Does Guilt Affect Performance? Evidence from Penalty Kicks in Soccer

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19 November 2018

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October 18, 2018

Abstract

Does guilt affect performance? Exploiting a novel measure of the justification of penalty calls, we find that unjustified penalty calls negatively affect penalty conversion rates, and that this effect increases with social norms of trust. Exploiting the variance arising from players who do not play in their countries of origin by including the norms of both the league and the kickers' countries of origin, we separate the constraints on egoism into two categories: internal sanctions, such as guilt, and external sanctions, such as shame. We find that both guilt and shame affect the performance of penalty kickers.

Keywords: D81, L83.
JEL classification: Guilt, performance, soccer, football, penalty kicks, Europe.

* We thank Meital Graham-Rosen, Ori Heffetz, and participants in the Hebrew University Behavioral Economics Seminar and the Israeli Economics Association Annual Conference for helpful discussions, comments, and suggestions. We also thank Redwood International Sports for providing the data. All remaining errors are ours. This work was conducted during our free time and not while working at the Bank of Israel. Moreover, the views expressed here are solely those of the authors and do not reflect the views of the Bank of Israel, or any of its staff.

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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.[1]

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 appeared to have been brought down in the box by Arsenal goalkeeper David Seaman and was 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 the Union of European Football Associations for his honesty.

The case of Fowler's penalty seems to deviate from a standard analysis of rational strategies, suggesting that other determinants should be considered. Our study explores the relationship between culture and penalty-kick performance, 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 (1999) find that higher levels of associational

[1] Kelly (2015).

memberships are related to higher incomes in Tanzania. Knack and Keefer (1997) find evidence that "social capital" affects 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.[2] 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, Sebald, & Strobel, 2011), these studies have some causal inference limitations. Participants reported that their beliefs might be affected by their 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, including penalties that were taken in five major European football leagues, in order to overcome the casual inference challenge using a quasi-natural experiment framework. Our dataset includes information on whether the penalty was rightly awarded. We surmise that the penalty kicker's performance will be negatively affected by his guilt aversion if the penalty has not been rightly awarded. By including a common-social-norms measure from the WVS, we show that this adverse effect is differential and depends on the norms of trust in the league in which the teams play. We strengthen our main results by using a supplemental and more comprehensive dataset, which enables us to show that the results are not an artifact of a small sample size bias.

[2] People also dislike lying and often avoid it even in situations in which lies cannot be detected. 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.

Moreover, by exploiting the variance arising from players who play outside of their countries of origin, we include a measure of norms both in the league in which the match takes place and in the kickers' countries and/or continents of origin. This enriches the analysis of the culturally heterogeneous effect. Importantly, in our results, we can shed some light on the separation of constraints on egoism between guilt and 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. We show that the guilt effect can, in fact, be differentiated into a guilt effect and a shame effect.

This article is constructed as follows: in section 2, we provide a non-exhaustive literature review; section 3 describes the data and offers some descriptive statistics; section 4 is the estimation part, containing results from multivariate analysis; in section 5 we provide a robustness test using a larger data set; in section 6 we differentiate between guilt and shame effects; section 7 concludes.

2. A Literature Review of Penalty Kicks

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-kick 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 Azar, Ritov, Keidar-Levin, & Schein (2007), Baumann, Friehe, & Wedow (2011), and Buzzacchi and Pedrini (2014). Empirical studies that are more related to non-rational effects on penalty kicks' performance are scarce, and none of them explore the effect

of guilt aversion. Jordet, Hartman, Visscher, & Lemmink (2007) explore the relationship between stress and performance on shootouts in the World Cup, European Championships, and Copa America between 1976 and 2004. They find 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 conclude 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-kick performance.

3. Data and Descriptive Statistics

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

Assuming there is a guilt effect, if the penalty kicker is the player who was fouled, it should affect his shot. However, although we do not know whether the kicker was the player who was fouled (in case this is the reason for the penalty call), we suggest two reasons why the extent to which the penalty was rightly awarded might affect the kicker. First, in most cases, the strikers are the ones who are both given and kicking the penalty kick. Second, in case the kicker is not the player who was fouled, the defending team and the crowd reacts differently in unjustified cases. Thus the kicker has at least some indication of the level of justification of the call.

Our main 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 2006–2007 and 2013–2014 football (soccer) seasons. For technical reasons, not all penalty kicks taken in these seasons were coded, but since the omitted penalty kicks do not have any unique characteristics, our data does not suffer from selection bias.

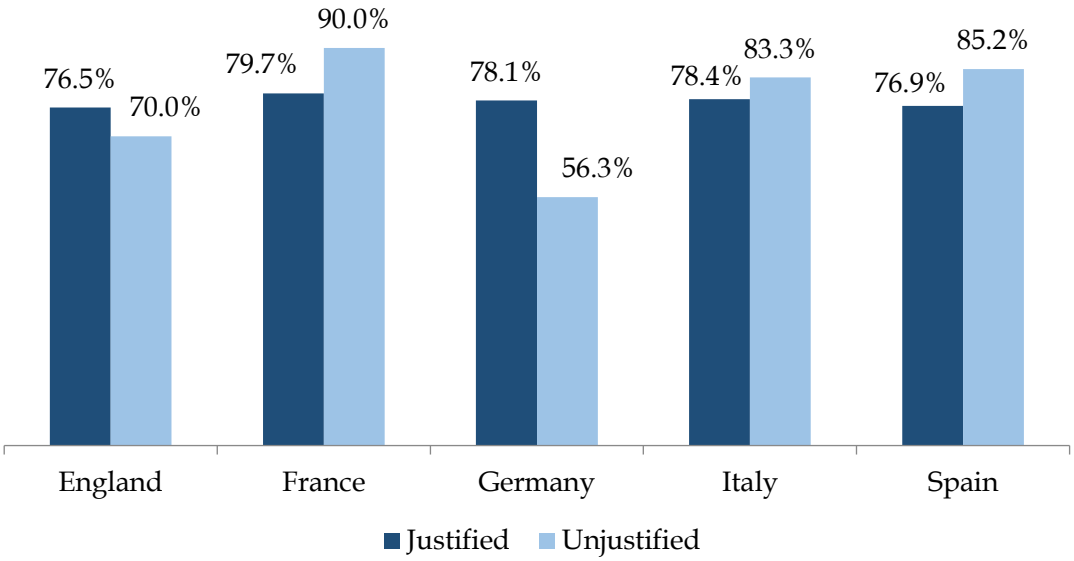
Each penalty kick was analyzed, and the analyst decided whether it was a justified, marginal, or incorrect call. We transform this variable into a dichotomous one, labeled INCORRECT, which takes 0 for a justified or marginal call and 1 for an incorrect one. We summarized these penalties and their outcomes 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 research, which is around 80%.

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	
	N	conversion rate	N	conversion rate	N	conversion rate
Total	1,388	77.7%	1,285	77.7%	103	77.7%
			By league			
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%
			By kicker's continent of origin			
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%

Source: authors' calculations.

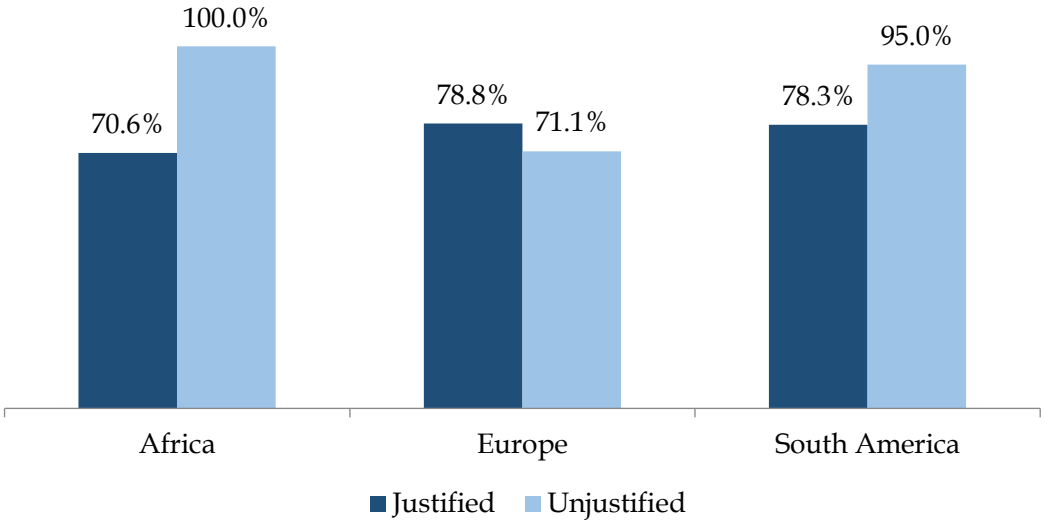
Figure 1: *Conversion rates of justified and unjustified penalty kicks, by league*



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 from 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 is 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).

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

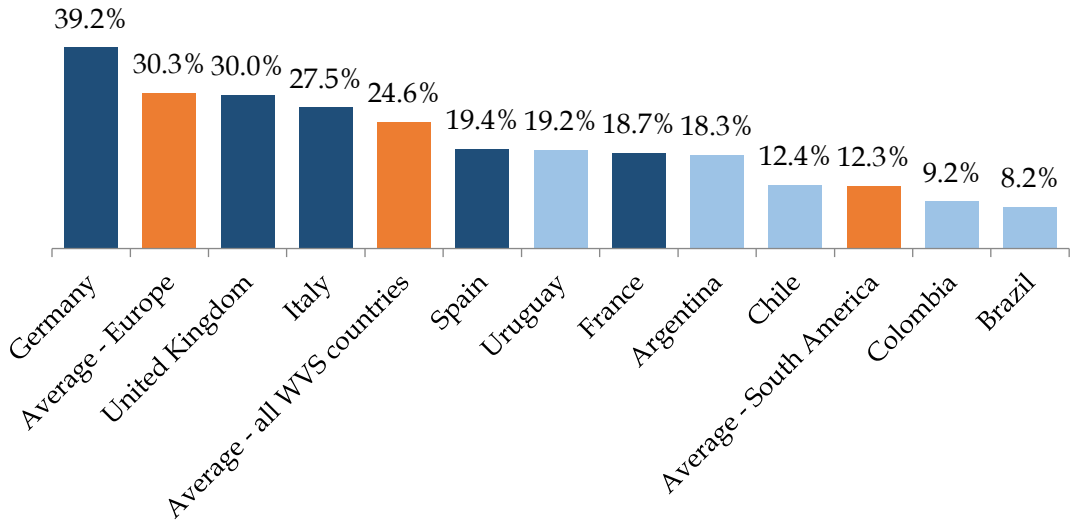


Notes: The rates in the figure are the raw conversion rates of 1,388 penalty kicks. Only kickers from continents in which at least one unjustified penalty was taken were included. Both justified and marginal calls are included under the title "Justified." Source: authors' calculations.

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 WVS, which has recorded people's values and beliefs over time in nearly 100 countries since 1981.

Figure 3 is based on data from the WVS, and it 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 may suggest that values and norms affect performance.

Figure 3: *Can most people be trusted?*



Notes: The share of positive answers in selected European (blue) and South American (light blue) countries. The shares are the average of the reported shares in the 2005–2009 and 2010–2014 surveys where available, or the latest reported share in countries that were not surveyed twice. The full sample and continent average is the non-weighted average of all countries in the WVS (around 80) or all the continent countries, respectively. Source: http://www.worldvaluessurvey.org/WVSOnline.jsp

4. Multivariate Analysis

Clearly, the analysis above could be misleading, since many other factors can affect the probability of scoring and might also affect the probability of making an unjustified call. In order to eliminate this concern, we gather a wide range of variables that characterize various aspects of each penalty kick. In particular, we explore data on the kicker, the goalkeeper, the penalty kick, and the current situation in the match at the time the penalty was called. In addition, we also include the social norms, as measured by the WVS, in the country of the league, the country of origin of the kicker and, alternatively, in the continent of origin of the kicker (calculated as the average of all countries in the continent). Except for the WVS values, most of the data we use was kindly provided to us by Redwood International Sports. The remainder was collected from online archives, especially *transfermarkt.com*. A detailed description of the data and its source is given in Table A.1 of the appendix.

We first run a set of t-tests for differences between the mean of the characteristics in each group, that is, justified versus unjustified calls. The results show that the assumption of no difference in the averages of all characteristics cannot be rejected at a 5% significance level (Table 2). This finding strengthens our critical assumption that the justification of a penalty is exogenous because if the decision is uncorrelated with the full range of observable variables, it is more likely that it is uncorrelated also with any unobservable variables as well.

Table 2: *t-test results for the difference in means between justified and unjustified penalty kicks*

Variable name	t-value	Pr(|T| > |t|)
Penalty scored	0.017	0.51
WVS_{league}	–0.330	0.37
$WVS_{country}$	–0.091	0.46
$WVS_{continent}$	–0.063	0.47
Crowd behind GK supports kicker	0.036	0.51
Crowd behind GK supports GK	–0.400	0.34
No crowd behind GK	–0.322	0.37
Mixed crowd behind GK	0.739	0.77
Kicker's market value	–0.575	0.28
GK's market value	–0.177	0.43
Kicker's club market value	–0.669	0.25
GK's club market value	–0.589	0.28
Kicker's home match dummy	0.148	0.56
Kicker's age	–1.098	0.14
Kicker's penalty performance	–1.139	0.13
Number of penalty kicks taken by kicker	–0.136	0.45
GK's age	1.015	0.84
GK's penalty performance	–0.259	0.40
Number of penalty kicks taken against GK	0.454	0.67
Minute in the match	–0.599	0.27
Round in the season	–1.181	0.12
Difference in Kicker–GK goals during the penalty	1.052	0.85

Notes: "GK"is an abbreviation for *goalkeeper*. Source: authors' calculations.

After reducing the possibility of endogeneity, we can use multivariate regression analysis to identify the causal effect of trust on scoring an incorrect penalty 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:

$$P(y_i|\boldsymbol{X}_i) = \Phi\big(\alpha + \beta_1 \times IS\_INCORRECT_i + \beta_2 \times WVS_g \times IS\_INCORRECT_i + \boldsymbol{\gamma}'(kicker_i) + \boldsymbol{\delta}'(goalkeeper_i) + \boldsymbol{\theta}'(match_i) + \varepsilon_i\big) \quad (1)$$

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* takes 1 if the call was incorrect and its interaction with WVS is the variable of our main interest, where g represents the country of the league, the country of the kicker, or the continent of the kicker.

If there is any guilt effect, we expect this variable's effect to be negative: the higher the social norms of trust in the country, the lower the chances of scoring an incorrect penalty shot. Moreover, by including, side by side, the social norms in the country in which the kicker plays (i.e., *g*=*league*) and the norms in the kicker's location of origin (whether his country or continent), we can test and distinguish between the effect external sanctions (shame) and internal sanctions (guilt) have on the player. The vectors *kicker* and *goalkeeper* include kicker and goalkeeper attributes, respectively; while *match* includes variables that are related to the match itself. Basic descriptive statistics are shown in Table 3.

We now examine the effect of the explanatory variables on the chances of scoring a penalty, with the variable of interest *IS_INCORRECT* and its interactions with the *WVS*. For this, we estimate the above model using a probit model and present the marginal effect of the variables of interest in Table 4 (the full regressions can be found in Table A.2 in the appendix.)

Table 3: *Descriptive statistics of the variables*

Variable	**All penalties**			**good**			**miss**		
	N	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Penalty scored	1,388	0.78	0.42	1,079	1	0	309	0	0

IS_INCORRECT	1,388	0.07	0.26	1,079	0.07	0.26	309	0.07	0.26
WVS_{league}	1,388	26.62	6.51	1,079	26.55	6.50	309	26.87	6.58
$WVS_{continent}$	1,388	25.64	7.67	1,079	25.63	7.64	309	25.65	7.76
$WVS_{country}$	1,388	23.88	11.19	1,079	23.95	11.19	309	23.65	11.22
Kicker's age	1,388	27.78	3.84	1,079	27.76	3.78	309	27.87	4.03
Kicker's market value	1,388	14.53	19.87	1,079	15.23	20.87	309	12.08	15.68
GK's age	1,388	28.89	4.79	1,079	28.86	4.87	309	28.99	4.48
GK's market value	1,388	5.16	5.61	1,079	4.96	5.43	309	5.85	6.17
Kicker's penalty performance history	1,362	0.81	0.21	1,063	0.87	0.13	299	0.60	0.29
Number of penalty kicks taken by kicker	1,362	11.06	11.68	1,063	11.46	11.82	299	9.66	11.05
GK's penalty performance	1,331	0.22	0.14	1,026	0.19	0.12	305	0.30	0.18
Number of penalty kicks taken against GK	1,331	17.04	12.53	1,026	16.82	12.58	305	17.78	12.36
Kicker's club market value	1,388	162.27	142.89	1,079	164.83	145.33	309	153.32	133.88
GK's club market value	1,388	123.77	108.83	1,079	122.24	106.68	309	129.14	116.07
Kicker's home match dummy	1,388	0.61	0.49	1,079	0.61	0.49	309	0.59	0.49
Minute in the match	1,388	52.44	26.21	1,079	52.17	26.28	309	53.41	25.97
Round in the season	1,388	17.96	10.49	1,079	17.98	10.48	309	17.88	10.56
Difference between kicker's and GK's goals during the penalty	1,388	-0.01	1.30	1,079	0.02	1.31	309	-0.09	1.26
Crowd behind GK Supports kicker	1,388	0.55	0.50	1,079	0.56	0.50	309	0.50	0.50
Crowd behind GK Supports GK	1,388	0.28	0.45	1,079	0.28	0.45	309	0.31	0.46
No crowd behind GK	1,388	0.07	0.26	1,079	0.07	0.25	309	0.07	0.26
Mixed crowd behind GK	1,388	0.03	0.18	1,079	0.03	0.18	309	0.03	0.16

Notes: "GK"is an abbreviation for *goalkeeper*. 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.

The first column indicates that without any control, there is no effect of the penalty's justification on the probability of scoring. In the second column we add all control variables, but still, no significant effect is found. However, including the interaction $WVS_{league} \times IS\_INCORRECT$ reveals the significant difference between leagues, with a negative sign pointing at our assumption that the higher the social norms are, the lower is the probability to score an incorrect penalty.

Table 4: *Probit model for penalty conversion rates*

Dep. Variables	(1) goal	(2) goal	(3) goal	(4) goal	(5) goal	(6) goal	(7) goal
						Only foreign players	*Only foreign players*
IS_INCORRECT	–0.00073	0.00524	0.229***	0.292***	0.242***	0.299***	0.281***
	(–0.0426)	(–0.0422)	(–0.0427)	(–0.0273)	(–0.0346)	(–0.0338)	(–0.0314)
WVS_{league} × $IS\_INCORRECT$			–0.0145**	–0.0131**	–0.0112*	–0.0154	–0.0191**
			(–0.00634)	(–0.00649)	(–0.00664)	(–0.00971)	(–0.00944)
$WVS_{continent}$ × $IS\_INCORRECT$				–0.0213***		–0.0200**	
				(–0.00804)		(–0.00899)	
$WVS_{country}$ × $IS\_INCORRECT$					–0.00628*		–0.00646
					(–0.00374)		(–0.00419)
Kicker controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Goalkeeper controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Match controls	No	Yes	Yes	Yes	Yes	Yes	Yes
League fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,388	1,388	1,388	1,388	1,388	754	754

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The full results can be found in Table A.2 in the appendix.

In order to test whether the effect can be separated into guilt and shame, we use the fact that 54.3 of the penalty kickers in our data are players who do not play in their home countries and we also include the *WVS* measure of their country or continent of origin. If the effect we find is shame, we assume that the norms in the kicker's location of origin will have no additional effect.

In column (4) we add the $WVS_{continent} \times IS\_INCORRECT$ variable and find it also to be negative and significant. Notice also that the effect of $WVS_{league} \times IS\_INCORRECT$ is practically the same, meaning that these two effects are completing each other. In the fifth column we replace $WVS_{continent} \times IS\_INCORRECT$ with $WVS_{country} \times IS\_INCORRECT$ and again find a significant albeit smaller effect.

Since the data include both local and foreign players, it would be cleaner analytically to use only foreign players for the estimation. In this sixth column, we include $WVS_{league} \times IS\_INCORRECT$ and $WVS_{continent} \times IS\_INCORRECT$ and find a strong effect of both league and continent norms. In column (7) we replace $WVS_{continent} \times IS\_INCORRECT$ with $WVS_{country} \times IS\_INCORRECT$ and find that the latter is only marginally significant (p-value=0.124). However, an F-test for the combined significance of the two interactions clearly shows their joint significance. We dive deeper into this result in section 6.

The estimated effects of the control variables include some interesting results.[3] 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 find 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 goalkeeper will increase the kicker's chances of succeeding by about 6.5 percentage points. When we include both market values, instead of their difference (not shown) we find that an increase of one standard deviation of the player's value increases the chance of scoring a goal by 5.3 percentage points, and an 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 scoring 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 the probability that a highly skilled player will score a penalty is high

[3] In the following paragraphs we refer to the results from column 5 in Table A.2 in the appendix.

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

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 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. 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 an increase of one standard deviation in the value difference reduces the chance by about 3.5 percentage points. 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 – that is, 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 the team's value difference.

Finally, we also examined the effect of the crowd located behind the goalkeeper. We find 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 almost 10 percentage points. We also find that a mixed crowd increases the probability of scoring, as well. Other crowd compositions have no significant effect.

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 for 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 the kick quality variable seems ideal for the purpose of our study, the control of this variable is not econometrically clean in several respects: (1) the kicking history of the kicker is influenced by the winner's

success rate, and (2) the success rate of the kicker takes into account the rest of the parameters we included in the model; 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 the kicker's and goalkeeper's skills.

In all specifications including the *WVS* interactions, the dummy *IS_INCORRECT* is found to be positive and significant, meaning that the probability of scoring an incorrect penalty kick is significantly higher, compared to a correctly awarded penalty. We suggest that this is a hypothetical result since in our sample there is no kicker who plays in a league and comes from a country whose WVS is zero. In most cases, therefore, the overall effect of the incorrectness of the call is zero and lower.

5. Robustness Tests Using Supplemental Data

Due to the relatively low number of incorrect penalties, the analysis above is subject to the possibility that the distribution of the probability of scoring an unjustified penalty kick is randomly assigned between leagues. Hence our results might be an artifact.

In order to better establish our results, we use a "supplemental sample." In most of its features, as we show below, this data is very similar to the main data (hereafter "the basic sample"). However, it lacks information about the market value and age of the kicker and goalkeeper, as well as about the market value of the playing teams.

The supplemental data consists of more than 130 leagues and other national and international competitions. However, most of these competitions were not fully covered, so the data is scarce. We defined two alternative thresholds for leagues to enter our data for the robustness checks: 1) at least 20 penalty kicks; 2) at least 10 incorrect penalty calls. The data filtered by the first alternative is larger, but the results, as we show below, are qualitatively the same.

Tables 5a and 5b show the basic conversion rates of all correct and incorrect penalties, for the supplemental data, filtered by each alternative. The key

numbers are very close to each other, and similar to the basic sample statistics: the rate of incorrect calls is 8.2%–9.6% compared to 7.4% in the basic sample.[5] Conversion rates are also very similar in all samples, regardless of whether the penalty call is correct or not. Hence, we can easily enhance our analysis to include the supplemental data, without any bias concerns.

The combined data gives us much more variance in both WVS_{league} and $WVS_{continent,country}$. The range of the WVS included now in the data is wider, as can be seen in Figure 4.[6] This also enables us, before moving to the multivariate analysis, to see the raw connection between the WVS_{league} level of the league's country and conversion rates of incorrect penalties (Figure 5). The negative correlation between the trust indicator and the conversion rates of incorrect penalties is straightforward.

Since some of the control variables are missing, we first made sure that leaving them out does not affect our main results (Table 6). In column (1) we show again the estimation results from Table 4, column (3), when using the basic sample and including the control variables, and in column (2) we show the same estimation but without the missing control variables. The differences are negligible. Hence, we conclude that the lack of these variables is not critically affecting the effect of the variables of interest.

[5] The slight differences can be explained by the fact that referees from the top five leagues are probably better than referees from the leagues included in the supplemental data, leagues from less developed countries and football culture, among the second and third leagues in their countries.

[6] Not all the countries included in the supplemental data have a WVS value. We imputed this value from two alternatives: 1) we assigned a country the WVS value of a neighboring country that is geographically and culturally close to it; 2) we assigned a country its continent average WVS value. In the following analysis we use alternative 1, but the results are not sensitive to the chosen alternative.

Table 5a: *Penalty kicks and conversion rates in the supplemental data, by league, kicker's continent, and justification of the call (only leagues in which the number of penalties is at least 20)*

	All calls		True or marginal calls		Incorrect calls	
	N	conversion rate	N	conversion rate	N	conversion rate
Total	2,923	76.8%	2,681	76.9%	242	75.6%
			By league			
Argentina	151	74.8%	141	74.5%	10	80.0%
Australia	21	85.7%	20	85.0%	1	100.0%
Austria	125	77.6%	116	76.7%	9	88.9%
Belgium	165	77.6%	148	77.7%	17	76.5%
Brazil	263	71.1%	239	69.0%	24	91.7%
Chile	58	82.8%	55	81.8%	3	100.0%
Czech Republic	43	88.4%	39	87.2%	4	100.0%
Denmark	47	91.5%	44	93.2%	3	66.7%
England	399	73.4%	364	73.1%	35	77.1%
Finland	24	66.7%	22	68.2%	2	50.0%
France	42	73.8%	37	73.0%	5	80.0%
Germany	129	73.6%	118	75.4%	11	54.5%
Greece	72	80.6%	69	81.2%	3	66.7%
Ireland	24	75.0%	22	81.8%	2	0.0%
Italy	248	81.0%	228	81.1%	20	80.0%
Japan	106	79.2%	99	82.8%	7	28.6%
Mexico	111	75.7%	103	74.8%	8	87.5%
Netherlands	200	73.0%	181	72.9%	19	73.7%
Norway	42	76.2%	37	75.7%	5	80.0%
Poland	61	78.7%	55	80.0%	6	66.7%
Portugal	113	80.5%	103	79.6%	10	90.0%
Romania	115	82.6%	109	83.5%	6	66.7%
Russia	57	71.9%	52	75.0%	5	40.0%
Scotland	45	77.8%	43	76.7%	2	100.0%
Spain	95	80.0%	83	81.9%	12	66.7%
Sweden	39	66.7%	39	66.7%	0	NA
Switzerland	68	82.4%	60	85.0%	8	62.5%
Turkey	36	72.2%	35	71.4%	1	100.0%
USA	24	83.3%	20	80.0%	4	100.0%
			By kicker's continent of origin			
Africa	111	74.8%	106	74.5%	5	80.0%
Asia	135	77.0%	125	80.8%	10	30.0%
Australia	24	83.3%	22	81.8%	2	100.0%
Europe	1,843	77.6%	1,686	78.1%	157	73.2%
North America	17	88.2%	14	85.7%	3	100.0%
South America	793	74.5%	728	73.5%	65	86.2%

Source: author's calculations.

In column (3) we use the full sample for estimation with the limited number of control variables[7], leaving out leagues with less than 20 penalty kicks. The effect of $WVS_{continent}$ remains negative and significant, even though cut by half. The effect of WVS_{league} however is only marginally significant (p-value=0.126), but an F-test for the combined significance of these two variables clearly shows their joint significance. In column (4), we estimate the model after leaving out more competitions, using the threshold of at least 10 incorrect penalty calls, and find a significant negative effect of both WVS_{league} and $WVS_{continent}$.

In columns (5), (6), and (7) we replace $WVS_{continent}$ with $WVS_{country}$ and estimate the model using only the available control variables for the three samples: the basic sample, the full sample limited by the number of penalty kicks, and the full sample limited by the number of incorrect penalty calls, respectively. In all cases, we find a negative effect of the WVS variables, and where the effect is not significant (Column 6), an F-test clearly shows a joint significant effect.

The critical conclusion we derive from using the supplemental data is that our results are most likely not driven by any random process, indicating that there is a causal link between social norms, guilt feelings, and incorrect penalties conversion rates.

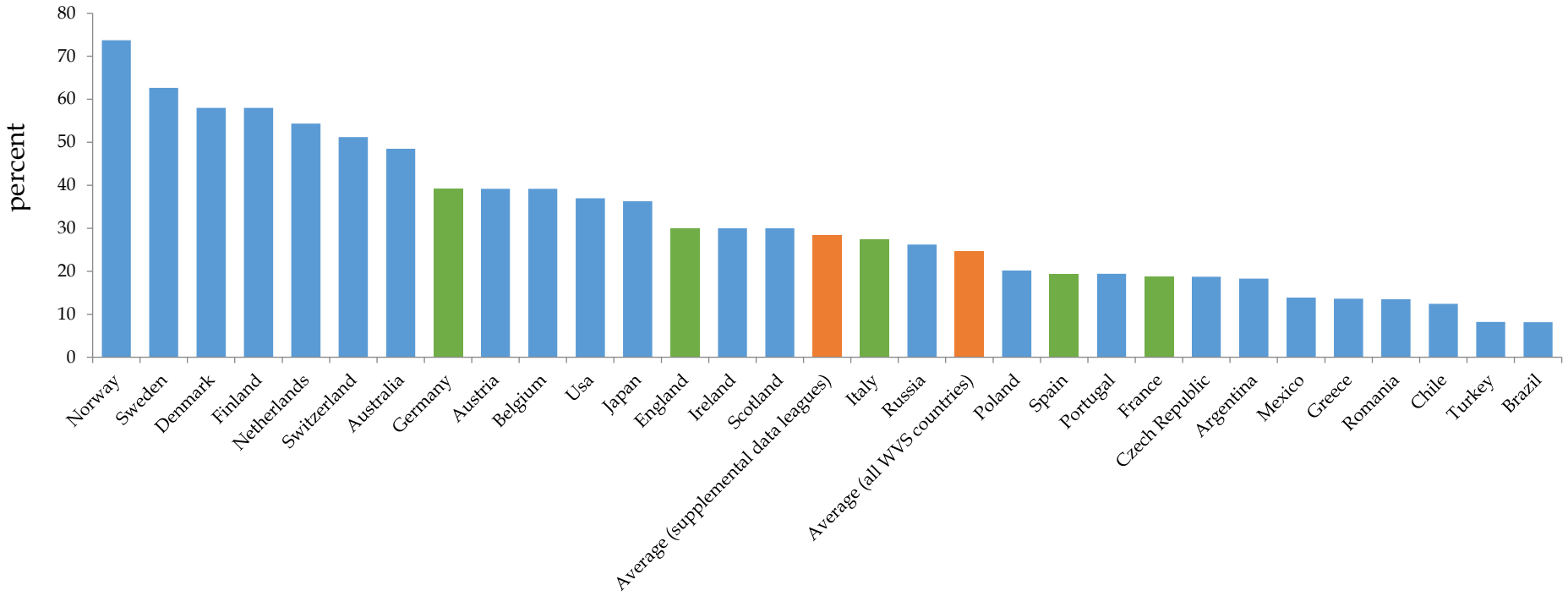
[7] Since the supplemental data includes also second and third tier leagues, we added 2 control dummy variables for second and third leagues.

Table 5b: *Penalty kicks and conversion rates in the supplemental data, by league, kicker's continent and justification of the call (only leagues in which the number of incorrect penalties is at least 10)*

	All calls		True or marginal calls		Incorrect calls	
	N	conversion rate	N	conversion rate	N	conversion rate
Total	1,306	75.8%	1,180	75.8%	126	76.2%
			By league			
Belgium	165	77.6%	148	77.7%	17	76.5%
Brazil	185	72.4%	163	69.9%	22	90.9%
England	399	73.4%	364	73.1%	35	77.1%
Germany	129	73.6%	118	75.4%	11	54.5%
Italy	227	81.1%	209	80.9%	18	83.3%
Netherlands	106	75.5%	95	76.8%	11	63.6%
Spain	95	80.0%	83	81.9%	12	66.7%
			By kicker's continent of origin			
Africa	50	76.0%	47	74.5%	3	100.0%
Asia	15	73.3%	14	78.6%	1	0.0%
Australia	4	75.0%	4	75.0%	93	72.0%
Europe	1,005	76.4%	912	76.9%	29	89.7%
North America	2	50.0%	2	50.0%	0	0.0%
South America	230	73.5%	201	71.1%	126	76.2%

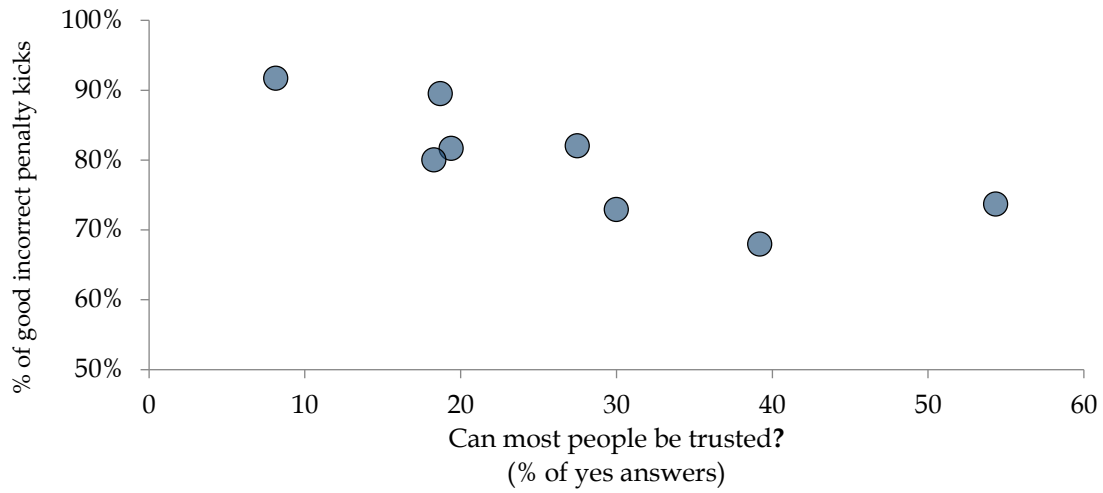
Source: author's calculations.

Figure 4: *Can most people be trusted?*



Notes: The share of positive answers in countries whose leagues are included in the supplemental data. The shares are the average of the reported shares in the 2005–2009 and 2010–2014 surveys where available, or the latest reported share in countries that were not surveyed twice. The full sample and supplemental data leagues average is the non-weighted average of all countries in the WVS (around 80) or all countries whose leagues are included in our supplemental data, respectively. Source: http://www.worldvaluessurvey.org/WVSOnline.jspy

Figure 5: *Goal rate in incorrect penalty kicks versus WVS*
(in leagues with at least 10 incorrect calls)



Source: http://www.worldvaluessurvey.org/WVSOnline.jspy and author's calculations.

Table 6: *Probit model for penalty conversion rates – basic and supplemental data*

Dep. Variables	(1) goal	(2) goal	(3) goal	(4) goal	(5) goal	(6) goal	(6) goal
	$WVS_{continent}$				$WVS_{country}$		
	Basic sample	*Basic sample, fewer controls*	*Full sample (penalties>=20)*	*Full sample (incorrect penalties>=10)*	*Basic sample, fewer controls*	*Full sample (penalties>=20)*	*Full sample (incorrect penalties>=10)*
IS_INCORRECT	0.292***	0.294***	0.226***	0.275***	0.244***	0.127***	0.204***
	(–0.0273)	(–0.0273)	(–0.0276)	(–0.0224)	(–0.0345)	(–0.039)	(–0.0381)
$WVS_{league} \times IS\_INCORRECT$	–0.0131**	–0.0136**	–0.00291	–0.00587*	–0.0115*	–0.00285	–0.00577*
	(–0.00649)	(–0.00646)	(–0.0019)	(–0.00312)	(–0.0066)	(–0.00246)	(–0.00328)
$WVS_{continent} \times IS\_INCORRECT$	–0.0213***	–0.0211***	–0.0112***	–0.0154***			
	(–0.00804)	(–0.00806)	(–0.00341)	(–0.00493)			
$WVS_{country} \times IS\_INCORRECT$					–0.00615*	–0.00291	–0.00497*
					(–0.00373)	(–0.00231)	(–0.00286)
Kicker controls	Yes	No	No	No		No	No
Goalkeeper controls	Yes	No	No	No		No	No
Match controls	Yes	Yes	Yes	Yes		Yes	Yes
League fixed effects	Yes	Yes	Yes	Yes		Yes	Yes
Observations	1,388	1,388	4,283	2,694		4,283	2,694

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The full results can be found in Table A.2 in the appendix.

6. Distinguishing between Shame and Guilt

In this section we further investigate the difference between the norms in the country where the kicker plays and the country where he comes from. The fact that players tend to miss unjustified penalty kicks when playing in leagues located in countries with higher norms can either be a result of guilt or shame. That is because norms within the country derive the response from the media and fans when an unjustified penalty is taken and scored, so a kicker might tend to miss this kind of penalty kick in order to avoid shame and not because of his own sense of guilt. However, a foreign player might be affected both by the norms in the country in which he plays but also by the norms from the country from where he comes. The norms of foreign players can be separated to norms that affect the level of shame the player might be exposed to and the norms that affect the level of guilt he will fell if he scores an unjustified penalty kick.

In order to do that, we amend Model (1) and add interactions between a dummy variable that takes 1 if the player is foreign (and 0 otherwise), the IS_INCORRECT dummy variable and both the WVS in the league and in the player's country of origin. Formally, we estimate:

$$\begin{aligned} P(y_i|\boldsymbol{X}_i) = \Phi\big(&\alpha + \beta_1 \times IS_{INCORRECT_i} + \beta_2 WVS_{league} \times IS_{INCORRECT_i} \\ &+ \beta_3 IS\_FOREIGN \times IS\_INCORRECT_i \\ &+ \beta_4 IS\_FOREIGN \times WVS_{league} \times IS\_INCORRECT_i \\ &+ \beta_5 IS\_FOREIGN \times WVS_{country} \times IS\_INCORRECT_i \\ &+ \boldsymbol{\theta}' match_i + \boldsymbol{\varphi}' other\_interactions + \varepsilon_i\big) \end{aligned} \tag{2}$$

Since we use the full data and not only the 5 major leagues data, we do not include unavailable kicker's and goalkeeper's variables, but match controls and all other possible interactions between the variables in our primary interest interactions are included. The results are shown in Table 7.

Table 7: *Probit model for penalty conversion rates – including foreign interactions*

Dep. Variables	(1) goal	(2) goal
	Full sample (penalties>=20)	*Full sample (incorrect penalties>=10)*
IS_INCORRECT	0.0647	0.168***
	(–0.0558)	(–0.0563)
$WVS_{league} \times IS\_INCORRECT$	–0.00352*	–0.00884**
	(–0.00209)	(–0.00366)
$IS\_FOREIGN \times IS\_INCORRECT$	0.211***	0.210***
	(–0.0344)	(–0.0589)
$IS\_FOREIGN \times WVS_{league} \times IS\_INCORRECT$	–0.00556	–0.00311
	(–0.00421)	(–0.0063)
$IS\_FOREIGN \times WVS_{country} \times IS\_INCORRECT$	–0.00507*	–0.00601*
	(–0.00301)	(–0.00352)
Other interactions terms	Yes	Yes
Kicker controls	No	No
Goalkeeper controls	No	No
Match controls	Yes	Yes
League fixed effects	Yes	Yes
Observations	4,283	2,694

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The full results can be found in Table A.2 in the appendix.

Consistent with the above analysis, the norms of the country of the league ($WVS_{league} \times IS\_INCORRECT$) are still negatively and significantly affecting the probability of scoring a penalty kick. We also find that foreign players are not affected differently by the norms in the country in which they play, compared to their local peers. However, we do find that on top of the norms in the country in which they play, the probability of foreign players scoring unjustified penalty kicks decreases with the level of the norms in their country of origin ($IS\_FOREIGN \times WVS_{country} \times IS\_INCORRECT$). We also find that foreign players' baseline probability of scoring an unjustified penalty kick ($IS\_FOREIGN \times IS\_INCORRECT$) is higher. However, this is only a partial effect; in order to calculate the probability of scoring, one should take into account all of the relevant dummy and interaction variables. For instance, the

WVS value in England stands at 30, while the average WVS of foreign players in England stands at 27.6.[8] This implies that, *ceteris paribus*, the probability of local players in England scoring an unjustified penalty kick is 10.5 percent lower than the baseline probability, while the probability for an average foreign player in England is just 3.4 percent[9] lower than the baseline probability. This difference is consistent over most leagues and is a result of the fact that foreign players come from countries with lower WVS values than the leagues in which they play.

To summarize this section, the analysis we've undertaken involves both a measure of norms in both the countries in which foreign players play and in their countries of origin shows that even after controlling for the first, the second also significantly affects scoring probability. We interpret this result as indicating that both guilt and shame play roles that affect the performance of penalty kickers' .

7. Conclusions

In this study, we examine the effect of guilt on performance by exploiting a novel measure of the justification of penalty calls. We find that unjustified penalty calls are negatively correlated with penalty conversion rates, conditional on the level of social norms in the country's league and in the kicker country or continent of origin.

We believe that the correlation we find reflects an adverse "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, the findings based on rich data from the top five European football leagues

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[8] This is a result of multiplying the marginal effect of $WVS_{league} \times IS\_INCORRECT$ by the WVS_{league} in England: (–0.00352 X 30) = –0.1056.

[9] This is a result of multiplying the marginal effect of $WVS_{league} \times IS\_INCORRECT$ by the WVS_{league}, in England, adding the product of $IS\_FOREIGN \times WVS_{country} \times IS\_INCORRECT$ and the average $WVS_{country}$ of foreign players in England and adding the coefficient of the interaction variable $IS\_FOREIGN \times IS\_INCORRECT$: (–0.00352 X 30) + (–0.00507 X 27.6) + 0.211 = –0.0344.

and based on a large sample (though more limited data produces similar results).

Exploiting the variance arising from players who do not play in their countries of origin by including the norms of both the league and the kickers' location of origin, we can separate the guilt and shame, or more generally, constraints on egoism to internal sanctions and external sanctions. We find that both guilt and shame play a role affecting penalty kicker's performance.

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Appendix A. Tables and Figures

Table A.1: *List of variables, their description and source*

Variable name	description	source
Penalty scored	is it a good penalty (1=yes, 0=no)	Redwood International Sports
IS_INCORRECT	is it a justified call (1=yes, 0=no)	Redwood International Sports
WVS_{league}	Percent of "yes" answers to the question "can most people be trusted" in the league's country	World Values Survey
$WVS_{country}$	Percent of "yes" answers to the question "can most people be trusted" in the kicker's country	World Values Survey
$WVS_{continent}$	Kicker's continent average percent of "yes" answers to the question "can most people be trusted" in the kicker's continent of origin	World Values Survey
Crowd behind GK supports kicker	Is the crowd behind the goalkeeper supporting the kicker's team? (1=yes, 0=no)	Redwood International Sports
Crowd behind GK supports GK	Is the crowd behind the goalkeeper supporting the goalkeeper's team? (1=yes, 0=no)	Redwood International Sports
No crowd behind GK	Is there no crowd behind the goalkeeper? (1=yes, 0=no)	Redwood International Sports
Mixed crowd behind GK	Is the crowd behind the goalkeeper divided between kicker and goalkeeper's' team supporters? (1=yes, 0=no)	Redwood International Sports
Kicker's market value	Kicker's market value (Euro mil.)	Transfermarkt.com
GK's market value	Goalkeeper's market value (Euro mil.)	Transfermarkt.com
Kicker's club market value	Kicker's team market value (Euro mil.)	Transfermarkt.com
GK's club market value	GK's team market value (Euro mil.)	Transfermarkt.com
Kicker's home match dummy	Is the match played at the kicker's team home stadium? (1=yes, 0=no)	Redwood International Sports
Kicker's age	Kicker's age	Transfermarkt.com
Kicker's penalty performance	% of successful penalties since 2000 and until the season preceded the kick's season	Transfermarkt.com
Number of penalty kicks taken by kicker	Number of penalties taken from 2000 until the season preceded the kick's season	Transfermarkt.com
GK's age	GK's age	Transfermarkt.com
GK's penalty performance	% of penalties GK stopped from 2000 until	Transfermarkt.com

	the season preceded the kick's season	
Number of penalty kicks taken against GK	number of penalties taken against the goalkeeper since 2000 and until the season preceded the kick's season	Transfermarkt.com
Minute in the match	which minute in the match the penalty was taken	Redwood International Sports
Round in the season	league round of the match	Redwood International Sports
Kicker–GK goals difference during the penalty	the difference between the kicker's team number of goals and the opponent at the time of the penalty kick	Redwood International Sports

Notes: "GK"is an abbreviation for *goalkeeper*.

Table A.2: *Probit model for penalty conversion rates – all variables*

Dep. Variables	(1) goal	(2) goal	(3) goal	(4) goal	(5) goal
IS_INCORRECT	–0.00073	0.00446	0.229***	0.292***	0.242***
	(–0.0426)	(–0.0423)	(–0.0426)	(–0.0273)	(–0.0344)
WVS_{league} *X IS_INCORRECT*			–0.0146**	–0.0132**	–0.0112*
			(–0.00635)	(–0.00649)	(–0.00664)
$WVS_{continent}$ *X IS_INCORRECT*				–0.0215***	
				(–0.00804)	
$WVS_{country}$ *X IS_INCORRECT*					–0.00633*
					(–0.00373)
WVS_{league}			–0.00134	–0.00179	–0.002
			(–0.00234)	(–0.00237)	(–0.00241)
$WVS_{continent}$				0.00215	
				(–0.00156)	
$WVS_{country}$					0.00111
					(–0.00115)
Kicker–GK value gap / 1 standard deviation		0.0652***	0.0648***	0.0664***	0.0653***
		(–0.0196)	(–0.0195)	(–0.0194)	(–0.0195)
Kicker–GK team value gap / 1 standard deviation		–0.0343*	–0.0346*	–0.0359*	–0.0357*
		(–0.0185)	(–0.0184)	(–0.0184)	(–0.0184)
Kicker's age		0.00166	0.00168	0.00182	0.00173
		(–0.00307)	(–0.00307)	(–0.00307)	(–0.00309)
GK's age		–0.00186	–0.00191	–0.0021	–0.00199
		(–0.0024)	(–0.0024)	(–0.0024)	(–0.00241)
Home game dummy		–0.0261	–0.025	–0.0247	–0.0254
		(–0.0321)	(–0.0322)	(–0.0321)	(–0.0322)
Minute in the match		–0.00057	–0.00057	–0.00058	–0.00057
		(–0.000439)	(–0.000439)	(–0.000439)	(–0.000439)
Round in the season		0.00085	0.000772	0.000864	0.00076
		(–0.00112)	(–0.00112)	(–0.00112)	(–0.00112)
Difference between kicker's and GK's goals during the penalty		0.00647	0.00664	0.00744	0.00734
		(–0.00913)	(–0.00913)	(–0.00912)	(–0.00914)
Year		–0.0122	–0.0125	–0.0131	–0.012
		(–0.00923)	(–0.00922)	(–0.00919)	(–0.00925)
Crowd behind GK supports GK		0.102**	0.101**	0.0992**	0.0983**
		(–0.0473)	(–0.0472)	(–0.0471)	(–0.0472)
No crowd behind GK		0.0426	0.0406	0.039	0.0377
		(–0.0483)	(–0.0483)	(–0.0483)	(–0.0485)

Mixed crowd behind GK		0.0341	0.0321	0.0319	0.0312
		(–0.0538)	(–0.0539)	(–0.0537)	(–0.054)
Crowd behind GK supports kicker		0.108**	0.106*	0.107**	0.108**
		(–0.0544)	(–0.0548)	(–0.0539)	(–0.0544)
Observations	1,388	1,388	1,388	1,388	1,388

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