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ABSTRACT

More Goals, Fewer Babies? On National Teams' Performance and Birth Rates

Does national team performance boost birth rates? We compiled a unique dataset combining country-level monthly birth rates for 50 European countries, along 56 years, with measures of national teams' performance in 27 international football events. We find that an increase in national teams' performance in international cups is associated with a drop in birth rates nine months after the event. We hypothesize that these results might be explained by individuals' time allocation choices.

JEL Classification: I10, J10, J11, J13

Keywords: football, sporting events, time allocation, birth rates, fertility

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1 Introduction

Anecdotic evidence suggests that a great performance in major sports competitions results in births increase among fans. International press reported various cases, namely a baby boom in Iceland nine months after the Euro 2016 win against England, an increase in births in Barcelona after Iniesta's last-minute goal in the 2009 Champions League semi-final. In the US, this phenomenon is often referred to as "Super Bowl babies": an increase in births among fans of the NFL Super Bowl winning team.

Indeed, major sporting events, such as FIFA World Cup, play an important role in reviving national pride and are by far the most watched events on television. For example, the latest World Cup, hosted by Russia in 2018, attracted a total of 3.6 billion watchers worldwide. In Europe, 86.1% of the population watched at least one minute of the competition (FIFA, 2018). As shown by a recent literature, the qualification and participation of the national team in the tournament represents the most relevant predictor of audience size, followed by match quality and scheduling-related variables (Uribe *et al.* 2021).

A growing body of literature has investigated the main determinants of birth rates and fertility, focusing on socioeconomic conditions (Kearney and Wilson 2018; Schaller *et al.* 2020), religion (Anderson and Coale 2017; Basedau *et al.* 2018), natural disasters (Nandi *et al.* 2018), power outages (Burlando 2014; Fetzer *et al.* 2018), mass media exposure (Billari *et al.* 2019; La Ferrara *et al.* 2012), and weather (Barreca *et al.* 2018). While the idea that euphoria generated by sports success can nurture hedonic sensations and then increase human conception has been widely suggested in society and mass media, it has not received much empirical attention. We fill this gap in the literature and provide the first empirical evidence on the relationship between national sports success and birth rates.

We compiled a unique dataset combining country-level monthly births for 50 European countries, along 56 years, with measures of national teams' performance in 27 major international football events (i.e., FIFA Wold Cup and UEFA European Football Championship). Our empirical results contradict the anecdotical evidence. We find that an increase in national teams' performance is associated with a *reduction* in births nine months after the event.

The remainder of this paper is organized as follows. Section 2 describes the data. Section 3 presents the main empirical analyses, while Section 4 presents some robustness checks. Section 5 discusses and concludes.

2 Data

We combined data from Eurostat on country-level monthly births for 50 European countries, from 1960 to 2016, with national team's performance, as measured by the ELO rating system, which is used by FIFA to compile the world national teams rank.

The ELO system accounts for two aspects of performance. First, it depends on individual match results and importance. Second, it cumulates through the competition, so it accounts for the permanence in the competitions and for the different number of games per competition over time. Both aspects are important for the results interpretation. More details are provided in Appendix A.

Information on national teams' performance is obtained from Wikipedia and covers 13 European Championships and 14 World Cups. About half of the competitions takes place between June and July, half in June, and two in July. Table 1 reports the main descriptive statistics.

Table 1. Descriptive statistics.

Variables	N	Mean	SD	Min	Max
Monthly births	17,658	15,548.17	22,689.18	5	174,839
Performance, ELO	17,658	1.628	18.074	0	425
Organizer	17,658	0.001		0	1
Year	17,658			1960	2016

Note: ELO is the rating system used by FIFA.

The ELO score ranges between 0 (i.e., country *c* did not participate) and 425 (i.e., country *c* wins the competition and most matches). Table B.1 in Appendix B shows the complete list of countries, their first and last year in the Eurostat database.

3 Empirical analysis

To investigate the relationship between national football teams' performance and birth rates, we estimate the following equation by means of FE estimator:

$$Ln\_Births_{ct+9} = \beta_0 + \beta_1 Std\_ELO_{ct} + \beta_2 Organizer_{ct} + \gamma_t + \mu_{ct} \quad (1)$$

Where Ln_Births_{ct+9} is the natural logarithm of monthly births in country *c* and month *t+9,* Std_ELO_{ct} is the standardized measure of national team's performance, $Organizer_{ct}$ is a dummy taking value 1 if country *c* hosted the competition in *t*. γ_t is a vector for time fixed effects, while country fixed effects are eliminated by the within transformation. Standard errors are clustered at the level of the country.

Results from estimating Equation (1) are presented in Table 2 and look very robust. Across all the specifications, we see that, on average, an increase in performance by one standard deviation is associated with a reduction in monthly births by 0.3% nine months after the event. Thus, these results challenge the anecdotical narrative often provided by mass media. On the contrary, they provide strong evidence that national teams' performance in major sports competitions is associated with a drop in births.

A back-of-the-envelope calculation of the number of missed births unveils the economic significance of our results. Let us consider a basic case, a participating country that obtains 127.74 points (i.e., the average score of a participating country); in this case, we could expect a drop in monthly births by 2.13% ([127.74/18] *0.3) nine months after the competition. More concretely, consider Italy and France, with average monthly births equal to 52k and 66.5k respectively, this result corresponds to 1.1k and 1.4k fewer monthly births, respectively.

Table 2. Effect of performance on the natural logarithm of number of births, 9 months after the beginning of the tournament; fixed-effect parameter estimates.

Variables	Ln_Births 9 months after the tournament							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Std_ELO	-0.003**	-0.003**	-0.003***	-0.003**	-0.003*	-0.004***	-0.002*	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Organizer		X	X	X	X	X	X	X
Year FE			X	X				
Month FE			X					
Month × Country FE				X	X	X		X
Year × Month						X		
Year × Month FE					X			X
Year × Month × Country							X	X
N	17,010	17,010	17,010	17,010	17,010	17,010	17,010	17,010
N countries	50	50	50	50	50	50	50	50

Note: Robust standard errors, clustered at country level, in parentheses. *** p<0.001, ** p<0.01, * p<0.05

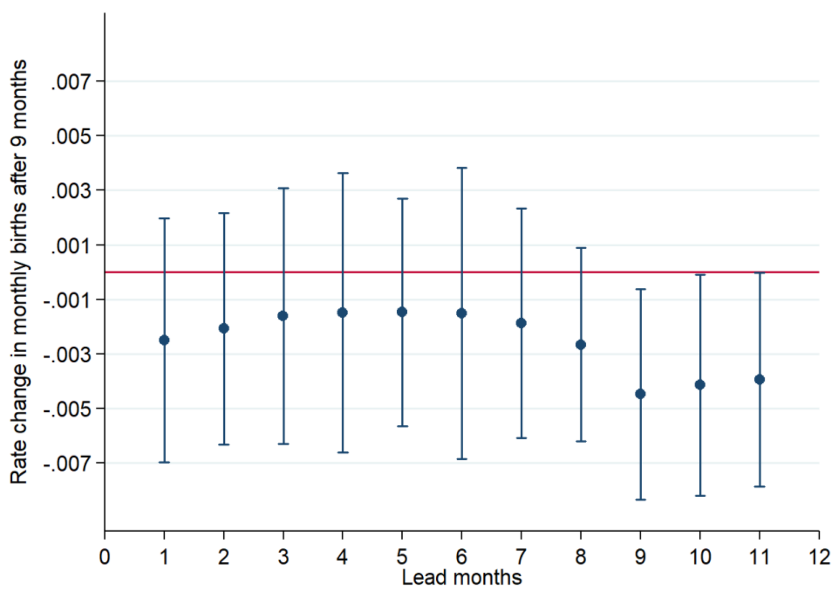
Notice that column (6) to (8) account for general and for country-specific time trends. Among other unobservable trends, these analyses account for evolution and spread over time of television and internet. This point is discussed in Section 5.

4 Robustness checks

We conduct a series of falsification tests. First, we conduct analyses on births from 1 to 11 months after the competition on the subsample of years when the tournaments were held entirely in one month, either only June or only July. These analyses are based on observations from 17 years (i.e., about 4k observations), which gives a smaller sample; thus, we use model specification from Column (3), Table 2.

Figure 1 illustrates the results. The effect of performance on monthly births is highly statistically significant nine and ten months after the tournament,[1] while the effect after eleven months is on the edge of significance.[2]

Figure 1. Effect of performance on monthly births



[1] That is, eight and nine months after the month when the tournament started, which gives nine and ten months of gestation respectively.

[2] This is probably due to the lack of information on *daily* births. Lower conception rate at the end of the month when the tournament started might reflect into lower birth rates about ten months later, that is, between ten and eleven months after the beginning of the tournament.

Note: The figure plots the parameter estimates alongside 95% confidence intervals of the analysis which estimates Equation (1) on the natural logarithm of births from 1 to 11 months after the tournament.

The results are equivalent to those from Column (3) with the same specification, and from Table 2 more in general.

Additionally, we conduct three randomization tests by means of Montecarlo simulation, 100 repetitions each: (i) we weight the ELO coefficient with a random number between 0 and 1; (ii) we randomly reassign country-ELO scores across time for participating countries;[3] (iii) we randomly reassign monthly-births within year, for each country. Table 3 reports the results. For comparison sake, we use the model specification from Column (3) in Table 2.

Table 3. Effect of performance on the natural logarithm of number of births, 9 months after the beginning of the tournament; fixed effect parameter estimates. Montecarlo simulations with rescaled ELO and with reassigned ELO.

	Simulations		
	ELO rescaling	ELO reassignment	Births reassignment
Variables	Ln_Births 9 months after		
	(1)	(2)	(3)
Std_ELO	-0.002	-0.002	-0.002
	(0.001)	(0.001)	(0.001)

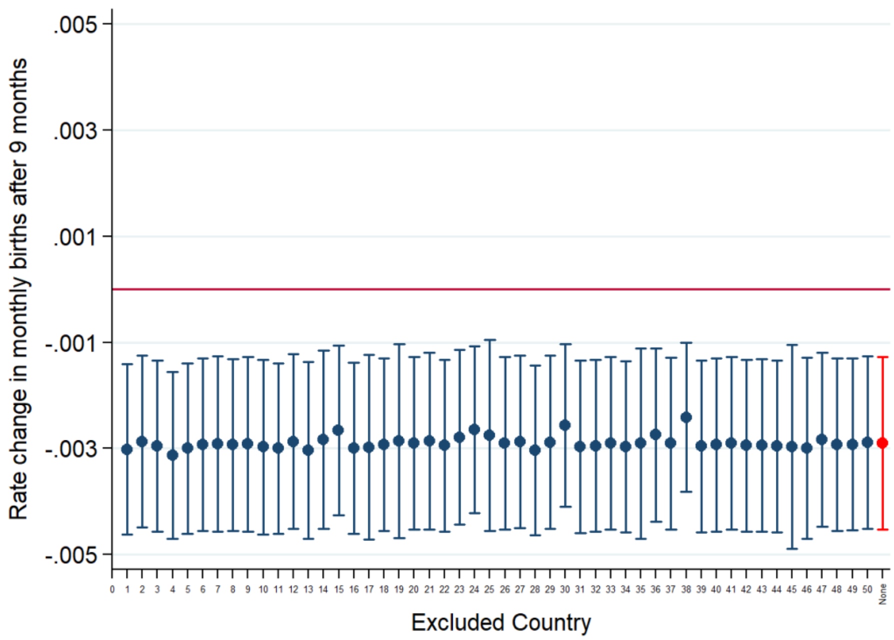
Note: The table reports average estimates and standard errors across 100 simulations. Robust standard errors, clustered at the level of the country, in parentheses. *** p<0.001, ** p<0.01, * p<0.05

The table shows that neither of the three simulations provides a statistically significant association between national teams' performance and country's births, nine months after the competition.

Finally, we perform a series of 50 leave-one-out analyses, where we subsequently exclude one country at a time. Figure 2 plots the estimates from the analyses. Compared to the analyses in Table 2, these results are virtually unchanged in term of magnitude and statistical significance.

[3] For example, let us say that Italy participated to 20 international competitions, so we have 20 ELO scores for Italy; we randomly reassign these 20 ELO scores across the 20 Italian appearances in these competitions.

Figure 2. Leave-one-out analysis.



Note: The figure plots the parameter estimates alongside 95% confidence intervals of the leave-one-out analysis which estimates Equation (1) by omitting one Country at time. The red diamond/line refers to the baseline estimate with no omitted Country.

5 Discussion

We have analysed the relationship between national teams' performance in major sports competitions and birth rates. We find that an increase in national team performance in international football competitions is associated with a drop in births nine months after the event.

Our paper contributes to shed light on the social determinants of birth rates and fertility. While our data provide a neat longitudinal framework, they do not allow us to investigate mechanisms linking national teams' performance and birth rates. We hypothesize that these results might be explained by individuals' time allocations choices (Mincer, 1963; Becker, 1965). In this framework, the attendance of live events (e.g., from late afternoon to late night, on TV, at the stadium, on big screens in public places[4]) may reduce the time spent on physical intimacy as suggested in other studies (Grimm *et al.*, 2015; Dewi *et al.*, 2017; Johnson, 2001; Hornik and McAnany, 2001). As a support to this substitution mechanism, it is important to notice that contrary to other entertainment video activities (e.g., watching movies and series, connecting on online social media), sports events are characterized by their uniqueness and unrepeatability as well as by their collective engagement. On top of that, good national teams' performances are likely followed by celebrations with friends and fellow countrymen, which reduces even more physical intimacy time. Differently, bad performances cause early exclusion from the tournament, without disrupting intimacy time. To this end, time allocation choices seem more salient than euphoria in explaining reproductive behaviour.

Our results have implications for both economics and demography. On one hand, in high-fertility settings, such as developing countries, governments may aim at reducing births, even with indirect interventions, such as increasing access to entertainment activities and TV. On the other hand, our results suggest that an increase in entertainment activities may reduce births even in low-fertility settings, such as most European countries, where governments typically aim at increasing fertility. While the effect of the massive increase in the consumption of media and entertainment in rich countries is broadly debated (Wallsten, 2013), its specific effect on reproductive behaviour remains largely unexplored.

[4] Historically, also World Cups outside of Europe scheduled matches at times corresponding to late afternoon/night in Europe (e.g., the US and Brazil World Cups).

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Appendix A: FIFA ELO score

To build our measure of national team's performance, we follow the official ELO system used by FIFA. The computation of individual national teams' performance in one international cup proceeds in two stages: first, we multiply the importance and result coefficient (see below) for each game played by one national team and, second, we sum the results of these multiplications across matches for the same national team, within the same competition. These are the two coefficients we combine:

- *importance coefficient:* 50 for matches before quarter-finals and 60 for matches in quarter-finals or later. In this dataset we have coefficients only on the final stages of international tournaments.
- *result coefficient:* 0 for a loss after regular or extra time, 0.5 for a draw or loss in a penalty shootout, 0.75 for a victory in a penalty shootout, 1 for a victory after regular or extra time.

If a game ends with a winner but still requires a penalty shootouts (i.e., in the second game of a two-legged tie), it is scored as a regular game (e.g., the score is based on the regular time result).

Since we are simply interested in studying a proxy for the national team's two-performance in an international tournament, we modify the official ELO scoring system to account for four aspects. First, international competitions format changed slightly over time, with some earlier competitions having a small group stage before the semi-finals, which factually corresponded to quarter-finals. Therefore, we assigned the importance coefficient equal to 60 to matches at that stage as well. Second, we added 60 additional points to the team that wins the international cup, regardless of whether the match ends after the regular time, extra time or penalty shootouts; a final victory has to count more than a victory in the semifinals or earlier. Third, we added 1 point to all of the national teams that participate to the international cup (i.e., a national team is assigned at least 1 point, even after loosing all of the matches in the international cup). A team that participates but looses all of the matches is still better off than a team that does not participate at all. Fourth, we are not considering ELO points assigned by the FIFA to national teams up until the tournament (i.e., points cumulated during qualification matches to the final stages of the competition); related to that, we are not accounting for the opponent team strength.

We conduct additional robustness checks that exclude the victory bonus (i.e., the second change in the ELO scoring system). The results are identical; it is not surprising, given that the amount of countries that are in the Eurostat database and win an international tournament is very small (i.e., 17).

Appendix B: Countries and Years

Table B.1 First and last year in the database, by country.

Country	First year	Last year
Albania	1997	2016
Andorra	2005	2012
Armenia	2005	2016
Austria	1960	2016
Azerbaijan	2005	2016
Belarus	2005	2015
Belgium	1960	2016
Bosnia and Herzegovina	2003	2012
Bulgaria	1994	2016
Croatia	1994	2016
Cyprus	1994	2016
Czech Republic	1990	2016
Denmark	1960	2016
Estonia	1960	2016
Finland	1960	2016
Former Yugoslav Republic of Macedonia	1994	2016
France	1994	2016
Georgia	2005	2015
Germany	1991	2016
Greece	1969	2016
Hungary	1994	2016
Iceland	1960	2016
Ireland	1969	2016
Italy	1960	2016
Kosovo under United Nations security	2005	2015
Latvia	1996	2016
Liechtenstein	1980	2016
Lithuania	1994	2016
Luxembourg	1960	2016
Malta	1994	2016
Moldova	2005	2016
Monaco	2005	2005
Montenegro	2005	2016
Netherland	1960	2016
Norway	1960	2016
Poland	1995	2016
Portugal	1969	2016
Romania	1995	2016

Russia	2005	2013
San Marino	2005	2012
Serbia	2000	2016
Slovakia	1996	2016
Slovenia	1994	2016
Spain	1960	2016
Sweden	1960	2016
Switzerland	1960	2016
Turkey	2004	2016
Ukraine	2005	2015
United Kingdom	1973	2016
Western Germany	1960	1990

Note: Countries entry to and exit from the database follows exogenous political agreements. Countries that have split over this time period are usually countries from the former Soviet bloc and former Yugoslavia. These countries enter the Eurostat database after they split. The database includes Western Germany from 1960 to 1990, while from 1991 it includes the unified Germany. Countries names in Table B.1 are those used in the Eurostat database.