal for the purpose of our study, the control of the kick quality variable is not econometrically clean in several respects: (1) the kicking history of the kicker is influenced by the winner's success rate, and

⁵ We include only the interaction between *IS_INCORRECT* and Europe because there is no variability in the outcome in observations of the interactions between *IS_INCORRECT* and Africa, North America, and Asia.

(2) the success rate of the kicker takes into account the rest of the parameters we included in the model, and therefore this variable is actually a type of result variable. We therefore believe that the kicker and goalkeeper's market value is a better control for kicker and goalkeeper's skills.

4. Conclusions

In this study, we examine the effect of guilt on performance by exploiting a novel measure of the justification of penalty calls in the top five European football leagues. We find that unjustified penalty calls are negatively correlated with penalty conversion rates.

We believe that the correlation we find reflects a negative “guilt effect.” We have ruled out a wide range of alternative explanations by controlling for a broad set of variables; our conclusions are statistically significant and robust. Moreover, we find the strongest correlation among players from countries that are characterized (based on WVS) as countries with high levels of trust: this is strongly evident in the German Bundesliga and among European kickers. This heterogeneity in the results suggests that guilt is indeed negatively affecting the probability of scoring a penalty.

Exploiting the variance arising from players who do not play in their countries of origin, we can break down the constraints on egoism into internal sanctions, such as guilt, and external sanctions, such as shame. Although foreign and local players should be evenly affected by the external sanctions being imposed by the fans and the media, we find heterogeneity in the effect between them. This heterogeneity suggests that the European players were affected by their own internal guilt sanction. Such an internal guilt sanction may reduce the need for a formal enforcement system, and may therefore increase economic efficiency and performance.

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Appendix A. Tables and Figures

Table A1: List of variables, their description and source

Variable name		description	source
<i>penalty scored</i>		is it a good penalty (1=yes, 0=no)	Redwood
			International Sports
<i>IS_INCORRECT</i>		is it a justified call (1=yes, 0=no)	Redwood
			International Sports
<i>German Bundesliga dummy</i>		German Bundesliga dummy (1=yes, 0=no)	
<i>France Ligue 1 dummy</i>		France Ligue 1 dummy	
<i>England Premier league</i>		England Premier league	
<i>Italy Serie A</i>		Italy Serie A	
<i>Spain La Liga</i>		Spain La Liga	
<i>German league</i>	X	interaction between German league and <i>is_incorrect</i>	Redwood
<i>IS_INCORRECT</i>			International Sports
<i>French league</i>	X	interaction between French league and <i>is_incorrect</i>	Redwood
<i>IS_INCORRECT</i>			International Sports
<i>English league</i>	X	interaction between English league and <i>is_incorrect</i>	Redwood
<i>IS_INCORRECT</i>			International Sports
<i>Italian league</i>	X	interaction between Italian league and <i>is_incorrect</i>	Redwood
<i>IS_INCORRECT</i>			International Sports
<i>Spanish league</i>	X	interaction between Spanish league and <i>is_incorrect</i>	Redwood
<i>IS_INCORRECT</i>			International Sports
<i>Crowd behind GK Supports kicker</i>		is the crowd behind the goalkeeper supporting the kicker's team (1=yes, 0=no)	Redwood
			International Sports
<i>Crowd behind GK Supports GK</i>		is the crowd behind the goalkeeper supporting the goalkeeper's team (1=yes, 0=no)	Redwood
			International Sports
<i>No crowd behind GK</i>		is there no crowd behind the goalkeeper (1=yes, 0=no)	Redwood
			International Sports
<i>Mixed crowd behind GK</i>		is the crowd behind the goalkeeper is divided between kicker and goalkeeper's' team supporters (1=yes, 0=no)	Redwood
			International Sports
<i>Kicker's market value</i>		kicker's market value (Euro mil.)	Transfermarkt.com
<i>GK's market value</i>		goalkeeper's market value (Euro mil.)	Transfermarkt.com
<i>Kicker's club market value</i>		kicker's team market value (Euro mil.)	Transfermarkt.com
<i>GK's club market value</i>		goalkeeper's team market value (Euro mil.)	Transfermarkt.com
<i>Kicker's home match dummy</i>		is the match plays at the kicker's team home stadium	Redwood

	(1=yes, 0=no)	International Sports
<i>Kicker's age</i>	kicker's age	Transfermarkt.com
<i>Kicker's penalty performance</i>	% of successful penalties since 2000 and until the season preceded the kick's season	Transfermarkt.com
<i>number of penalty kicks taken by kicker</i>	number of taken penalties since 2000 and until the season preceded the kick's season	Transfermarkt.com
<i>GK's age</i>	goalkeeper's age	Transfermarkt.com
<i>GK's penalty performance</i>	% of penalties the goalkeeper stopped since 2000 and until the season preceded the kick's season	Transfermarkt.com
<i>number of penalty kicks taken against GK</i>	number of penalties taken against the goalkeeper since 2000 and until the season preceded the kick's season	Transfermarkt.com
<i>minute in the match</i>	which minute in the match the penalty was taken	Redwood
		International Sports
<i>round in the season</i>	league round of the match	Redwood
		International Sports
<i>Kicker-GK goals difference during the penalty</i>	the difference between the kicker's team number of goals and the opponent at the time of the penalty kick	Redwood
<i>African kicker dummy</i>	is the kicker from Africa (yes=1, no=0)	International Sports
<i>European kicker dummy</i>	is the kicker from Europe (yes=1, no=0)	Transfermarkt.com
<i>North American kicker dummy</i>	is the kicker from North America (yes=1, no=0)	Transfermarkt.com
<i>South American kicker dummy</i>	is the kicker from South America (yes=1, no=0)	Transfermarkt.com
<i>Asian kicker dummy</i>	is the kicker from Asia (yes=1, no=0)	Transfermarkt.com
