

Braun, Sebastian; Kvasnicka, Michael

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Sebastian Braun¹ and Michael Kvasnicka²

Abstract

National sentiment can have major implications for individual consumption and investment choices but has been researched little by economists. This article studies how national sentiment in the form of a perception or loyalty bias of bettors may affect pricing patterns on national wagering markets for European football. The authors show theoretically that both biases can be profitably exploited by domestic bookmakers through price adjustment. Analyzing empirically a unique data set of betting odds from online bookmakers in Europe, the authors find evidence of systematic biases in the pricing of own national teams, deviations that can be explained by the aforementioned two biases.

Keywords

national sentiment, betting markets, home bias, investment

Introduction

Consumer preferences for home country products, “buy domestic” campaigns, the issuing and success of war bonds, or the home equity puzzle in international financial markets suggest that national sentiment may be of importance for individual

¹ Kiel Institute for the World Economy, Kiel, Germany

² RWI, IZA, Berlin, Germany

Corresponding Author:

Sebastian Braun, Kiel Institute for the World Economy, Hindenburgufer 66, 24105 Kiel, Germany.

Email: sebastian.braun@ifw-kiel.de

consumption and investment choices. Little empirical research, however, has been done to substantiate such conjectures.¹ This article contributes to this insufficiently researched area in economics by studying the international football betting market, a market that is likely to be strongly influenced by national sentiment.

The online betting market in international football exhibits a number of features that make it particularly suited for analyzing the influence of national sentiment on economic behavior. First, there appears to be a strong bonding of patriotism and sports, especially in football, the most popular sport in Europe. Second, information on the quality of national teams and odds marketed (prices offered by bookmakers) should be largely symmetric across countries, as detailed information, including statistics on past performance of teams and expert analyses, can be obtained online easily, quickly, and at negligible if not zero cost. Given our focus on online wagering, access of bettors to this medium of information is furthermore guaranteed. Third, there is a single homogeneous good traded on this market ("outcome of a game"). Variations in prices across countries therefore cannot be caused by (potentially unobservable) differences in the respective products traded. Finally, online betting markets in Europe are still largely segmented between countries, as legal constraints, language barriers, and transactions costs impede wagering abroad.²

Segmentation of national betting markets (pools of bettors) is important for our analysis. With a homogeneous product and symmetric information, prices (betting odds) should be identical across countries if markets are unified. With segmented markets, however, prices may differ. They will differ in terms of the average payout per monetary unit waged if different industry structures across countries support different markups charged by bookmakers. They will also differ in terms of relative odds for particular outcomes of a game if bookmakers can profitably exploit either a *perception bias* among bettors that induces them to overrate the winning chances of their national team or a *loyalty bias* that keeps bettors from wagering against their own team even under favorable odds. Both type of biases reflect bettor sentiment. Empirical support for their influence on betting market outcomes has been found for club sports at national level. On the perception bias, see for example, the study by Levitt (2004) which explores wagering behavior on National Football League (NFL) games in the United States. First evidence for the loyalty bias, in turn, has been provided by Forrest and Simmons (2008) who analyze wagering on top tier Spanish and Scottish football.

Among the extensive and growing body of literature on sports wagering, however, no study has yet explored betting markets across countries, let alone the influence of national sentiment on cross-country differences in wagering behavior (for a comprehensive survey of the economics literature on sports wagering markets, see Sauer, 1998). In theoretical models of wagering markets, in turn, only the misperception bias has yet been formally modeled and analyzed. And as regards wagering on European football, that is the very context of our analysis, but a single study has explored this bias and its effects and then only by means of a numerical example (Kuypers, 2000).

This article develops a first theoretical model of wagering markets that allows for both types of biases and it also provides first empirical evidence on their influence on

betting odds for international sport events in a cross-country context. Based on a unique data set of betting odds from online bookmakers in 12 European countries for qualification games to the Union of European Football Associations (UEFA) Euro 2008, we analyze differences in odds for win offered across countries for evidence of systematic biases in the pricing of own national teams. For the majority of countries in our sample, we find evidence for such systematic biases. Variations in the sign and magnitude of these deviations can be explained by differences in the respective strengths between countries of the perception and the loyalty bias among bettors.

Overall, our empirical results provide evidence for a sizable influence of national sentiment on wagering market outcomes in Europe. Prices for own national teams are systematically biased, a finding that existing single-country studies miss by construction. Future research can fruitfully extend our analysis to other markets in which assets are traded to explore if domestic prices follow similar patterns as those found in our analysis of online wagering on European football.

The article is structured as follows: The section on Theoretical Considerations analyzes theoretically the price-setting behavior of a bookmaker in the absence and in the presence of bettor national sentiment as expressed in a perception or a loyalty bias. The next section is on Data, followed by the section on Results which presents the empirical results. The section on Discussion and Further Robustness Checks discusses our findings and several robustness checks we did. The final section concludes.

Theoretical Considerations

On wagering markets, prices (odds) are set by bookmakers. Hence, for prices to be informative about any national sentiment of bettors, it must be profitable for bookmakers to shade their odds when faced with such underlying bettor preferences. This we show in this section by studying the price-setting behavior of a profit-maximizing (risk-neutral) bookmaker³ in the absence and in the presence of bettor national sentiment. We first describe the model setup in the absence of any perception and loyalty bias of bettors and then examine their respective effects on bookmaker odds offered.

To formalize the decision problem of the bookmaker, consider a football match between countries *A* and *B* and assume, for simplicity, that there are only two potential outcomes, either Country *A* or Country *B* wins.⁴ Wagering markets are assumed to be separated between countries and to be served each by a single bookmaker. Bettors in both countries may hence place bets only with their respective domestic bookmaker. Information on the quality of national teams is furthermore assumed to be freely available and symmetric across countries, bookmakers, and bettors. In the absence of any national sentiment bias, quotes marketed in countries *A* and *B* would hence be identical.

Given the symmetric setup for the two countries, we can restrict the analysis in the following without loss of generality to the pricing behavior of a bookmaker in just one of the countries, say Country *A*. The choice variable of the bookmaker

in Country *A* is the probability $a \in [0, 1]$ of win for Country *A*. The resulting odds for this outcome as offered by the bookmaker (the quote marketed) is just the inverse of this probability, that is, $\frac{1}{a}$, or simply the payout for a single monetary unit waged on this event. Likewise, the probability and the resulting odds for win of Country *B* are given by $1 - a$ and $\frac{1}{1-a}$, respectively. The bookmaker's subjective probability for win of Country *A*, denoted \hat{a} , need not coincide with probability a underlying the odds actually offered to bettors. In reality, bookmakers typically charge a fixed markup. Here, we abstract from such markups for ease of exposition.⁵ In the empirical part, we will of course account for them.

Regarding the behavior of bettors, we first assume in line with Kuypers (2000) and Levitt (2004) that the decision of bettors to enter the market (to place a bet on the game) has already been made and concentrate on how punters spread the total volume of bets on the two outcomes.⁶ Each bettor is assumed to place a monetary unit on one of the two teams. A bettor will place her money on Country *A* if a is equal to or smaller than her subjective probability for win of Country *A*. Otherwise, she will bet on Country *B*. Let $f(a)$ represent the fraction of punters that for a given probability a will bet on Country *A*. The function $f(a)$ is assumed to be nonincreasing in a , differentiable ($f'(a) \leq 0$), and known to the bookmaker.

The bookmaker's expected profit on a unit bet on one of the two teams is the unit itself minus the expected payout. The latter is given by the corresponding odds multiplied by the subjective outcome probability of the bookmaker. To obtain total profits per unit bet, the (per unit) profit generated by a bet on one of the two teams has to be weighted by the corresponding fraction of bettors. Summing up across the two outcomes yields:

$$\left(1 - \frac{\hat{a}}{a}\right)f(a) + \left(1 - \frac{1 - \hat{a}}{1 - a}\right)(1 - f(a)). \quad (1)$$

The bookmaker will choose a as to maximize Equation 1. The corresponding first-order condition is given by:

$$\frac{\hat{a}}{a^2}f(a) - \left(1 - \frac{1 - \hat{a}}{1 - a}\right)f'(a) = -\left(1 - \frac{\hat{a}}{a}\right)f'(a) + \frac{1 - \hat{a}}{(1 - a)^2}(1 - f(a)), \quad (2)$$

which is fulfilled at the optimal $a = a^*$. The terms on the left-hand side of the equation represent the marginal benefits of a small increase in the probability a , while the right-hand side contains the corresponding marginal costs. Since a reflects the probability for Country *A* winning the match, an increase in a translates into lower odds for bets on Team *A*. Consequently, the bookmaker's expected profit for any monetary unit placed on Country *A* increases in a , as reflected by the first term on the left-hand side of Equation 2. However, lower odds also induce punters to switch to Team *B* so that the expected gross profit per unit bet on Country *A* now applies to a smaller fraction $f(a)$ of bettors (first term on the right-hand side). For bets waged on Team *B*, the findings are just reversed as the corresponding probability $1 - a$ gets smaller.

Within this basic analytical framework, we can now explore the two pathways by which bettor national sentiment may affect pricing patterns on domestic wagering markets. We consider the perception bias first.

Perception Bias

National sentiment may bias bettors' perceptions of the winning chances of their national team upward. In principle, of course, one may also allow for underconfidence in the national team. However, the (albeit rare) existing evidence suggests that supporters, if at all biased in their perceptions, tend to over- rather than underestimate the winning chances of their own team (Babad & Katz, 1991). If so, then for any given probability set by the bookmaker, the fraction of bettors placing a bet on Country *A* is equal to or greater than the corresponding fraction in the absence of a perception bias. The bookmaker is hence faced with a function $f^{\text{Bias}}(a)$ such that $f^{\text{Bias}}(a) \geq f(a) \forall a \in [0, 1]$. Assuming that the slopes of the two functions coincide at $a = a^*$, that is, $f^{\text{Bias}}(a^*) = f'(a^*)$,⁷ and provided that $f^{\text{Bias}}(a^*) > f(a^*)$, a perception bias among bettors unambiguously increases the bookmaker's profit-maximizing choice of the probability *a* for win of Country *A*.

This finding can be appreciated by inspecting the first-order condition at $a = a^*$. When bettors overrate the winning chances of their own national team, marginal benefits to the bookmaker of an increase in *a* rise because the higher expected profit per unit bet on Country *A* now applies to a larger fraction of bettors. At the same time, the corresponding marginal costs decline, as lower expected profits on any monetary unit waged on Country *B* now accrue only for a reduced fraction $1 - f^{\text{Bias}}(a^*)$ of bettors. It is therefore unambiguously profitable for the bookmaker to increase probability *a* and thereby reduce the odds for win of Team *A* offered to bettors.⁸ It is straightforward to show that this result also holds when the bookmaker's subjective probability \hat{a} is biased upward by national sentiment as well.⁹

Summarizing the above, the more confident are bettors regarding the success probability of their home team, that is the stronger is the perception bias, the lower will be the actual odds for such an outcome offered by the domestic bookmaker. A similar point has been made by Kuypers (2000) by means of an illustrative numerical example. He shows that a bookmaker may take advantage of bettors who overrate the winning chances of their favorite team by shading odds against this team.

Loyalty Bias

Up to now we have assumed that punters always place a bet on a game. Their only decision therefore concerned how to spread their betting stakes over the two possible match outcomes. However, as noted but not formalized by Forrest and Simmons (2008), wagering against the own team may well be unacceptable to supporters. Committed bettors, the authors note, might be as unwilling to switch bets to the opponent team if odds on win offered for the own team get unfavorable as they are unlikely to switch to replica shirts of the opponent team only because these got

relatively cheaper. Viewed as an act of disloyalty, supporters may just be interested in a bet on their team or none at all (loyalty bias).

If bettors only consider whether to bet on their national team, the actual betting volume is no longer fixed, only the *potential* one.¹⁰ If the bookmaker sets probability a below the corresponding subjective probability of a loyal bettor for win of the own national team, this bettor will not switch to wager money on *Country B* but instead refrain from wagering altogether. The bookmaker's profit function hence consists only of the first term of Equation 1, that is, of the profit generated by bets on *Country A*. The corresponding first-order condition then reads:

$$\frac{\hat{a}}{a^2}f(a) = -\left(1 - \frac{\hat{a}}{a}\right)f'(a). \quad (3)$$

As is evident from Equation 3, the impact of a loyalty bias of bettors on offered betting odds cannot be unambiguously determined. The probability chosen by the bookmaker will increase (decrease) whenever at $a = a^*$ marginal benefits of further increases in a are larger (smaller) than the corresponding marginal losses, that is, whenever at $a = a^*$ the left hand-side of Equation 3 exceeds the right-hand side. Benefits arise from higher expected profits per unit bet and losses from a reduction in the actual betting volume. If the behavioral response of bettors to changes in a is sufficiently strong, that is, if $f'(a^*)$ is sufficiently large in absolute terms, odds for win of *Country A* will actually be biased in favor of domestic bettors. If, instead, the behavioral response is relatively weak, odds will be biased against domestic bettors.¹¹ Note that by increasing marginal benefits, an additional perception bias among bettors will as before increase the probability a set by the bookmaker.

To sum up our analysis of the loyalty bias: if national sentiments induce bettors to wager, if at all, only on win for their own national team, then domestic bookmakers may profitably bias odds in favor of rather than against committed bettors. More favorable odds on win for own national teams, if indeed observed in the data, therefore provide evidence for a loyalty bias of domestic bettors. Although bettors need not necessarily be free of a perception bias in this case, any overconfidence on their part would have to be very weak. If, in contrast, odds on win for own national teams are found to be less favorable, national sentiment in the form of either or both a perception and a loyalty bias may sign responsible.

Data

The empirical analysis is based on a unique data set of betting odds that we collected from online bookmakers in 12 European countries for qualification games of national football teams to the UEFA Euro 2008. The dozen countries sampled represent a selective subset of the 50 UEFA member countries participating in the qualification. All 12 bookmakers are from countries that were seeded in one of the top

Table 1. Countries, Bookmakers, and Summary Statistics.

| Country | | Games Covered | | | | Overround | |
|-----------------------|---------------------|---------------|-----------|----------|----------|-----------|--------|
| Name | Bookmaker | Group (1) | Total (2) | Home (3) | Away (4) | M (5) | SD (6) |
| Bulgaria ^a | eurofootball.bg | 7 | 194 | 4 | 4 | .207 | .019 |
| Czech Republic | eurotip.cz | 4 | 217 | 4 | 4 | .110 | .007 |
| Denmark* | danskespil.dk | 6 | 171 | 5 | 4 | .146 | .011 |
| England | skybet.com | 5 | 217 | 4 | 4 | .123 | .007 |
| France* | fdjeux.com | 2 | 181 | 4 | 4 | .228 | .034 |
| Germany | sportwetten-gera.de | 4 | 210 | 5 | 4 | .122 | .008 |
| Italy | match-point.it | 2 | 202 | 4 | 4 | .112 | .010 |
| Netherlands* | toto.nl (De Lotto) | 7 | 141 | 4 | 4 | .246 | .020 |
| Norway* | Norsk-tipping.no | 3 | 154 | 5 | 4 | .176 | .002 |
| Slovenia* | Sportna-loterija.si | 7 | 200 | 5 | 4 | .149 | .018 |
| Spain | miapuesta.com | 6 | 217 | 5 | 4 | .101 | .004 |
| Sweden* | svenskaspel.se | 6 | 207 | 4 | 4 | .250 | .003 |

Note. ^adenote countries for which the respective bookmaker is state run.

(1): qualification group of betting country; (2): total number of games for which betting country has complete triplet (win, tie, loss) of quotes; (3 and 4): number of home and away games of betting country; (5): average (gross) profit of bookmaker from a wager of a punter who bets on all three match outcomes such that she collects a unit return; (6): standard deviation of average (gross) profit.

three (out of seven) pools used to draw the qualifying groups.¹² Our sample thus excludes bookmakers from truly minor football countries.¹³ The bets considered are simple bets on home win, draw, and away win (quote^H, quote^D, and quote^A). Betting odds for games were collected online in the morning of a qualification round in random order across countries to avoid potential sampling bias due to systematic early or late recording. Online bookmakers for the 12 countries considered were primarily selected from members of the European Lotteries and Toto Association which is composed of State Lottery and Toto companies established in Europe (see www.european-lotteries.org). For each country, a bookmaker was chosen that operated online and offered simple home win, tie, and away win bets. If none of the members of a country met these conditions, we selected a large private online bookmaker from the Internet. Throughout this process, we disregarded bookmakers who operated via subsidiaries in more than one European country.¹⁴

Table 1 describes our final data set, which covers betting quotes on 218 qualification games from 12 European countries in 6 qualification groups, sampled online between November 2006 and November 2007. Starting the research project only after the qualification had started, we did not record the first 4 (out of 15) qualification rounds. Our sample, however, covers 71% of all qualification games. As can be seen in Column 2 of Table 1, no bookmaker offers bets on all games. The number of games for which bets are offered range from as few as 141 in the case of the Dutch bookmaker to 217, or almost the total number of matches sampled, for bookmakers

in the Czech Republic, England, and in Spain. To gauge the influence of any sample selection bias arising from this differential coverage of games, we will use three estimation samples in the regression analysis. The first, or "Total Sample," includes all games for which at least one bookmaker offers quotes (218 games). The second ("Restricted Sample I") includes all games for which at least six bookmakers offer betting odds (208 games), and the third ("Restricted Sample II") all games for which at least nine bookmakers offer quotes (189 games).¹⁵ Furthermore, to gauge any potential bias that may arise from the inclusion of bookmakers from smaller football countries, we use a fourth sample ("Restricted Sample III") that excludes bookmakers from countries which were not seeded in one of the two top pools used to draw the qualifying groups.¹⁶

For each country in our sample, we observe a total of eight to nine home and away matches (Columns 3 and 4), that is, games in which the national team takes part. Columns 5 and 6 report means and standard deviations of the so-called overround which can be taken as a measure of a bookmaker's gross margin. The overround is defined as the expected (gross) profit a bookmaker makes from a wager of a punter who bets on all three match outcomes such that she collects an expected unit return. For a given match, the overround is equal to the sum of the inversed betting odds minus one. As is evident, overrounds differ significantly between bookmakers in different countries (Column 5) and are largest (as was to be expected) for state-run bookmakers, but vary hardly across games for individual bookmakers (Column 6). The first finding supports our assumption of nationally separated online betting markets, as such marked differences in (gross) profits across countries could not persist if betting markets were unified. The last finding, in turn, suggests that bookmakers seek to realize a specific gross margin. It also implies that the overround is not used by bookmakers as a means to price potential variation across games in either outcome uncertainty or bettor sentiment. Note that average transaction costs (overrounds) are sizable. These costs may discourage financially focused bettors so that leisure bettors tend to be overrepresented in the market. The latter type of bettors is likely to be more susceptible to sentiment biases.¹⁷

Measures for our primary outcome of interest considered in the theoretical analysis, the probability of win for a national team, can be obtained from the respective odds offered for win of the home team in home games and of the away team in away games. As odds offered to bettors also contain the overround, however, they need to be adjusted first so as to obtain the underlying probabilities for the respective outcomes as marketed by bookmakers. Specifically, the implied probability of win for the home team (a^H) and the probability of win for the away team (a^A) can be calculated from the quotes bookmaker j offers on match i as the inverse of the quote for the respective outcome, adjusted by the sum of all inverse quotes for the three potential match outcomes:

$$a_{ij}^k = \frac{1}{\rho_{ij} * \text{quote}_{ij}^k},$$

where $k = \{H, A\}$ and p_{ij} is given by $\frac{1}{\text{quote}_{ij}^H} + \frac{1}{\text{quote}_{ij}^D} + \frac{1}{\text{quote}_{ij}^A}$. In the following analysis, these probabilities will be used as our endogenous variables to assess whether national teams are priced differently at home and abroad.

Results

To investigate whether betting behavior in any of our 12 European countries sampled is subject to a national sentiment bias, we run separate regressions for home ($k = H$) and away games ($k = A$) of the following type:

$$\log(a_{ij}^k) = \beta_0 + \beta_1(\text{HomeGame}_{ij} \times \text{Bookmaker}_j) + \beta_2(\text{AwayGame}_{ij} \times \text{Bookmaker}_j) + \beta_3\text{Bookmaker}_j + \beta_4\text{Game}_i + \varepsilon_{ij}, \quad (4)$$

where $\log(a_{ij}^k)$ is the logarithm of the implied probability of win for the home (away) team in game i as set by bookmaker j , and Bookmaker_j and Game_i are full sets of betting country and game dummies, respectively. Game fixed effects capture all relevant information on the objective winning chances of teams on the day of a game (recall that betting odds have been sampled in the morning of a qualification round). They also capture biases in the pricing of teams in a specific match that are common to all bookmakers, such as a general undervaluation of the favorite team. If information is indeed symmetric across countries, implied probabilities should not vary much across bookmakers, and we should thus be able to account for most of the variation in probabilities in the data by the game dummies. To capture the potential influence of national sentiment bias of bettors on prices set, we furthermore include a dummy variable HomeGame_{ij} (AwayGame_{ij}) that indicates whether bookmaker j 's national team participates as the host (visitor) in a particular match. As national sentiments may express themselves differently across countries, we interact the dummies for both home and away game status with betting country identifiers¹⁸ to capture such heterogeneities.¹⁹ As odds for win of the home (away) team marketed in the country of the away (home) team may be biased as well, we also include as additional controls a set of interaction terms of betting country identifiers and dummies for away (home) game status. Odds offered in nonparticipating countries to a game hence constitute our control group of "objective" price measures.²⁰ In regressions that use the probability of win for the home (away) team as the endogenous variable, our primary coefficient vector of interest is β_1 (β_2). If wagering behavior of domestic bettors is unaffected by national sentiment, that is free of any perception and loyalty bias, then elements in β_1 (β_2) will not be significantly different from zero.

As shown in Table 2, which contains the regression output for the probability of win for home teams, we obtain an $R^2 \approx .99$ across the different estimation samples considered, a consequence of the inclusion of game dummies into the regression

Table 2. Ordinary Least Squares (OLS) Estimates for Winning Probability in Home Games.

| Dependent Variable: Probability Win Home Team | | | | |
|---|-----------------|-----------------|------------------|-------------------|
| Covariates | Total Sample | Restr. Sample I | Restr. Sample II | Restr. Sample III |
| Home team and bookmaker from | | | | |
| Bulgaria | .072*** (.022) | .071*** (.022) | .069*** (.022) | — |
| Czech Republic | -.040* (.022) | -.038* (.022) | -.025 (.022) | -.039* (.023) |
| Denmark | .130*** (.022) | .131*** (.023) | .145*** (.021) | — |
| England | .008 (.013) | .004 (.013) | -.002 (.012) | -.011 (.012) |
| France | -.068*** (.023) | -.068*** (.023) | -.070*** (.023) | -.068*** (.025) |
| Germany | -.017 (.014) | -.017 (.016) | -.012 (.016) | -.018 (.014) |
| Italy | .043** (.017) | .043** (.017) | .055*** (.018) | .049*** (.017) |
| Netherlands | -.045* (.026) | -.046* (.026) | -.046* (.026) | -.037 (.027) |
| Norway | .019 (.025) | .019 (.025) | .019 (.025) | — |
| Slovenia | -.089 (.056) | -.087 (.056) | -.086 (.056) | — |
| Spain | .066*** (.011) | .065*** (.011) | .056*** (.010) | .079*** (.014) |
| Sweden | -.076*** (.015) | -.076*** (.015) | -.078*** (.015) | -.069*** (.015) |
| Away team × bookmaker interactions | Yes | Yes | Yes | Yes |
| Country dummies | Yes | Yes | Yes | Yes |
| Game dummies | Yes | Yes | Yes | Yes |
| N | 2,311 | 2,267 | 2,131 | 1,592 |
| R ² | 0.99 | 0.99 | 0.99 | 0.99 |

Note. Obs. = observations; Restr. = restricted. Standard errors are clustered at game level and reported in parentheses.

Total Sample: at least 1 obs. per match; Restr. Sample I: at least 6 obs. per match; Restr. Sample II: at least 9 obs. per match. Restr. Sample III: Excludes countries that were not seeded in one of the two top pools used to draw the qualifying groups (Bulgaria, Denmark, Norway, and Slovenia are excluded). Base group: betting countries not participating in a game.

*, **, and *** denote statistical significance at the 10%, 5%, and 1% level.

equation. This suggests that outcomes of games are indeed priced very similar across bookmakers (cf. Strumpf, 2003). Of primary importance for the purpose of our analysis, however, probabilities for home win implied by odds offered appear systematically biased in several countries when it is their respective national team that has the home game. Biases, however, are not uniform, either in sign or magnitude. In Bulgaria, Denmark, Italy, and Spain the bias is positive, in France, Sweden, the Czech Republic, and the Netherlands it is negative. Among the former, with 13.0% the bias is most pronounced in Denmark, among the latter it is largest in Sweden and France (−7.6 and −6.8%, respectively). Note that the results are remarkably consistent across estimation samples in terms of the sign, magnitude, and statistical significance of the estimated coefficients. Only for the Czech Republic (in the third estimation sample) and the Netherlands (in the fourth estimation sample) do the estimated coefficients, although unchanged in sign, turn insignificant. Potential

sampling bias due to noncoverage of particular games by bookmakers or to the inclusion of second-tier football countries hence appears negligible.

Following our theoretical discussion in the Theoretical Considerations section, the empirical finding of a downward bias in the probability for home win in France, Sweden, and the Netherlands suggests that national sentiment in these countries primarily expresses itself in terms of committed bettors that only consider betting on the home team if at all (loyalty bias). Bettors in these countries hence do not—or only to a very limited degree—overrate the winning chances of their home team. The positive biases found for Bulgaria, Denmark, Italy, and Spain can potentially be explained with reference to both types of sentiment biases. Bettors may only consider bets on their home team and/or overrate the winning chances of their national team in home games relative to the chances as they are on average marketed in countries not participating in a game. If the loyalty bias were generally negative, however, bettors' perceptions of the winning chances of their national team would have to be significantly upward biased for a positive bias to be in the interest of a profit-maximizing bookmaker. In this case, the magnitude of the bias in the odds for win is again informative about the respective strengths of the two biases. Specifically, the level of overconfidence will *ceteris paribus* increase the degree to which odds are biased upward. Overall, our regression results for home matches indicate that prices of own national teams are biased in 8 of the 12 countries.²¹ The magnitude of the estimated biases is nonnegligible and range, in absolute terms, from 4.0% in the Czech Republic to 13.0% in Denmark. Yet, the biases generally fall short of the overround charged by the bookmaker and cannot be profitably exploited. Relative to the overround, the estimated bias is largest in Denmark (0.130 relative to an overround of 0.146) and Spain (0.066 relative to an overround of 0.101).

Rerunning the same regressions, but now with the probabilities for win in an away game as implied by quotes set, we get results that are qualitatively identical for countries exhibiting the largest upward or downward bias in home games (Table 3). Specifically, in Denmark (Sweden and France) implied probabilities for win of the away team are again biased upward (downward). More generally, the estimated coefficients for own national teams have the same sign in away and home matches in virtually all countries. Only for Germany, we obtain a negative but statistically insignificant coefficient for home games but a statistically significant upward bias for away matches.²² Thus, for a given bookmaker the deviations in prices for win of the own national team display largely consistent patterns across home and away matches. However, there are also some differences observable, in particular with respect to the level of significance of the estimated coefficients. For Bulgaria, for instance, we still find a positive coefficient on the interaction term of the country identifiers and the dummies for away game status but the estimate is no longer statistically significant. Likewise, Dutch bettors, who in home games are faced with more favorable odds for win of the own team, are not confronted with a statistically significant bias in away games of their national team.

Table 3. Ordinary Least Squares (OLS) Estimates for Winning Probability in Away Games.

| Dependent Variable: Probability Win Away Team | | | | |
|---|-----------------|-----------------|------------------|-------------------|
| Covariates | Total Sample | Restr. Sample I | Restr. Sample II | Restr. Sample III |
| Away team and bookmaker from | | | | |
| Bulgaria | .075 (.050) | .076 (.050) | .075 (.050) | — |
| Czech Republic | -.129 (.110) | -.129 (.110) | -.109 (.110) | -.101 (.093) |
| Denmark | .143*** (.026) | .142*** (.026) | .143*** (.026) | — |
| England | .030** (.013) | .023* (.013) | .021* (.012) | .039** (.016) |
| France | -.064*** (.024) | -.064*** (.024) | -.062*** (.024) | -.062*** (.026) |
| Germany | .034*** (.013) | .035*** (.013) | .032*** (.013) | .047*** (.013) |
| Italy | .032*** (.009) | .032*** (.009) | .031*** (.011) | .034*** (.009) |
| Netherlands | -.019 (.047) | -.019 (.046) | -.020 (.046) | -.008 (.046) |
| Norway | -.015 (.015) | -.015 (.015) | -.015 (.015) | — |
| Slovenia | -.069 (.055) | -.069 (.055) | -.067 (.055) | — |
| Spain | .142*** (.027) | .135*** (.032) | .120*** (.031) | .153*** (.030) |
| Sweden | -.149*** (.020) | -.145*** (.020) | -.129*** (.017) | -.154*** (.027) |
| Home team × bookmaker interactions | yes | yes | yes | yes |
| Country dummies | yes | yes | yes | yes |
| Game dummies | yes | yes | yes | yes |
| N | 2,311 | 2,267 | 2,131 | 1,592 |
| R ² | 0.98 | 0.98 | 0.98 | 0.98 |

Note. Obs. = observations; Restr. = restricted.

Standard errors are clustered at game level and reported in parentheses.

Total sample: at least 1 obs. per match; Restr. Sample I: at least 6 obs. per match; Restr. Sample II: at least 9 obs. per match. Restr. Sample III: Excludes countries that were not seeded in one of the two top pools used to draw the qualifying groups (Bulgaria, Denmark, Norway, and Slovenia are excluded). Base group: betting countries not participating in a game.

*, **, and *** denote statistical significance at the 10%, 5%, and 1% level.

Table 4 summarizes the qualitative findings of our baseline regressions. Entries along its main diagonal are comprised of countries that display consistent patterns regarding the presence or absence and direction of biases in odds marketed for win of own national teams across both home and away games. Eight of the twelve countries in our sample, and hence the majority, belongs to this group. The remainders (off-diagonal entries) are countries in which probabilities for win of the national team are biased upward or downward in home or in away games, but not in both. Not for a single country does the bias change its sign across away and home matches. Overall, we find evidence for systematic biases in the rating of own national teams in 9 of the 12 countries in our sample,²³ with incidences of a positive bias outnumbering those of a negative bias.

Table 4. Summary of Results From Baseline Regressions.

| | Away Game | | |
|---------------|-----------------------|----------------|---|
| | Positive Bias | Negative Bias | Objective |
| Home Game | | | |
| Positive Bias | Denmark, Italy, Spain | | Bulgaria |
| Negative Bias | | France, Sweden | Netherlands |
| Objective | England, Germany | | Czech Republic ^a , Slovenia, Norway |

Note. "Objective" denotes countries that do not differ statistically significantly in their odds for win offered on their own national team from odds on the same outcome as on averaged marketed in countries not opposing these countries.

^aThe statistically significant and positive coefficient of the Czech Republic for home matches is not robust to changes in the sample. Therefore, the bookmaker's implied probability has been classified as "objective."

Discussion and Further Robustness Checks

Our empirical analysis provides evidence for systematic (and consistent across home and away games) deviations in the pricing of win outcomes for own national teams in the qualification to the UEFA Euro 2008. Such intercountry deviations have not been noted before in the economics literature, neither for online wagering, nor for wagering markets more generally. This shortcoming is easily explained. Most economic studies on sports wagering are confined to the analysis of only a single country or bookmaker—and hence simply lack a control group that allows to identify the effect of national sentiment on domestic prices. Our findings may hence have more general implications for the existing literature on pricing behavior in betting markets. Moreover, they may well be of importance also for other markets in which assets are traded, such as financial markets.

As shown in our theoretical model, the observed systematic deviations or biases in the pricing of own national teams can be explained by cross-country differences in the prevalence and magnitude of national bettor sentiments that affect wagering. Unfortunately, like most studies on wagering markets, we do not have data on actual betting volumes. Such data would allow us to identify whether a perception or a loyalty bias of domestic bettors can explain particular incidences of more favorable odds offered by a domestic bookmakers for games of the own national team. Our model assumes that the loyalty bias keeps bettors from wagering against their own national team. If indeed the case, the own national team should attract an overproportional part of the betting volume. Another fruitful area for further research is why national sentiment on wagering markets appears to vary considerably in importance across European countries, both in magnitude and in kind. This question, which naturally arises from our findings, requires further cross-country examinations in other areas of economic activity, investigations that however are beyond the scope

of this article. Analysis of direct (survey-based) measures of national sentiment could also be useful to identify and explain country-specific behavioral patterns. Finally, it would be interesting to explore whether the systematic biases in the pricing of own national teams can also be observed in betting markets with lower transactions costs than those reported in our study. As noted before, low transaction costs might primarily attract financially focused bettors that may be less susceptible to sentiment biases.²⁴

Are there potential explanations other than national sentiment for our results? Foremost, it is important to stress that our empirical findings of systematic deviations in the pricing of own national teams cannot be accounted for by prominent biases long researched in the economics literature on wagering markets. The biases we find are different from the favorite-long shot bias according to which favorites tend to be overbet and longshots underbet. Nor do they reflect mere home team advantage, as it is differences across bookmakers in the odds for a particular outcome of a specific game that we consider (we consider home and away games separately in the empirical analysis). Biases also do not resemble simple patterns of overall country performance in the qualification to the UEFA Euro 2008. Quotes for win of the Swedish team, for instance, have been favorable in Sweden (i.e., the implied probability for win was downward biased) but the team safely qualified as second best in its group. Spanish bettors, in contrast, were faced with less favorable odds, although their national team also qualified safely for the Euro finals in Austria/Switzerland.

Estimated biases also do not fit a simple national-private bookmaker divide.²⁵ In any case, the bookmakers dummies we use throughout our empirical analysis control for any match-invariant bookmaker (and country) characteristics, such as average bettor income and bookmaker efficiency, and thus also for private and public ownership. Similarly, the use of game dummies, and the fact that we recorded the odds of all bookmakers in random order in the morning of the very day that games were played, controls for any public information available that is relevant for (predicting) game outcomes, including team characteristics, past performances, potential favorite and underdog status, and the importance of a game for a country's qualification.

Our findings are also unlikely to be explainable by an information advantage of domestic bettors regarding the likely performance of their own national team. First, and more generally, it is unlikely that there exists a great deal of inside information in football that does not cross national borders. In professional leagues, and especially in international football, matches attract a large audience and are covered extensively in the media (Kuypers, 2000). Moreover, information about the participating teams and the odds marketed in other countries can be easily obtained online (and, in case of team statistics, are often provided directly by the bookmaker). Second, we show that the winning probabilities of national teams are *persistently* over- or underestimated in their home countries. To be able to explain such persistent biases, however, information advantages of domestic over foreign bettors would also have to be *persistent* over time, that is, nontransitory. This is unlikely. Qualification games spread over several months. Foreign bettors, as a consequence,

had ample time to correct or update their information on a national team.²⁶ Third, and most importantly, the empirical evidence for our sample suggests that the observed deviations in the pricing of own national teams do not carry additional information (over and above the quotes posted by neutral bookmakers) that helps to predict match outcomes.²⁷

We checked the robustness of our results to changes in both the regression specification and the estimation sample. Checks of the former type include the inclusion of country-specific time trends across qualification rounds, and the use of identifiers for games of teams that are in the same group as the respective betting country. Changes in the latter dimension include the restriction of the estimation sample to games in which at least one of the betting countries participated and to games not involving teams in the same qualification group as the betting country unless the latter itself represents the home or away team. None of these checks changed our results materially. The near statistically significant negative bias for Slovenia in home games in our baseline regressions at times turned significant, while the weakly statistically significant positive bias for England in away games occasionally got insignificant. Detailed regression outputs of these robustness checks can be obtained from the authors upon request.

Conclusion

National sentiment may be of importance for individual consumption and investment choices but has been little researched by economists. The small existing literature on the issue has produced evidence that consumers tend to favor domestic brands (Shankarmahesh, 2006) and that the degree of patriotism in a country affects the investment in domestic companies (Morse & Shive, 2011). Furthermore, studies on wagering markets have provided evidence that bettor sentiment affect prices set by bookmakers. So far, however, studies in this area have been confined to the analyses of a single bookmaker or country (Forrest & Simmons, 2008, Franck, Erwin, & Nüesch, 2010; Levitt, 2004).

This article has provided a first theoretical treatment of how national sentiment may bias across countries odds for win marketed for own national teams in sports competitions. Based on a unique data set of online betting odds from 12 European countries for qualification games to the UEFA Euro 2008, we furthermore analyzed empirically differences in odds for win offered across countries for evidence of systematic biases in the pricing of own national teams. We found several countries to exhibit such biases in pricing behavior. Biases were mostly positive and appeared more often in home games than away games. As shown in our theoretical model, positive biases can potentially be explained by either a perception bias or a loyalty bias of domestic bettors. Negative biases, in turn, can be explained by the latter type of bettor sentiment provided domestic bettors respond strongly to changes in bookmaker probabilities.

In the growing economics literature on sports betting, our study is the first to have analyzed wagering markets in a cross-country context, and the first to have noted the existence of systematic cross-country differences in the pricing of own national teams. The underlying determinants of these cross-country differences warrant further research. In particular, future research needs to explore why national sentiments seem to express themselves so differently across wagering markets in Europe. Another fruitful extension to our study would be the analysis of further markets to see whether national sentiment influences behavior also in other areas of the economy and whether prices follow similar patterns across countries as those found in our analysis of the online wagering market on European football.

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Notes

1. For example, Shankarmahesh (2006) provides evidence on consumer ethnocentrism, and Morse and Shive (2011) explore the importance of patriotism for the portfolio choices of domestic investors.
2. For a recent survey of national regulations in European countries governing online wagering markets, see Williams and Wood (2009). In a perfectly unified market, competitive pressures should eliminate excess profits of bookmakers. For our sample of European countries, however, we show in the Data section that the fixed markups charged by online bookmakers in different countries vary considerably.
3. In the literature, bookmakers are often assumed to be profit maximizing (see, e.g., Franck et al., 2010; Kuypers, 2000). In practice, however, bookmakers may want to avoid risks that arise from excessive betting on a particular outcome. If so, they may adjust their quotes so as to make their return independent from the outcome of the event (bookmakers are said to "balance their books"). It can be shown that even under this alternative modeling assumption, which does not seem to hold in practice (Forrest & Simmons, 2008),

prices are still affected by bettor sentiment. The formal calculations can be obtained from the authors upon request.

4. See Kuypers (2000) for a related model that allows for three distinct outcomes. In the empirical analysis, we concentrate solely on the effect of national sentiment on odds for win of the own national team. Accordingly, one may reinterpret the model as distinguishing between the outcomes “win” and “non-win” of a team.
5. In practice, the markup will determine the overall volume of bets placed with a bookmaker (see, e.g., Bruce, Johnson, Peirson, & Yu, 2009; Ottaviani & Sørensen, 2010). Following Kuypers (2000) and Levitt (2004), we abstract from this effect and assume that the decision of bettors to enter the market has already been made (see also Footnote 6). The size of the markup may also influence the type of bettors a bookmaker attracts (Bruce et al., 2009). In particular, high transaction costs may discourage financially focused bettors from betting so that leisure bettors who derive a high recreational utility value from betting may be overrepresented among bettors in markets with high transaction costs. These leisure bettors may, in general, be more susceptible to sentiment biases. We return to the issue in our empirical analysis.
6. See Franck et al. (2010) for a recent contribution that relaxes this assumption. In our model, the simplifying assumption of a fixed volume can be relaxed by allowing for two distinct revenue functions, one for each outcome. In this case, the revenue wagered on each outcome would still depend on the quote set by the bookmaker. However, a monetary unit that is not wagered on *Country A* would no longer necessarily be wagered on *Country B*. While this change in assumption leads to a slightly different first-order condition of the profit-maximizing bookmaker, it does not change the qualitative results of our model. The corresponding calculations can be obtained from the authors upon request. Note also that in our model the total betting volume is not fixed if a loyalty bias keeps bettors from betting against their own team.
7. Alternatively, one can assume that the responsiveness of bettors to the odds offered by the bookmaker is larger (smaller) with biased perceptions than without, that is, $f^{\text{Bias}}(a^*) < f'(a^*)$ ($f^{\text{Bias}}(a^*) > f'(a^*)$). The effects identified in the following are then still present. But the negative effect of an increase in a on the fraction of bettors wagering on *Country A* would be more (less) pronounced, and the positive effect on the fraction $1 - f(a)$ would be reinforced (dampened). The bookmaker would hence face two additional effects that pull odds into different directions.
8. As an example consider a match for which the subjective outcome probability of the bookmaker is $\hat{a} = 0.5$. Assume that in the absence of any sentiment bias among bettors the bookmaker faces the linear demand function $f(a) = 1 - a$ (so that exactly half of all bettors will bet on each team if the bookmaker sets $a = \hat{a} = 0.5$). It is straightforward to show that the bookmaker will set $a = 0.5$ and will earn zero profits (recall that we abstract from any fixed markup). Now suppose instead that bettors overrate the winning probability of *Country A*, so that the bookmaker faces a (biased) demand function $f^{\text{Bias}}(a) = 1.1 - a$ for $a \in [0.1, 1]$ (and $f(a) = 0$ otherwise). If the bookmaker continues to set $a = 0.5$, profits would remain zero. Yet, by increasing a to the new profit-

maximizing choice of $a \approx 0.53$ (i.e., by shading the odds against sentiment bettors), the bookmaker will earn positive expected profits of approximately 0.01 per unit bet. The increase in a is profitable because the higher (lower) expected profit per unit bet on *Country A (B)* now applies to a larger (smaller) fraction of bettors.

9. In fact, the bookmaker's tendency to reduce the odds for win of Team *A* will be reinforced in this case. Levitt (2004), however, presents evidence that bookmakers are more skilled than bettors at predicting match outcomes. This finding suggests that bookmakers, if anything, are less affected by any sentiment in their assessment of objective outcome probabilities.
10. One could also assume that only a fraction of bettors exhibits a loyalty bias. For the sign of the induced deviation in marketed odds, however, such change in assumption is immaterial.
11. Consider again the example in footnote 8. The bookmaker has a subjective outcome probability of $\hat{a} = 0.5$ and faces a linear demand function of $f(a) = 1 - a$. In the absence of any loyalty (and perception) bias, the bookmaker will set $a = 0.5$ and will earn zero profits. Now suppose instead that bettors are only interested in bets on *Country A*, that is, the bookmaker faces no demand for bets on *Country B*. If the bookmaker continues to set a equal to \hat{a} , bookmaker profits would remain zero. Yet, the bookmaker can do better: the profit maximizing choice $a \approx 0.71$ is associated with expected positive profits of approximately 0.09 per unit bet. It is therefore profitable for the bookmaker to shade odds against domestic bettors.
12. The ranking was based on the performance of national teams in the UEFA Euro 2004 and FIFA World Cup 2006 qualifying stages.
13. We also had to exclude some major football countries because we could not find a national bookmaker that offered online odds-based bets on football and that did not operate via subsidiaries also in other European countries.
14. For Germany, we had to drop the state-run online bookmaker Oddset from our sample, as its online betting service was temporarily discontinued during the observation period. Note also that the choice of an English bookmaker poses some problems since its service is likely to be taken up also by Scots which do not share much sympathy with the English national team. However, the English are by far in the majority among potential bettors in the United Kingdom. Nevertheless, the estimates for the national sentiment bias in England should be taken with some caution. Dropping England from our data set does not affect the results for the other countries.
15. Sample sizes decline significantly if this minimum threshold is further increased. Only for less than half of all games covered in our data (107 games) do all 12 betting countries offer betting odds.
16. This sample excludes Bulgaria, Denmark, Norway, and Slovenia.
17. However, the estimated biases we find do not fit a simple national-private (high-low overround) bookmaker divide (see Conclusion section). High transaction costs have also been found by Forrest and Simmons (2008) in their study on sentiment bias in the online betting market on Spanish football.
18. Our estimation sample includes odds from bookmakers both for games in which the own national team of a bookmaker participates and for games in which the own national team

does not participate. We can hence include a full set of interaction terms of betting country identifiers with dummies for home and away game status.

19. When we force the coefficient estimate of HomeGame_{ij} or AwayGame_{ij} to be identical across countries, the probability for win of the own national team is on average upward biased by 0.4% in both home and away matches. The coefficient estimates are, however, not statistically significantly different from zero; a result that does not come as a surprise given the strongly heterogeneous findings we report later in this section.
20. These price measures are objective in the sense that they are free of a national sentiment bias. They might, of course, be affected by other biases that are common to all bookmakers.
21. The number shrinks to 6 of the 12 countries if we consider only deviations that are significant at the 5 or 1% level.
22. The second exception is Norway. While the coefficient estimate changes from positive in home games to negative in away games, both coefficient estimates are not statistically significantly different from zero.
23. One may also add the Czech Republic to the list of countries for which we find systematic biases. However, the statistically significant upward bias reported for home matches of the Czech Republic is not robust to changes in the sample.
24. Note, however, that in our sample differences in the overround do not seem to explain differences in the biases across countries. In particular, we find systematic deviations in the pricing of the own national team not only for the bookmaker with the highest overround (Sweden) but also for the bookmaker with the lowest overround (Spain). Moreover, the magnitude of the bias is comparable across these two countries.
25. Among the countries with a positive sentiment bias, there are both countries with state-run bookmakers (e.g., Bulgaria and Denmark) and countries with private bookmakers (e.g., Italy and Spain). A negative bias, in contrast, is observable only in countries with state-run bookmakers (e.g., France and Sweden), and among countries that do not exhibit any bias at all, again both state-run bookmakers (Norway and Slovenia) and a private bookmaker (Czech Republic) can be found.
26. For instance, French bettors might be sooner informed about a permanent injury of a French player that happens very shortly before a game of the French team. Yet, bettors in other countries should quickly learn this information and adjust their expectations concerning future matches of the French team.
27. We ran linear probability (and probit) models of the following type:

$$\text{Outcome}_i = \beta_0 + \beta_1 \text{ProbNeutral}_i + \beta_2 \text{Home}_i + \beta_3 (\text{ProbDomestic}_i - \text{ProbNeutral}_i) + \varepsilon_i, \quad (5)$$

where the unit of observation i refers to the individual bet that a team will win a given match. Outcome_i is a dummy that will take on a value of one if a bet wins. ProbNeutral_i is the average probability of win implied by the published odds of neutral bookmakers, Home_i is a dummy for bets on home teams, and ProbDomestic_i is the probability of win implied by the relevant national bookmaker. As expected, ProbNeutral_i enters with a positive sign and is highly statistically significant. If $\text{ProbDomestic}_i - \text{ProbNeutral}_i$ indeed carried additional information (over and above ProbNeutral_i) on the likely match outcome, its coefficient β_3 should be statistically different from zero. As it turns out, it is not. The

sample size, however, is relatively small (95 games), as we can only use matches in which the own national team of at least one bookmaker participates. Detailed regression results can be obtained from the authors upon request.

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Author Biographies

Sebastian Braun is the acting head of the research area Reforming the Welfare Society at the Kiel Institute for the World Economy. He studied at St Andrews University and at Humboldt University of Berlin and obtained his Ph.D. at Humboldt University of Berlin.

Michael Kvasnicka is a researcher at RWI, research fellow at IZA, and president of the Berlin Network of Labor Market Research (BeNA). He studied at Oxford University and at University College London and obtained his Ph.D. at Humboldt University of Berlin.