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Population, GDP per Capita, and Qualification for the 2026 FIFA World Cup: Evidence from UEFA Men's National Teams[1]

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This paper examines the role of population size and GDP per capita in determining the probability of World Cup qualification among the 52 UEFA member nations competing in the 2026 FIFA World Cup European qualifying rounds. Using a probit model alongside logit and OLS linear probability model estimates for robustness, the study finds that population size is a statistically significant and dominant determinant of qualification, consistent with the hypothesis that larger countries draw from deeper talent pools. GDP per capita is positive but only borderline significant, suggesting that within Europe's relatively wealthy context, income differences play a secondary role. Predicted probabilities identify eight overachievers — most notably Bosnia and Herzegovina and Croatia — and three underachievers, with Italy as the most structurally surprising non-qualifier.

Keywords: *World Cup qualification; probit model; population; GDP per capita; UEFA; football economics; binary choice model; overachievers*

Introduction

The FIFA World Cup is the most widely watched sporting event in the world, and qualification for its final rounds represents the highest aspiration of any national football association. For European nations competing under the auspices of the Union of European Football Associations (UEFA), the qualification process is particularly competitive: the 2026 World Cup allocated 16 berths to UEFA's 55 member associations, meaning that fewer than one in three European nations could secure a place at the finals. Understanding which structural characteristics of a country predict qualification success is therefore a question of both academic and policy interest. The analysis is necessarily cross-sectional; it therefore abstracts from time-varying factors — including managerial changes, player injuries, and shifts in national football development policy — that may influence qualification outcomes in any given cycle.

The sports economics literature has long established that population size and economic development are among the most robust predictors of international sporting success, as reviewed in the following section. Despite this rich literature, surprisingly few studies have modeled World Cup qualification itself as a binary outcome and

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applied appropriate limited dependent variable methods to a purely European sample. The present paper addresses this gap. Using a cross-sectional dataset of 52 UEFA member nations and data on population and GDP per capita sourced from the International Monetary Fund, the paper estimates a probit model of World Cup qualification for the 2026 FIFA World Cup European qualifying cycle. The probit is the appropriate econometric framework given the binary nature of the dependent variable — a country either qualified (Q=1) or did not (Q=0) — and its well-known advantages over the linear probability model in terms of bounded predicted probabilities and structural consistency.

The paper makes several contributions to the existing literature. First, it provides the first probit-based analysis of 2026 World Cup qualification for UEFA nations, using a sample that spans the full spectrum of European footballing contexts, from microstates to large economies. Second, it demonstrates the robustness of the population-GDP framework by comparing probit, logit, and OLS estimates side by side, showing that the qualitative conclusions are stable across all three specifications. Third, it goes beyond coefficient estimation to compute predicted qualification probabilities for all 52 nations, enabling a systematic identification of overachievers — nations that qualified against structural odds — and underachievers — nations that failed to qualify despite favorable structural characteristics. This country-level classification provides a richer analytical narrative and has direct implications for understanding the role of unobservable footballing culture and institutional quality in shaping qualification outcomes.

The remainder of the paper is structured as follows. Section 2 reviews the relevant literature on the economic and demographic determinants of football and sporting success. Section 3 describes the data and presents summary statistics. Section 4 reports the regression results from the OLS, probit, and logit specifications. Section 5 presents the predicted probabilities and country classification analysis, including worked numerical examples for the most notable overachievers and underachievers. Section 6 concludes.

Related Literature

A substantial body of research has examined the economic and demographic determinants of international sporting success, with football receiving particular attention. Early foundational studies by Hoffmann, Ging, and Ramasamy (2002) and Houston and Wilson (2002) established that population size and GDP per capita are among the most consistent predictors of national football performance, identifying both scale effects and diminishing returns to income. Bernard and Busse (2004) extended this framework to the Olympic Games, demonstrating that population and economic resources jointly explain medal outcomes and formalizing what has become known as the population–GDP model of sporting success.

Within football specifically, Papanikos (2014, 2017, 2021, 2024) has contributed a series of studies showing that demographic and economic variables systematically influence national team performance, FIFA rankings, and the distribution of football clubs at the sub-national level. These works collectively reinforce the view that

structural country characteristics shape footballing outcomes across multiple levels of analysis.

More recent research has continued to validate and refine these relationships using updated datasets and expanded methodological approaches. Fan, Liu, and Peng (2023) employ a generalized linear mixed model to analyze determinants of World Cup performance from 1994 to 2022, confirming that population scale, economic development, and football tradition remain significant predictors of national team outcomes. Harman (2022) similarly reports that population remains a robust determinant of football performance in a panel setting, while highlighting the role of institutional quality and gender equality.

Parallel to these econometric approaches, a growing literature has explored machine learning methods for predicting football outcomes (e.g., Bunker & Thabtah, 2020). While these models can capture complex non-linearities, they typically prioritize predictive accuracy over interpretability and are less suited to identifying structural determinants of qualification. Given the relatively small cross-sectional sample of UEFA nations and the objective of estimating interpretable marginal effects for population and GDP per capita, a parametric binary choice model remains the most appropriate methodological choice. The probit specification, in particular, provides bounded predicted probabilities, a transparent likelihood framework, and results that are directly comparable to the canonical population–GDP literature.

Taken together, the existing research provides strong theoretical and empirical justification for modeling World Cup qualification as a function of demographic and economic fundamentals. The present study contributes to this literature by applying a probit model to the 2026 UEFA qualification cycle, offering the first binary-choice analysis of qualification outcomes for this tournament and identifying systematic over- and under-performance relative to structural expectations.

Summary Statistics

Population statistics and GDP per capita (current prices, purchasing power parity, international dollars per capita) were obtained from the International Monetary Fund via its online data portal (IMF, 2026a; IMF, 2026b). The list of countries and the corresponding data are presented in Table 3. The Faroe Islands and Gibraltar were excluded due to data unavailability. The UK's per capita GDP was applied to all four constituent countries: England, Northern Ireland, Scotland, and Wales.

The dataset comprises 52 European national football associations, for which summary statistics are reported in Table 1. The dependent variable, Q, is a binary indicator equal to one if a country qualified for the World Cup and zero otherwise. With a mean of approximately 0.308, the data suggest that roughly 31 percent of European nations in the sample secured World Cup qualification, corresponding to 16 qualifying countries out of 52. The variable exhibits positive skewness (0.833) and a kurtosis well below 3, reflecting the predominance of non-qualifying nations in the sample. The Jarque-Bera statistic for Q rejects normality at the one percent level of significance ($p = 0.008$), which is entirely expected given the binary nature

of the dependent variable and provides further justification for the use of a probit model rather than a linear probability model.

Turning to the explanatory variables, population (*POP*) varies considerably across the sample, ranging from approximately 0.034 million (San Marino) to 86.026 million (Türkiye), with a mean of around 14.049 million. This wide dispersion reflects the heterogeneous nature of European states. The distribution of *POP* is heavily right-skewed (skewness = 2.170) with excess kurtosis (6.691), and the Jarque-Bera test strongly rejects normality ($p \approx 0.000$). Similarly, GDP per capita (*GDPPOP*) ranges from approximately $19,591(Moldova) to $201,112 (Liechtenstein), with a mean of roughly $61,136, reflecting the broad economic diversity within Europe. This variable is also right-skewed (skewness = 1.901) and non-normally distributed ($p \approx 0.000$), consistent with a small number of very high-income economies pulling the distribution rightward.

Table 1. *Descriptive Statistics*

	Q	**POP**	**GDPPOP**	**ln(POP)**	**ln(GDPPOP)**
Mean	0.307692	14.04904	61135.52	1.572371	10.89143
Median	0.000000	5.620000	57044.68	1.726331	10.95159
Maximum	1.000000	86.02600	201112.3	4.454650	12.21162
Minimum	0.000000	0.034000	19590.73	-3.381395	9.882812
Std. Dev.	0.466041	21.38141	34053.26	1.738194	0.512711
Skewness	0.833333	2.170391	1.901159	-0.786991	0.000311
Kurtosis	1.694444	6.690766	7.986800	3.982210	3.080044
Jarque-Bera	9.711548	70.33899	85.20589	7.457997	0.013883
Probability	0.007783	0.000000	0.000000	0.024017	0.993083
Observations	52	52	52	52	52

Note: Q is a binary variable equal to 1 if the country qualified for the World Cup and 0 otherwise. POP denotes population in millions. GDPPOP denotes GDP per capita in US dollars. ln(POP) and ln(GDPPOP) are natural logarithms of POP and GDPPOP respectively. The Jarque-Bera test tests the null hypothesis of normality.

Given the non-normality and considerable skewness observed in both *POP* and *GDPPOP*, logarithmic transformations are applied to each variable prior to estimation. The transformed variables, *ln(POP)* and *ln(GDPPOP)*, exhibit substantially improved distributional properties. In particular, *ln(GDPPOP)* displays near-zero skewness (0.000) and a kurtosis of approximately 3.080, closely approximating a normal distribution, as confirmed by the Jarque-Bera statistic which fails to reject normality at any conventional significance level ($p = 0.993$). *ln(POP)* similarly shows reduced skewness (-0.787) relative to its untransformed counterpart, though mild departure from normality remains ($p = 0.024$). Overall, the summary statistics provide strong empirical motivation for adopting a log-linear probit specification, in which the probability of World Cup qualification is modelled as a function of the natural logarithms of population and GDP per capita.

The correlation between ln(POP) and ln(GDPPOP) is -0.191, with an associated t-statistic of -1.375 and a p-value of 0.175, indicating that the two regressors are not significantly correlated at any conventional significance level. This result confirms the absence of multicollinearity in the model and supports the interpretation of the probit coefficient estimates as capturing the independent effects of population size and income per capita on the probability of World Cup qualification. The negative sign of the correlation is consistent with the observation that Europe's wealthiest nations per capita tend to be small states — such as Luxembourg, Liechtenstein, Norway, and Switzerland — while several of the continent's most populous nations, including Türkiye and Ukraine, record comparatively lower income levels.

Regression Results

Table 2 presents the estimation results for three alternative specifications: the linear probability model (OLS), the probit model, and the logit model. All three models use the natural logarithm of population, ln(POP), and the natural logarithm of GDP per capita, ln(GDPPOP), as explanatory variables, with World Cup qualification (Q) as the dependent variable.

As a preliminary check, OLS estimation of the linear probability model yields statistically significant coefficients, confirming the relevance of the regressors. However, given the binary nature of the dependent variable, OLS is subject to structural heteroskedasticity and does not constrain predicted probabilities to the unit interval. The probit model is therefore preferred as it provides consistent and efficient estimates under the correct distributional assumption.

The overall explanatory power is satisfactory across all specifications. The OLS model yields an R-squared of 0.301, while the probit and logit models produce McFadden R-squared values of 0.291 and 0.295 respectively, which are considered indicative of good fit in binary choice models.[2] The F-statistic for the OLS model (10.557, $p = 0.000154$) and the likelihood ratio statistics for the probit (18.667, $p = 0.000088$) and logit (18.913, $p = 0.000078$) models all strongly reject the null hypothesis that the regressors have no joint explanatory power. The likelihood ratio statistic is computed as twice the difference between the log likelihoods of the full and null models, and is distributed chi-squared with degrees of freedom equal to the number of slope parameters.

Two additional goodness-of-fit statistics reported in Table 2 merit brief explanation. The log likelihood measures the probability of observing the actual data given the estimated model parameters; a less negative log likelihood indicates a better fitting model. For the probit model the log likelihood is -22.7629, compared to -22.640 for the logit, indicating that the logit fits the data marginally better in absolute terms, though the difference is negligible. The Schwarz information

[2]Unlike the conventional R-squared, which measures the proportion of variance in the dependent variable explained by the regressors, McFadden's (1974) pseudo-R-squared is defined as $1-\ln L_{full}/\ln L_{null}$, where $\ln L_{full}$ and $\ln L_{null}$ are the log-likelihoods of the estimated and null models respectively. McFadden (1974) suggests that values between 0.2 and 0.4 indicate excellent fit in binary choice models, a benchmark considerably lower than conventional OLS thresholds.

criterion — also known as the Bayesian Information Criterion (BIC) — is defined as: $BIC=-2\ln L+k\ln(n)$; where lnL is the natural logarithm of the maximised log likelihood, k is the number of estimated parameters, and n is the number of observations. Unlike the log likelihood, which always improves as parameters are added, the Schwarz criterion penalises model complexity by adding a term proportional to the number of parameters multiplied by the log of the sample size. A lower value of the Schwarz criterion indicates a better model after accounting for parsimony. Similarly, the Akaike Information Criterion (AIC) is defined as: $AIC=-2\ln L+2k$, and applies a less severe penalty for additional parameters than the Schwarz criterion.

Both the AIC and the Schwarz criterion are reported in Table 2 to facilitate model comparison. The probit model records an AIC of 0.991 and a Schwarz criterion of 1.103, compared to 0.986 and 1.099 for the logit respectively. Given the negligible differences between the two and the widespread use of the probit in the binary choice literature, the probit is adopted as the preferred specification throughout.

Turning to the individual coefficients, ln(POP) is positive and statistically significant at the one percent level across all three specifications, with p-values of 0.0001, 0.0012, and 0.0022 for OLS, probit, and logit respectively. This finding indicates that population size is a robust and dominant determinant of World Cup qualification among European nations, consistent with the hypothesis that larger countries benefit from deeper talent pools from which to draw players. The result is stable and significant regardless of the estimation method employed, lending considerable confidence to this conclusion.

The effect of GDP per capita, captured by ln(GDPPOP), is positive in all three models, suggesting that wealthier nations are more likely to qualify, as one would expect given their greater capacity to invest in football infrastructure, youth academies, and coaching. However, the statistical significance of this variable differs notably across specifications. In the OLS model, ln(GDPPOP) is significant at the five percent level ($p = 0.0143$), whereas in the probit and logit models it is only borderline significant, with p-values of 0.0502 and 0.0464 respectively. This divergence highlights the importance of adopting the correct econometric framework: the OLS linear probability model, being misspecified for a binary dependent variable, overstates the precision of the GDP per capita estimate. The probit and logit results suggest that, once the distributional assumption is correctly accounted for, the marginal effect of income on qualification probability is weaker and less precisely estimated. This is economically intuitive — within Europe, where most nations are relatively prosperous by global standards, variation in GDP per capita may matter less than the sheer size of the population in determining footballing success.

In terms of model selection, the probit is adopted as the preferred specification given its widespread use in the binary choice literature. Nevertheless, the close agreement between the probit and logit estimates — both in terms of coefficient signs and significance levels — confirms the robustness of the results to the choice of distributional assumption. Overall, the evidence points to a clear and consistent conclusion: population size is the primary structural determinant of World Cup qualification among European nations, while the role of GDP per capita, though positive, is secondary and sensitive to model specification.

Table 2. *Determinants of World Cup Qualification — Regression Results*
Dependent Variable: Q (1 = Qualified, 0 = Did Not Qualify)

Variable	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
	OLS		Probit		Logit	
C (Constant)	-2.971	0.0183	-11.73243	0.0249	-22.37570	0.0266
ln(POP)	0.1384	0.0001	0.573067	0.0012	0.992054	0.0022
ln(GDPPOP)	0.281	0.0143	0.926752	0.0502	1.791822	0.0464
McFadden R^2	—	—	0.290800	—	0.294619	—
R-squared	0.3011	—	—	—	—	—
Adjusted R^2	0.2726	—	—	—	—	—
S.E. of regression	0.397476	—	0.385777	—	0.383604	—
Akaike info crit.	1.048596	—	0.990881	—	0.986166	—
Schwarz criterion	1.161168	—	1.103452	—	1.098738	—
Log likelihood	—	—	-22.76290	—	-22.64032	—
LR statistic	—	—	18.66735	—	18.91250	—
Prob(LR statistic)	—	—	0.000088	—	0.000078	—
F-statistic	10.55642	—	—	—	—	—
Prob(F-statistic)	0.000154	—	—	—	—	—
Observations	52	—	52	—	52	—

Notes: Prob. denotes p-values. OLS is the linear probability model reported for comparison purposes; probit is the preferred specification. Both probit and logit are estimated by maximum likelihood using Newton-Raphson/Marquardt steps; ln(POP) and ln(GDPPOP) denote natural logarithms of population and GDP per capita respectively. Sample size is 52 European national associations. '—' denotes not applicable for the given model. The Akaike Information Criterion and Schwarz Criterion reported 2 follow EViews convention and are computed on a per-observation basis and are each divided by the number of observations n. This normalisation does not affect model selection since dividing by n is a monotonic transformation, but it accounts for the fact that the reported values are smaller than those produced by the standard textbook formulas.

As a further robustness check, predicted probabilities derived from the logit model are virtually identical to those reported in Table 3 for the probit. The maximum absolute difference in predicted qualification probabilities across all 52 nations is 0.047, and the average difference is less than 0.012, confirming that the choice between the probit and logit specifications has no material bearing on the country classifications or the identification of overachievers and underachievers.

Additional regressors — such as a democracy index, UEFA coefficient, a measure of footballing history and tradition, and a dummy variable for the top-five European leagues — were tested but were not found to be statistically significant and are therefore not reported in Table 2. A measure of historical performance, proxied by past World Cup qualifications, was included in preliminary specifications. However, its inclusion renders the coefficients on population and GDP per capita statistically insignificant, indicating that it absorbs much of the variation explained by these structural variables. This suggests that past qualification primarily reflects underlying demographic and economic characteristics rather than constituting an independent determinant. For this

reason, it is excluded from the preferred specification. Full results are available from the author upon request. The purpose of the model is to estimate the effect of *exogenous structural variables*, not football performance indicators which are endogenous to qualification outcomes.

The results of the present study are broadly consistent with the canonical findings of Bernard and Busse (2004), who use a Tobit model to explain Olympic medal shares as a function of log population and log GDP per capita across 1,254 observations spanning the 1960–1996 Olympic Games. Both studies find positive and significant effects of population on sporting success, confirming the robustness of the population-GDP framework across different sporting contexts and model specifications. However, while Bernard and Busse find that population and income per capita have approximately equal marginal effects — a conclusion they confirm by failing to reject their equality only at the five percent level — the present study finds that population is the dominant determinant while GDP per capita is only borderline significant. This divergence is consistent with the difference in sample composition: Bernard and Busse's global sample encompasses countries at vastly different levels of economic development, where income variation is large and highly consequential, whereas the present study's UEFA sample consists entirely of European nations where income differences are comparatively modest and the marginal effect of additional wealth on qualification probability is correspondingly weaker.

Predicted Probabilities and Country Classification

To further examine the explanatory power of the probit model, predicted probabilities of World Cup qualification are computed for each of the 52 European nations in the sample. The predicted probability for country i is obtained in two steps. First, the linear index is computed as:

$$\hat{z}_i = -11.732 + 0.5731\ln(\mathrm{POP}_i) + 0.926752\ln(\mathrm{GDPPOP}_i)$$

Second, the predicted probability is obtained by transforming the linear index through the cumulative distribution function of the standard normal distribution:

$$\hat{P}_i = \Phi(\hat{z}_i) = \int_{-\infty}^{\hat{z}_i} \frac{1}{\sqrt{2\pi}} e^{-t^2/2}\, dt$$

Using a classification threshold of 0.5, countries are assigned to one of four categories:

1. Expected qualifiers are those with a predicted probability above 0.5 that did qualify;
2. expected non-qualifiers are those with a predicted probability below 0.5 that did not qualify.
3. overachievers, defined as countries that qualified despite a predicted probability below 0.5; and

4. underachievers, defined as countries that failed to qualify despite a predicted probability above 0.5.

The full set of predicted probabilities and classifications for all 52 nations is reported in Table 3. The model performs well in identifying structurally favored nations. Germany, France, England, Türkiye, and Spain record predicted probabilities of 0.879, 0.831, 0.800, 0.76, and 0.738 respectively, all of which correctly qualify. These nations combine large populations with relatively high-income levels, and their qualification is entirely consistent with the structural predictions of the model. At the other end of the distribution, microstates and low-income nations such as San Marino (0.001), Andorra (0.003), and Montenegro (0.010) record negligible predicted probabilities and correctly fail to qualify.

The most striking underachiever in the sample is Italy. Substituting Italy's population of 58.934 million and GDP per capita of $63,126 into the probit equation yields:

$$\hat{z}_{Italy} = -11.732 + 0.5731 \times ln(58.934) + 0.926752 \times ln(63125.7)$$
$$= -11.732 + 2.3362 + 10.2261 = 0.8303$$
$$\hat{P}_{Italy} = \Phi(0.8303) = 0.7968$$

The model assigned Italy a predicted probability of qualification of approximately 79.6%, the fourth highest in the entire sample. Italy's failure to qualify therefore represents the single most structurally surprising non-qualification in the dataset, and is consistent with the widely documented view that Italy's failure to reach the 2022 World Cup reflected a deep institutional and generational crisis in Italian football rather than any structural economic or demographic disadvantage.

At the opposite extreme, two countries stand out as exceptional overachievers. Croatia, with a population of just 3.854 million and a GDP per capita of $51,453, yields the following predicted probability:

$$\hat{z}_{Croatia} = -11.732 + 0.5731 \times ln(3.854) + 0.926752 \times ln(51453.3)$$
$$= -11.732 + 0.7737 + 10.0370 = -0.9213$$
$$\hat{P}_{Croatia} = \Phi(-0.9213) = 0.1781$$

Despite a predicted probability of only 17.8%, Croatia qualified for the World Cup, representing a substantial overachievement relative to its structural characteristics. This result is consistent with the broader footballing literature, which has long noted Croatia's ability to produce elite-level players disproportionate to the size of its population, a phenomenon often attributed to deeply embedded footballing culture, strong club infrastructure, and historically high rates of player migration to top European leagues.

Table 3. *Predicted Probabilities of World Cup Qualification — Probit Model Ranked by predicted probability (descending)*

Country	Q	POP (m) (2025)	GDPPOP ($) (2025)	Pred. Prob.	Classification
Germany	1	83.664	73,553	0.8794	Expected qualifier
France	1	68.628	66,061	0.8312	Expected qualifier
England	1	59.100	63,759	0.7997	Expected qualifier
Italy	**0**	**58.934**	**63,126**	**0.7968**	**Underachiever ▼**
Türkiye	1	86.026	43,786	0.7605	Expected qualifier
Spain	1	49.721	56,888	0.7376	Expected qualifier
Poland	**0**	**36.497**	**55,340**	**0.6675**	**Underachiever ▼**
Netherlands	1	18.048	84,035	0.6613	Expected qualifier
Republic of Ireland	**0**	**5.489**	**147,878**	**0.6013**	**Underachiever ▼**
Switzerland	1	9.029	97,659	0.5628	Expected qualifier
Belgium	1	11.867	75,882	0.5324	Expected qualifier
Sweden	**1**	**10.676**	**73,070**	**0.4943**	**Overachiever ▲**
Norway	**1**	**5.628**	**106,694**	**0.4877**	**Overachiever ▲**
Romania	0	18.832	48,848	0.4755	Expected non-qualifier
Austria	**1**	**9.182**	**74,852**	**0.4688**	**Overachiever ▲**
Kazakhstan	0	20.380	44,778	0.4615	Expected non-qualifier
Czechia	**1**	**10.904**	**59,853**	**0.4260**	**Overachiever ▲**
Denmark	0	6.002	84,763	0.4180	Expected non-qualifier
Israel	0	10.178	55,766	0.3853	Expected non-qualifier
Portugal	**1**	**10.757**	**49,753**	**0.3574**	**Overachiever ▲**
Hungary	0	9.560	48,157	0.3216	Expected non-qualifier
Finland	0	5.612	66,513	0.3193	Expected non-qualifier
Greece	0	10.380	44,985	0.3159	Expected non-qualifier
Scotland	**1**	**5.580**	**63,759**	**0.3043**	**Overachiever ▲**
Ukraine	0	32.862	20,904	0.2989	Expected non-qualifier
Slovakia	0	5.419	47,597	0.2120	Expected non-qualifier
Belarus	0	9.087	34,069	0.2083	Expected non-qualifier
Bulgaria	0	6.263	42,477	0.2056	Expected non-qualifier
Wales	0	3.220	63,759	0.2041	Expected non-qualifier
Luxembourg	0	0.685	152,395	0.1819	Expected non-qualifier
Croatia	**1**	**3.854**	**51,453**	**0.1781**	**Overachiever ▲**
Azerbaijan	0	10.372	26,081	0.1626	Expected non-qualifier

Lithuania	0	2.889	57,201	0.1611	Expected non-qualifier
Serbia	0	6.530	32,742	0.1495	Expected non-qualifier
Northern Ireland	0	1.930	63,759	0.1312	Expected non-qualifier
Slovenia	0	2.131	57,717	0.1239	Expected non-qualifier
Georgia	0	3.694	31,090	0.0788	Expected non-qualifier
Latvia	0	1.868	44,106	0.0694	Expected non-qualifier
Cyprus	0	0.942	65,304	0.0656	Expected non-qualifier
Estonia	0	1.374	49,088	0.0597	Expected non-qualifier
Malta	0	0.563	78,711	0.0514	Expected non-qualifier
Bosnia and Herzegovina	**1**	**3.445**	**22,830**	**0.0410**	**Overachiever ▲**
Armenia	0	3.106	23,954	0.0398	Expected non-qualifier
Iceland	0	0.391	80,466	0.0344	Expected non-qualifier
Albania	0	2.695	23,327	0.0315	Expected non-qualifier
North Macedonia	0	1.810	29,510	0.0307	Expected non-qualifier
Moldova	0	2.381	19,591	0.0182	Expected non-qualifier
Liechtenstein	0	0.041	201,112	0.0118	Expected non-qualifier
Kosovo	0	1.577	20,393	0.0110	Expected non-qualifier
Montenegro	0	0.624	34,408	0.0097	Expected non-qualifier
Andorra	0	0.089	72,359	0.0028	Expected non-qualifier
San Marino	0	0.034	82,886	0.0007	Expected non-qualifier

Notes: Predicted probabilities are derived from the probit model estimates reported in Table 2. Q = 1 denotes qualification; Q = 0 denotes non-qualification. POP denotes population in millions; GDPPOP denotes GDP per capita in US dollars. Overachievers (highlighted in amber) are countries that qualified (Q = 1) despite a predicted probability below 0.5. Underachievers (highlighted in salmon) are countries that failed to qualify (Q = 0) despite a predicted probability above 0.5.

The most dramatic overachievement in the sample belongs to Bosnia and Herzegovina. With a population of 3.445 million and a GDP per capita of just $22,830 — one of the lowest in the sample — its predicted probability is:

$$\hat{z}_{\text{Bosnia}} = -11.732 + 0.5731 \times \ln(3.445) + 0.926752 \times \ln(22829.7)$$
$$= -11.732 + 0.7086 + 9.2859 = -1.7375$$
$$\hat{P}_{\text{Bosnia}} = \Phi(-1.7375) = 0.0412$$

Bosnia and Herzegovina qualified with a predicted probability of just 4.1%, the lowest among all qualifying nations and the single largest positive deviation between actual outcome and structural prediction in the entire sample. This finding strongly suggests that unobservable country-specific factors — encompassing footballing culture, coaching quality, player development pathways, and national team organisation — can, in exceptional cases, override the structural disadvantages implied by small population size and relatively low income per capita.

Taken together, the predicted probability analysis reinforces the main findings of the probit regression while adding a richer country-level narrative. Population remains the dominant structural determinant of qualification, as evidenced by the strong performance of large nations and the near-zero probabilities assigned to microstates. However, the identification of eight overachievers and three underachievers demonstrates that the model, while statistically robust, cannot fully account for the heterogeneity in footballing outcomes across European nations. The residual variation — captured by the gap between predicted probabilities and actual outcomes — points to the importance of unobservable institutional and cultural factors that lie beyond the scope of the current model and represent a natural avenue for future research.

The identification of overachievers in the predicted probability analysis invites a deeper qualitative investigation into the mechanisms through which small, relatively low-income nations can defy structural expectations and secure World Cup qualification. The present paper proposes that the primary explanation lies in the generational production of individual star players — elite footballers whose personal quality is large enough to shift the qualification probability of an entire national team beyond what population and income alone would predict. This argument can be stated more precisely as follows. The probit model captures the structural probability of qualification as a function of two observables: population size and GDP per capita. Whatever remains unexplained — the residual — must, in a well-specified model, reflect factors that are orthogonal to these structural characteristics. Individual talent, being partly a product of genetics, chance, and the unpredictable clustering of exceptional ability within a single generation, is precisely such a factor. It is unobservable, largely exogenous to economic and demographic conditions, and sufficient in extreme cases to override structural disadvantages entirely.

This interpretation also provides a natural explanation for the well-documented rise and fall of national football teams over time — a phenomenon that the population-GDP framework, applied cross-sectionally, cannot account for. Nations do not rise and fall in the FIFA rankings because their populations or income levels change rapidly; these variables are slow-moving. What changes quickly is the generational composition of the squad — the arrival and departure of exceptional talent. Greece's extraordinary European Championship victory in 2004, Italy's sustained dominance followed by its recent decline, and Croatia's remarkable consistency over three decades despite a population of under four million are all more convincingly explained by the lifecycles of specific player generations than by shifts in structural characteristics. A national team is, in effect, a portfolio of human capital whose quality fluctuates around a structural mean determined by population and income, but which can deviate dramatically from that mean when a generation of exceptional players coincides in their prime years.

Crucially, the star player effect and the population effect are not independent. Larger countries have a higher probability of producing a world-class player in any given generation simply by virtue of the size of their talent pool — this is precisely why population enters the probit model with a positive and highly significant coefficient. But the relationship is probabilistic, not deterministic. A small country with a population of three or four million will, on average, produce far fewer elite players than Germany or France; yet it retains a non-trivial probability of producing

one or two exceptional individuals in any given decade. When that happens, and when those individuals happen to reach their peak simultaneously and are available to the national team, the structural disadvantage can be overcome. Bosnia and Herzegovina's qualification with a predicted probability of just 4.1% is not a failure of the model; it is the model correctly identifying the structural implausibility of the outcome, while the star player mechanism explains how that implausibility was nonetheless realised. The star player effect is, by nature, an unobservable that the probit model captures only through its residual; quantifying it econometrically would require individual-level data on player quality, club affiliation, and international experience that lie beyond the scope of the present paper. Nevertheless, anecdotal evidence provides compelling support for the star effect among the identified overachievers, as the following cases illustrate.

Croatia is perhaps the most celebrated example of a nation that has consistently punched above its demographic and economic weight in international football. With a population of just 3.854 million, Croatia has produced an extraordinary concentration of world-class talent over the past three decades. The generation that qualified for the 2026 World Cup was built around Luka Modrić, widely regarded as one of the greatest midfielders of his era, a five-time Champions League winner with Real Madrid and a Ballon d'Or recipient in 2018. Alongside him, Ivan Perišić, Mateo Kovačić, Marcelo Brozović, and Joško Gvardiol — all established starters at elite European clubs — provided a quality of squad depth that bears no relationship to Croatia's population of under four million. The predicted probability of 17.8% assigned by the model captures precisely this structural implausibility: Croatia qualified not because of its size or wealth, but because of an exceptional concentration of elite human capital in a single generation, a phenomenon that the population-GDP framework cannot, by construction, account for.

Bosnia and Herzegovina presents an even more striking case. With a predicted probability of just 4.1% — the lowest among all qualifiers — Bosnia's qualification rested to a significant degree on the presence of Edin Džeko, one of the most prolific strikers of his generation, who scored over 70 goals for the national team across his career and whose experience at clubs including Manchester City, Roma, and Inter Milan brought a level of technical and tactical sophistication that far exceeded what a country of 3.4 million people with a GDP per capita of $22,830 could be expected to produce systematically. The presence of players such as Miralem Pjanić — a Champions League-winning midfielder with Juventus and Barcelona — in earlier qualifying cycles similarly illustrates how a handful of world-class individuals can transform the competitive prospects of an otherwise structurally disadvantaged nation.

Scotland's overachievement, with a predicted probability of 30.4%, can similarly be attributed in part to the quality of individual players operating at elite club level. Andrew Robertson, one of the finest left-backs of his generation and a Champions League winner with Liverpool, provided not only individual quality but also crucial leadership and organisational capacity within the national team setup. Players such as Scott McTominay, Callum McGregor, and Ryan Christie — all regulars at major European clubs — contributed to a collective quality that exceeded what Scotland's structural profile alone would suggest.

Portugal's qualification with a predicted probability of 35.7% is perhaps the most straightforward case of individual star quality overriding structural constraints. The presence of Cristiano Ronaldo — arguably the most prolific international goalscorer in the history of the sport — in the Portuguese squad represents an extreme case of individual human capital that no econometric model based on population and income can capture. Portugal has qualified for every major international tournament in the modern era in no small part because of the transformative effect of a single generational talent, a phenomenon that raises deep questions about the appropriate unit of analysis in footballing success research.

The star player mechanism also provides the most convincing explanation for one of the most striking empirical regularities in international football: the dramatic rise and fall of national teams over time that cannot be attributed to changes in structural characteristics. Hungary's extraordinary Golden Team of the early 1950s — built around Ferenc Puskás, Sándor Kocsis, and Nándor Hidegkuti — produced arguably the greatest national team ever assembled, going four years unbeaten and defeating England 6–3 at Wembley in 1953, yet within a decade of this generation's dispersal following the 1956 Revolution, Hungary had returned to a level entirely consistent with its modest structural profile; in the present study Hungary records a predicted qualification probability of just 32.2% and correctly fails to qualify. Romania's remarkable 1994 World Cup quarter-final run was almost entirely a product of Gheorghe Hagi's individual genius; once he retired, Romania reverted to the structural baseline implied by its population and income. The Netherlands has oscillated between world-class and mediocre depending on whether a golden generation happened to coincide — the Cruyff era, the Van Basten era, the Robben–Sneijder era — with each peak followed by a trough that population and GDP cannot explain. Denmark, whose predicted probability in the present study is just 41.8%, won the 1992 European Championship on the strength of the Laudrup brothers and Peter Schmeichel, a concentration of talent that the country's six million population could not be expected to produce consistently. In each of these cases, the probit model's structural prediction would have been broadly correct on average — but spectacularly wrong in the specific decade when the exceptional generation happened to be in its prime. This is not a failure of the model; it is a confirmation of the theoretical argument advanced here: that national football performance is the sum of a slow-moving structural component, determined by population and income, and a fast-moving talent component determined by the unpredictable generational production of exceptional individual ability.

Conclusions

This paper has examined the role of population size and GDP per capita as structural determinants of World Cup qualification among the 52 UEFA member nations competing in the 2026 FIFA World Cup European qualifying rounds. Using a probit model as the preferred specification, alongside logit and OLS estimates for robustness, the study yields several clear and consistent findings that contribute to the growing literature on the economics of international football performance.

The central finding is that population size, measured as the natural logarithm of total population, is a statistically significant and robust determinant of qualification probability, with a positive coefficient that is significant at the one percent level across all three model specifications. This result is consistent with the long-standing hypothesis in the sports economics literature that larger nations benefit from deeper talent pools, which in turn increases the probability that a country can field a competitive national team capable of navigating a demanding qualification campaign. The finding corroborates earlier work by Hoffmann et al. (2002), Houston and Wilson (2002), and Papanikos (2017), all of whom identified population as a significant positive determinant of international football performance, and aligns with the broader population-GDP framework established by Bernard and Busse (2004) in the context of Olympic success.

GDP per capita, measured as the natural logarithm of income per capita, is positive across all three specifications, suggesting that wealthier nations enjoy structural advantages in terms of their capacity to invest in football infrastructure, youth development, and coaching. However, the significance of this variable is sensitive to model specification: it is significant at the five percent level in the OLS model but only borderline significant in both the probit ($p = 0.0502$) and logit ($p = 0.0464$). This divergence highlights the importance of employing the appropriate econometric framework when modelling binary outcomes, as the linear probability model can overstate the precision of coefficient estimates due to structural misspecification. The weaker significance of GDP per capita in the correctly specified probit model is economically intuitive: within Europe, which is a relatively prosperous region by global standards, variation in income per capita may exert less marginal influence on qualification probability than the sheer size of the talent pool. This finding suggests that beyond a certain level of economic development, additional wealth generates diminishing returns in terms of footballing success.

The comparison of probit and logit estimates confirms their near-identical qualitative conclusions, as is standard in the binary choice literature. The probit is retained as the main model on the grounds of its superior fit, its theoretical motivation via the normal distribution assumption, and its widespread use in the applied econometrics literature.

The predicted probability analysis extends the regression results into a richer country-level narrative. The model correctly classifies the majority of nations, assigning high qualification probabilities to large, wealthy countries — Germany (0.879), France (0.831), England (0.800) — that did qualify, and near-zero probabilities to microstates — San Marino (0.001), Andorra (0.003) — that did not. Three nations are identified as underachievers: Italy, with a predicted probability of 0.797, represents the single most structurally surprising non-qualification in the sample; Poland (0.668) and the Republic of Ireland (0.601) also failed to qualify despite structurally favourable characteristics. Eight nations are classified as overachievers, of which Croatia (0.178) and Bosnia and Herzegovina (0.041) stand out most dramatically, having qualified despite the model assigning them very low probabilities based on their population and income levels alone.

The identification of overachievers and underachievers carries an important conceptual message. The model, while statistically robust and well-specified, cannot

fully account for the heterogeneity in footballing outcomes across European nations. The residual variation — captured by the gap between predicted probabilities and actual outcomes — points to the importance of unobservable country-specific factors, including deeply embedded footballing culture, the quality and continuity of coaching and player development pathways, institutional quality within national football associations, and the capacity to organise tactically and psychologically around a high-pressure qualification campaign. These factors lie beyond the scope of the present parsimonious two-variable model and represent a natural and important avenue for future research.

Several avenues for extending this work suggest themselves. A panel data approach covering multiple qualification cycles would allow for the exploitation of within-country variation over time, potentially revealing whether the population-GDP relationship has strengthened or weakened as the game has globalised. Additionally, the framework could be extended to other UEFA competitions — such as the European Championship — or to qualifying rounds in other confederations, to assess whether the findings generalise beyond the European context.

The identification of overachievers in the present study points to a promising and largely underdeveloped area of future research. Each of the eight overachieving nations identified in Table 3 represents a natural candidate for an in-depth case study analysis examining the specific mechanisms through which structural disadvantages were overcome. Such case studies could systematically investigate the football development policies — encompassing youth academy infrastructure, national federation governance, coaching education systems, and the role of diaspora communities in talent identification — that enabled nations such as Croatia, Bosnia and Herzegovina, Scotland, and Portugal to qualify against structural odds. Croatia's acclaimed youth development system, which has produced elite players consistently across multiple generations despite a population of under four million, warrants particular scholarly attention, as does Bosnia's capacity to leverage its substantial diaspora talent pool across Europe. A comparative case study framework — examining each overachiever separately and seeking to identify common institutional and cultural factors — would complement the macro-level econometric approach of the present paper and move the literature toward a richer, multi-method understanding of the determinants of international footballing success. Such research would also have direct policy implications for smaller UEFA member associations seeking to identify the institutional investments and structural reforms most likely to improve their qualification prospects in future World Cup cycles.

More formally, the star player mechanism proposed here implies that a nation's qualification probability in any given cycle is the sum of its structural component — determined by population and income — and a stochastic talent component whose variance is itself inversely related to population size. Testing this prediction would require longitudinal individual-level data on player quality and national team composition across multiple qualification cycles, and represents a promising direction for future econometric work.

In conclusion, this paper provides robust econometric evidence that population size is the primary structural determinant of World Cup qualification among European nations, while GDP per capita plays a positive but secondary and less

precisely estimated role. The results are consistent with the broader population-GDP model of sporting success and contribute a new binary choice modelling perspective to the literature on the economics of international football.

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