Ancestral Diversity and Performance: Evidence From Football Data*

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Abstract

The theoretical impact of diversity is ambiguous since it leads to costs and benefits at the collective level. In this paper, we assess empirically the connection between ancestral diversity and the performance of sport teams. Focusing on football (soccer), we built a novel dataset of national teams of European countries having participated in the European and the World Championships since 1970. Ancestral diversity of national teams is based augmenting the diversity index with genetic distance information on every players' origins in the team. Origins for each player are recovered using a matching algorithm based on family names. Performance is measured at the match level. Identification of the causal link relies on an instrumental variable strategy based on past immigration at the country level about one generation before. Our findings indicate a positive causal link between ancestral diversity and teams' performance. We find that a one-standard increase in diversity can lead to ranking changes of two to three positions after each stage of a championship.

Keywords: Ancestral diversity, Football, Sports team, Performance, Family names, Migration

JEL classification: F22, F66, O15, O47, Z22

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1 Introduction

Over the last decades, international human mobility has been on the rise, involving millions of people moving to another country. Today, there are more than 240 million people living in a country other than the one in which they were born. This process has led to significant changes in the cultural landscapes of the host countries, with important consequences for the size and the composition of their labor force. Migrants bring with them deep-seated social values, human capital, institutions, history, and traditions. As a consequence, countries that have experienced large immigration flows in the past are characterized today by a greater diversity in their populations.

National teams in international sport competitions also reflect the increased level of diversity brought by immigration. In football, the most popular sport worldwide, national teams in immigration countries have become more diverse because the teams attract players from the larger and more diversified talent pool that is available in the country. At the 2018 FIFA Men's World Cup in Russia, 84 football players competed for national teams of countries other than their country of birth. It was the second-highest absolute number of foreign-born footballers in the history of the World Cup (van Campenhout et al., 2019). More significantly, in immigration countries, a high proportion of players on national teams are second-generation migrants, bringing with them endowments that are different from the one found in the native population of the country they play for.

Ethnic indentity is a key dimension of diversity, exerting a potential effect on productivity and collective performance. Previous work on ethnic diversity suggests that higher diversity exerts a positive effect on global productivity (Alesina et al., 2016; Alesina and Ferrara, 2005). Regarding the inherited aspect of this dimension, Ashraf and Galor (2013) focus on genetic diversity and argue that there is an optimal level in terms of productivity. On the one hand, diversity brings complementarity in skills, which results in a higher level of productivity. On the other hand, genetic distances across populations are proxies for differences in history, culture, and social values. These can be seen as an excellent summary statistic capturing divergence in the whole set of implicit beliefs, biases, conventions, and norms transmitted across generations—biologically and culturally—with high persistence (Spolaore and Wacziarg, 2009; 2016; 2018). Besides, ancestry affects culture even after several generations (Guiso et al., 2006) not only because culture is transmitted to an enormous degree intergenerationally, but also because differences among individuals with different ancestries are related to differences in their values and preferences (Bisin and Verdier, 2001). These divergences associated with diversity might mitigate or offset diversity's positive impact on productivity.

In this paper, we investigate the role of ancestral diversity in the performances of national football teams. One interesting aspect of this sports activity is the fact that performances are measured precisely and are much less subject to measurement errors compared to other economic activities. The case of football is interesting, beyond the fact that it is the most popular sport worldwide, since the performance of a team relies on the interaction of players who need to have very different skills, depending on their position on the pitch. This clearly refers to the complementarity of skills channel mentioned above. It is empirically unclear in football to what extent the cultural channel and the divergence-in-beliefs channel associated with higher diversity are substantial and might offset the positive effect of the skill complementarity. Anecdotal evidence suggests, however, that there is some belief that diversity does affect football performance positively. In 2012, Belgium succeeded to a 2–0 away win over Scotland during the World Cup qualification process. Commenting on this result, Scotland assistant manager Mark McGhee described the Belgian team's skill pool as follows: [1]

> They are choosing from a pool that is different from us. They have the advantage of an African connection and can bring in real athleticism...We can hope, of course, that out of the gene pool that is East Dunbartonshire, Lanarkshire and South Ayrshire we produce a group of players that will one day be as good as them. But they have a much broader base, and I think that is a huge advantage.

Former U.S. President Barack Obama, in his tribute speech to commemorate Nelson Mandela's birthday in 2018, praised the diversity of French football team, stating that

> [diversity] delivers practical benefits since it ensures that a society can draw upon the energy and skills of all... people. And if you doubt that, just ask the French football team that just won the World Cup because not all these folks look like Gauls to me....[2]

As of February 18, 2021, Belgium and France were ranked first and second worldwide respectively, according to the World Rankings provided by the Fédération Internationale de Football Association (henceforth FIFA).[3] One of the goals of this paper is to check whether these perceptions are supported by some sound statistical analysis.

To establish a causal link between the sportive teams' ancestral diversity and performance, we develop specific measures of the key dimensions, i.e., performances and ancestral diversity of football teams. Performance data are collected at the match at the World Cup and the European championship competitions from 1970 onward. At the match level, we use the goal difference as the benchmark outcome variable but show that our results are robust to alternative measures. The ancestral diversity of each team is based on the bilateral genetic *distance* between players. Data on genetic distance comes from Spolaore and Wacziarg (2009), who using data from Cavalli-Sforza et al. (1994), quantify a genetic distance that effectively measures the time since two populations shared a common ancestor. We interpret this index of genetic distances to capture long-term population relatedness in line with the argument by Dickens (2018) that connects genetic distances to the complementarities of people dissimilarities. On the one hand, narrow genetic distances mean similar traits and ideas, and thus easier communication but fewer novel ideas to share among similar populations. On the other, more significant genetic distances imply a long history of remoteness and a broader spectrum of non-overlapping but more likely novel and complementary ideas and traits to share. We follow the approach of using family names to capture the ethnic background of individuals adopted in different fields such as the patents literature (Kerr and Kerr, 2018) or the study of intergenerational mobility (Clark, 2015).[4] Our measure of

[1] Mark Wilson, "Brilliant Belgians just incomparable insists Scotland assistant coach McGhee,"

[2] France24, "In Mandela address, Obama cites French World Cup model as champs of diversity,"

[3] FIFA.com. "Men's ranking: Belgium, Royal Belgian Football Association." `https://www.fifa.com/fifa-world-ranking/associations/association/BEL/men/`

[4] This surname-based idea was previously adopted in the patents literature (Kerr and Kerr, 2018) and in the study of intergenerational mobility, as in Clark (2015). An alternative predictor of player origins would be, for instance, the birth country, as used in van Campenhout et al. (2019) for their players' diversity index. This measure would likely be a good match for players who undergo naturalization, but it would fail to capture second-generation aspects of immigration. This last is critical for our setting, as we focus on the vertical-transmission mechanisms related to group-dynamics, focus on national teams, and base our identification strategy on previous-generation migration

ancestral diversity at the national level suggests that diversity has changed significantly over the period of investigation, especially in countries of past intensive immigration.

The econometric analysis of the causal link between ancestral diversity and performance of national teams is likely to be affected by a set of confounding factors that can bias the estimated impact of diversity. Our identification strategy relies on an instrumental variable (IV) approach that makes use of the ancestral diversity of past immigration flows at the population level. More specifically, we instrument the ancestral diversity of football's national teams with a measure of ancestral diversity for the immigration stocks about one generation before (20 years). The idea is that higher diversity in immigration yesterday increases the diversity of second-generation migrants who can today play for the national team of their parents' adopted country. The strict rules of eligibility for participation on a national team in football prevent the implementation of a strategy in which diversity could be manipulated by national federations. This lowers the concern that this instrument does not comply with the exclusion restriction. Our IV results therefore allow to uncover an overlooked benefit of immigration, namely, its long-run benefit in terms of performance in collective sports.

We hypothesize, and then show empirically, that ancestral diversity implies significant complementarities (tactical, technical and physical) among players, affecting performance positively. It is important to note that we do not, of course, address the direct effect of genes on sports performance. In contrast, our analysis addresses the benefits and drawbacks of ancestral diversity on performance measured at a collective level. We expect ancestral diversity in sports to affect performance through a variety of channels. These channels include (i) the ability to play as a team, conveyed by norms of cooperation belonging to different nationalities; and (ii) the improved complementarities among players in view of the different skills required for different roles in the game.

We find a positive net benefit on team's performance. A one-standard-deviation increase in diversity yields an increase of around one point in the goal difference. These findings are robust in an alternative unilateral setting where the outcome variable is the ranking of the team [5]. The results are also robust to whether passive players are included or not, to alternative measures of ethnic distance, to the way bilateral performances are captured, and to the fact that hosting teams usually have an advantage in football. In addition, we control for coaching quality that could confound the identification of the causal impact of diversity. The results are also robust to the number of years that past immigration flows are expected to impact ancestral diversity of national teams in the first stage of the IV analysis. Finally, we perform a placebo test using performances in athletics, i.e., a sport in which diversity should not play any role, given that competitions do not involve any collective effort. We do not find any role of ancestral diversity in explaining performances in athletics.

While our paper is clearly connected with the literature on the role of ethnic and birthplace diversity, our analysis is also related to a large empirical literature looking at the role of immigration in football. This literature is reviewed in the next section. Our paper deviates from the existing papers in that we focus on the performances of national teams, not on football clubs. In the context of this investigation, a similar analysis at the club level would be more

patterns.

[5] For readibility, we bring this analysis iin the online appendix.

subject to endogeneity issues. Through transfers of players, a club could explicitly implement a strategy to boost diversity in order to improve the team's performances. Given the strict rules governing the composition of national teams in football, such a strategy would hardly be possible. While some naturalization strategies have sometimes been implemented, they remain more an exception than the rule.

UPDATE The paper is organized as follows. Section 2 briefly reviews the relevant literature. In Section 3, we describe the data used in our analysis. Section 4 introduces the empirical analysis. Section 4.2 presents the main results, discusses identification issues, and Section 6 exposes the robustness checks. Our placebo analysis is detailed in Section 6.1. Section 6.1 concludes.

2 Literature review

The economic implications of diversity have produced a very extensive literature. Prior studies investigate the effects of ethnic diversity on growth (Easterly and Levine, 1997; Docquier et al., 2019; Ager and Brückner, 2013), on economic prosperity (Alesina et al., 2016), on trade (Alesina et al., 2000), on polarization (Bove and Elia, 2017), on individuals' preferences (Alesina and Ferrara, 2005), on community participation (Alesina and La Ferrara, 2000) and on the provision of public goods (Spolaore and Wacziarg, 2009). Prior studies also relate diversity to the performance of collective organizations. The seminal model of Lazear (1999) emphasize the role global organizations as multicultural teams. To offset the costs of cross-cultural interaction, the complementarities among different workers must, however, be substantial. Delis et al. (2017) use a panel of U.K. and U.S. firms listed on the stock market and track the ancestral diversity of the board of directors, finding positive effects on the firm's performance as measured by risk-adjusted returns and the Tobin's Q. Delis et al. (2021) apply a similar analysis to the movie industry, finding an optimal degree of ancestral diversity of actors and directors on the box office figures of attendance. In Prat (2002), diversity of team members results in diverse decision-making processes, which brings benefits in the case of actions' submodularity. Studying working groups in a multinational firm setting, Earley and Mosakowski (2000) propose and document that teams effectiveness is highest at the bottom and top levels of group heterogeneity, whilst Dumas et al. (2013) document that demographically dissimilar groups tend to respond less well to corporate activities that aim at stimulating group cohesion. Focusing on the mechanisms, Miller and del Carmen Triana (2009) identify innovation and reputation as important channels in the role of racial diversity of board-directors and corporate performance. Shin et al. (2012) analyze the individual-level outcomes of team diversity in the context of Chinese firms. They find that a positive link between cognitive diversity and creativity depends on individuals' beliefs on their own creativity, and highlight the key role of leadership in shaping a positive effect. In the findings of Watson et al. (1993) and Horwitz and Horwitz (2007), performance gains from diverse teams would materialize, after allowing for some initial burning phase in the team formation.[6]

The literature that stresses on the long-term dimension of population diversity is more recent. Spolaore and

[6]As we focus on national teams, we believe that team formation is already consolidated at the moment of the performance and this mediator is less of a concern in our setting. Yet, we also include a set of team-level controls such as average age and players turnover, which would further account for possible asymmetries in team characteristics.

Wacziarg (2018), Ashraf and Galor (2013) and Delis et al. (2017) are seminal contributions that relate genetic diversity and performance. Distinguishing between the measurements of diversity is relevant because these may present different patterns (Alesina et al., 2016). To the best of our knowledge, our paper is the first study to explore the effects of ancestral diversity on sports performance.

Focusing on sports, Kahane et al. (2013) provide evidence from hockey and generally find a positive effect of cultural diversity. Parshakov et al. (2018) use e-sport data to investigate the impact of cultural, language, and experience heterogeneity on performance. Cultural diversity correlates positively with tournaments performance, while language and experience diversity are found to affect performance negatively. Gould and Winter (2009) build a panel of baseball players from 1970 to 2003 and observe that workers' (players') efforts and interactions depend on the complementarities in the production technology. A recent contribution by Tovar (2020) explores the link among diversity, national identity, and performance at the player and team level, analyzing data from the Spanish and English leagues. The study found a non-linear relationship between the team's and the players' performance.[7] Also concentrating on club-level performance, Brox and Krieger (2019) provide evidence from German men's football, finding that an intermediate level of birthplace diversity maximizes team performance. Ingersoll et al. (2017) enlarge the set of countries and investigate the effect of cultural diversity on the club teams' performances in the top leagues in the UEFA Champions League (2003–2012) for Germany, England, Italy, France, and Spain. In their findings, culturally heterogeneous teams outperform homogeneous ones, cultural diversity being proxied by linguistic diversity data based on players' nationality.

We contribute to the sports literature in various areas. We use ancestral diversity to capture deeply rooted differences in values related to culture, language, and other diversity dimensions. This measure of diversity helps to attenuate any endogeneity concern. The dataset we build for that purpose includes a much larger number of countries and tournaments than do previous studies. We establish a causal link, not just a correlation, between performance and diversity. Finally, our perspective is innovative as we tackle the importance of an intergenerational aspect of diversity in sports teams. In doing so, we can better assess the causality of the relationship among past immigration, diversity, and sports performance.

3 Data

To analyze the impact of ancestral diversity on the performance of national football teams, we collect and build indicators of diversity and performance as well as other variables. We start by explaining how key data are built, namely, ancestral diversity at the team level and the performance. We then present other variables that enter into the subsequent econometric analysis.

[7] Another related paper using clubs and not national teams, is Haas and Nüesch (2012). This study uses match-level, panel data (ranging from 1999 to 2005) from the German Bundesliga, employing the nationality of team members. It documents a negative effect on the number of points received given the game outcome, the goal-difference, and an average of individual players' performance evaluations made by experts. In addition, Vasilakis (2017) examines how the increase in mobility has reshaped the players' market among clubs and produced distributional effects in terms of performance and wages.

3.1 Measuring ancestral diversity at the team level

Our key indicator of interest to explain the performance of a given national football team is its ancestral diversity. To capture this relationship, we gather information on the team composition. From this, we then establish a measure for the characteristics of each team member and relate how the individual information on the player's origins is combined to yield an indicator of diversity.

National team composition.

We collect data on the composition of national squads from the website *worldfootball.net*, with some comparisons and checks using *soccerway.com* and Wikipedia. Squad data on Turkey was absent for two periods in the main source, and the desired information was obtained through the source *https://www.national-football-teams.com.* For every European team that entered either tournament $\in$ {Euros, World Cup} over the period 1970 to 2018, we obtained information on players' names, their age, and their minutes/appearances in the competition at each stage $\in$ {Qualification, Finals}.[8]

In our baseline specifications, we include each player from the squad list in our diversity measure, regardless of his appearance time. Ingersoll et al. (2017) focus on football clubs and identify that cultural diversity on the pitch matters positively for performance. Yet they find an insignificant effect for off-the-pitch interactions. To accommodate this possible heterogeneity, we also include minutes played as weights in our diversity calculations in one of our sensitivity checks.

Ethnicity of players.

For societies with patrilineal surnames customs, surnames are known indicators of population structure and relatedness in the genetic literature (Piazza et al., 1987; Jobling, 2001), and are not new to the economic literature. For instance, works by Kerr and Kerr (2018), Clark (2015) and Buonanno and Vanin (2017) in different fields of economics use surnames to predict ethnicity and community relatedness. We follow this global approach in order to characterize the ancestral diversity of each national team. We obtain data on each surname's geographical distribution from the web source *forebears.io*, which presents a set of country-level statistics for a great variety of surnames.

More specifically, for each unique surname in the full list of players in our dataset, this source provides the three countries ($country_1$, $country_2$, $country_3$) displaying the highest incidences (i.e., number of people having that surname in a particular country) and the highest frequencies (i.e., percentage of people having that surname in a particular country) of that specific surname. We then identify the best predicted country $i*$ for a surname as the country i associated with the highest value of the variable ($Incidence_i * frequency_i$, $i \in country_1, country_2, country_3$). This procedure avoids favoring very small countries, which would occur if we looked only at the frequency (e.g., virtually every surname in Monaco has very high frequencies). Further, it avoids favoring very big countries, as would happen if

[8]Given the full name lists, we proceeded with a splitting to separate the father name information. The web source *soccerway.com* presents players' profiles with names and surnames separated. Whenever we could match the player in our sample to his profile on *soccerway.com*, we used the surname as presented in the source. In the other occurrences, name splitting was performed according the following decision rule: we extracted the last part of the full name instance by taking into account particular nominal particles, such as "De," "Van," "Van Der," "Von," "Di," etc. With Spanish and Portuguese teams, the splitting followed the typical country's customs: for Spain, the first surname corresponds to the father's surname, and vice versa for Portugal. We focus on father surnames for cross-country comparability.

one relied on the incidence only (e.g., countries like the U.S. have generally higher incidences, even for rare surnames).[9] Our website of choice has the important feature of delivering accent-sensitive information, which increases precision when mapping a surname and a country of origin.[10] While some measurement error concerns were addressed via the manual cleaning, with the choice of this proxy, this method performs quite well in capturing the second-generation of migrants who may still contribute to the team's diversity (e.g., French national Zinedine Zidane was born in Marseille and is of Algerian descent). Examples of the algorithm prediction results are found in Appendix 8.

Ancestral diversity.

Diversity Div_{ist} of team i at time $t \in \{1970, ..., 2018\}$ and at competition stage s is given by :

$$Div_{ist} = \frac{1}{S_t} \sum_{j=1}^{N_t} \sum_{k=1}^{N_t} (p_{jt} p_{kt} d_{jk}), \; j \neq k \quad (1)$$

where p_{jt} and p_{kt} are the shares of players on the team (predicted to be from origin j and k respectively) belonging to the set of origins $\{1,...N_t\}$ in team i for stage s of championship t. The fraction $\frac{1}{S_t}$ operates as a normalization factor for different squad sizes reported on the web source for the qualification stages. d_{jk} is the genetic distance between origin j and origin k, belonging to the set of surname-predicted origins in the squad. We use genetic distances in a fashion similar to Alesina et al. (2016), implying that our indicator can be seen as a weighted average of genetic distances over all origin pairs in the team. Data on bilateral genetic distance d_{jk} come from Spolaore and Wacziarg (2009) who adapt distance matrices from the genetic literature (Cavalli-Sforza et al., 1994). Spolaore and Wacziarg (2009) quantify a genetic distance - a molecular clock - that measures the time since two populations shared a common ancestor. In a similar vein as Dickens (2018), we interpret this index of populations relatedness as ancestral diversity. Players originating from populations with a narrow genetic distance have a high likelihood of similar traits and ideas, and thus they may possess fewer novel ideas and attributes to share. However, players from population groups with significant genetic distances have a higher chance of holding a broader spectrum of non-overlapping and more complementary ideas and traits. This approach is comparable to Ingersoll et al. (2017)'s linguistic diversity and does not profoundly differ from linguistic diversity indicators proposed by the seminal work of Greenberg (1956) and re-elaborated in Fearon (2003). The explicit consideration of genetic distances, key to our framework, allows more weight to be given to more genetically distant origins.[11]

[9] A first manual cleaning was performed using a language detection algorithm in Python. Specifically, we used language-predictive libraries (TextBlob, langdetect) in Python to check whether the surname prediction coming from our algorithm was in line with these library-based predictions. With this approach, in some minor cases, we corrected a minority of surnames manually. We also performed a manual validation step. Here, we separated between the probability of wrongly assigning the player a foreign origin and the probability of wrongly assigning the player a domestic origin. The manual checking revealed measurement errors resulted almost exclusively fromthe first type. In our data, foreign predicted players accounted for N% of the sample. For these observations, online sources were used for the checking of these predictions. To correct, we applied a conservative approach, i.e. we only assigned a foreign origin if some online sources could confirm so.

[10] Building a small sample of 314 recent national teams' players, whose ethnicity was found through a set of online newspapers, the *forebears.io*-based technique performed better than two alternative measures considered: *www.name-prism.com/* and *http://abel.lis.illinois.edu/cgi-bin/ethnea/search.py*. The results are not reported here in the interest of space but can be obtained upon request.

[11] This source led us to exclude two national teams from our sample, Andorra and Liechtenstein, as they are not part of the Spolaore and

As a snapshot example, we report in Figure 1 the cross-country variation of diversity in the EUROs 2016. A general pattern appears with Eastern Europe teams presenting lower diversity levels, whereas in Western Europe teams show higher levels of diversity, likely reflecting accumulated migration inflows over the recent decades.

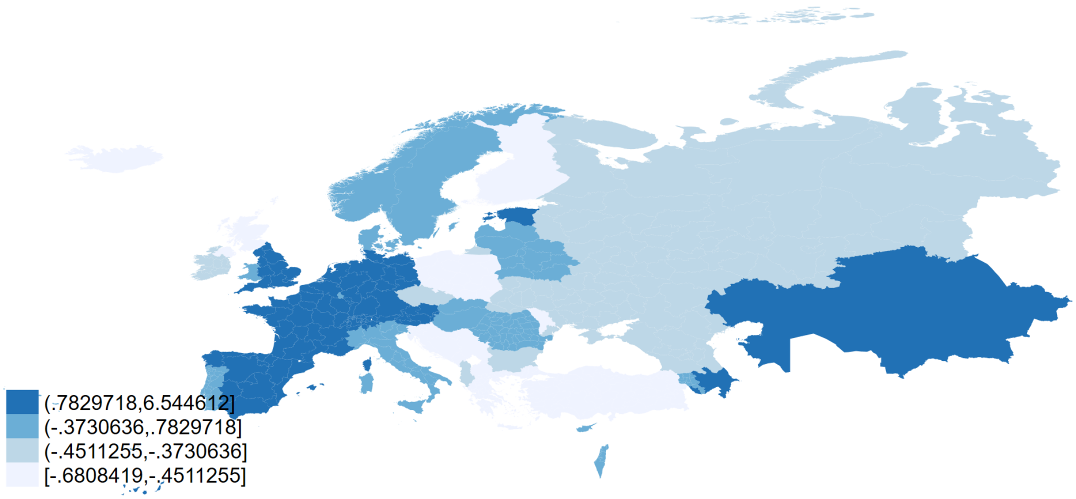


Figure 1. Diversity of national teams, EURO 2016, qualifications

Notes: In Figure 1, we plot a cross-sectional example for our diversity index, taking the 2016 EURO qualifications as the tournament of reference. As a general pattern, we observe higher levels of diversity in the Western area.

3.2 Measuring performances of national teams

Our main variable of national teams' performance is measured at the match level and it has a dyadic nature: the performance of one team depends also on the perforamnce of the opponent. More specifically, our performance outcome is the goal difference. Data at the match level come from the collection *International Football Results from 1872 to 2020* assembled by Mart Jürisoo. It includes a complete and updated men's football international matches dataset.[12] Figure 3 provides a summary of the key components of the bilateral measure, i.e., scored and received goals, broken down between home (left panel) and away (right panel) matches. The figures confirm that, on average, teams perform better at home than abroad, a well-known feature in football competitions. We will account for this feature in the econometric specification involving the bilateral dimension of performances.

Tables 1 in the Section xx provide summary statistics for the main variables. The full list of countries included in the sample is given in Table **??**.

Wacziarg's dataset. All other countries were included.

[12] Mart Jürisoo, International Football Results from 1872 to 2020. Retrieved on January 2020. https://www.kaggle.com/martj42/international-football-results-from-1872-to-2017/tasks (version 4).

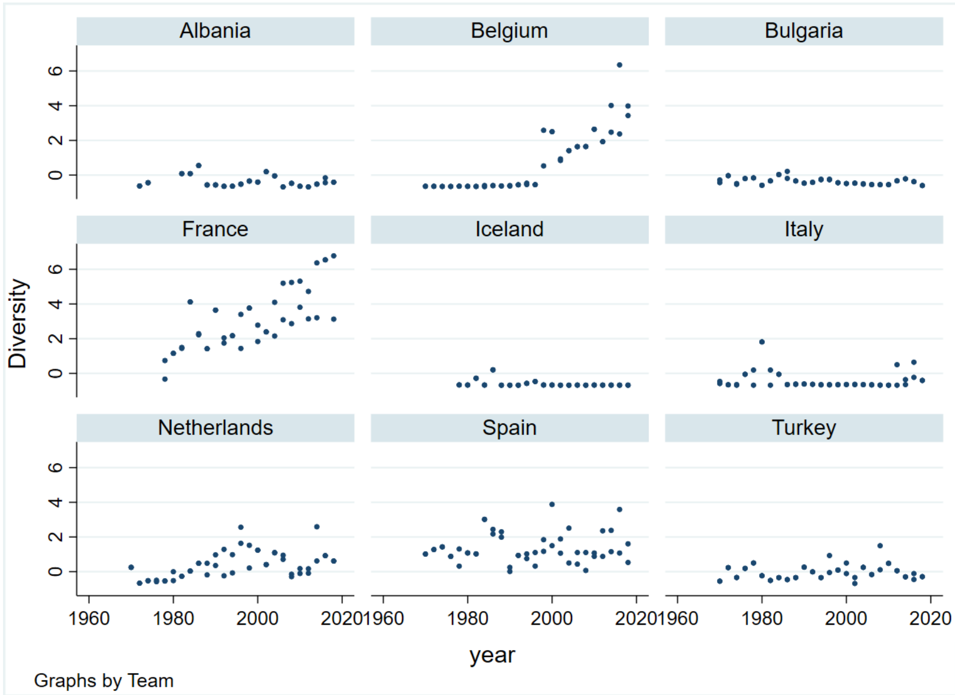


Figure 2. Ancestral diversity over time, selected national teams

Notes: In Figure 2, we present the time variation of our index of ancestral diversity for a subset of teams. While for some countries, like Belgium, we can identify a sudden change in the compositional diversity in the most recent decades, some other countries like France and the Netherlands display a smoother evolution pattern. This contrast might be explained by the different patterns of past immigration. Countries such as Portugal show higher, yet noisier team diversity levels. Italy, Albania, and Bulgaria are examples of countries with lower and relatively stable index values. These countries are, at least up to a recent period, mainly emigration rather than immigration countries. Iceland is a typical example with almost no ancestral diversity in its national team due to the relative isolation of the country in terms of human mobility.

3.3 Other variables

We include various covariates affecting the performances of national teams. These variables are observed at either the team or country level. In our benchmark estimates, at the team level, we include the average age in its quadratic form and the players' appearance time variation for the team. We also include the standard deviation in the team members' minutes to better disentangle possible turnover decisions or other strategic concerns that may reflect the distribution of talent within the team. Country-level controls involve population (in millions), (the log of) GDP per capita, and past immigration stocks. Population data are retrieved from the Centre d'Études Prospectives et d'Informations Internationales (CEPII) for the period up to 2014 and then completed using World Bank data for the most recent values. GDP data (at constant 2015 prices) are extracted from the United Nations data office;[13] immigrant stocks are retrieved from the World Bank and start in 1960. As we lag this information, estimates that include this covariate will reduce the sample size to more recent years (beginning in 1978). We provide extensive information on all variables in

[13] National Accounts Section of the United Nations Statistics Division: National Accounts Main Aggregates Database. https://unstats.un.org/unsd/snaama/Basic

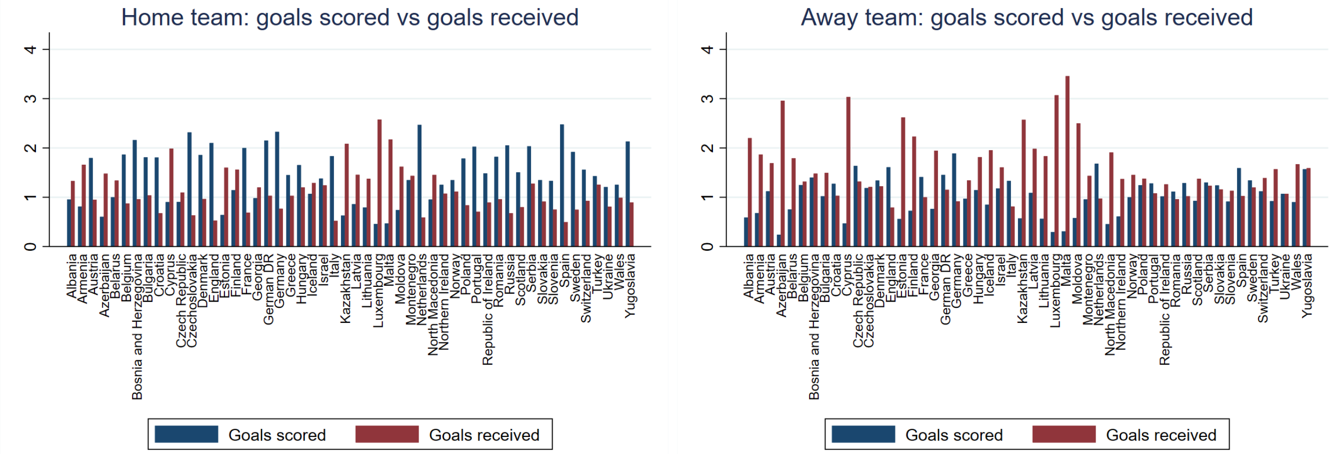


Figure 3. All-time goals scored and received, all national teams

Notes: In Figure 3, we present the all-time averages for the teams' bilateral performances, key outcome in our baseline estimations. Blue bars represent the average goals scored, whereas red bars represent the average goals received. On the left we list results for the teams listed as *home teams* in our dataset; on the right, we depict the same statistics for the teams when listed as *away teams*.

our regressions in Appendix **??**.

3.4 Instrument

Our goal is to estimate a causal relationship between the football teams' ancestral diversity and their performance. As we include a set of controls at team and national levels, together with team level fixed effects and country dummies, concerns regarding the endogeneity of our variable of interest are mitigated. Still, it is possible that a set of current political, cultural, economic or institutional conditions that are not considered in our framework will fall into the error term, resulting in a potential omitted variable bias. As an example, naturalized players and, more generally, players who possess more than one nationality may be able to choose which national team to play for. They may have incentives to play for countries offering favorable conditions. These conditions may reflect financial, cultural, institutional and/or football-related resources that may correlate as well with the team performance. The squad selection process may also reflect cultural and/or institutional characteristics of the countries. If this selection is carried out to favor native players over second-generation migrants, this could cause inefficiencies in the talent selection, thus undermining the teams' performance. While part of these issues may be fixed over time, we allow for time variation in these characteristics and carry out an instrumental variable approach to ensure causality under these circumstances.[14] We use the level of ancestral diversity of past immigration of the country as an instrument. In the structural equation, we account for the size of past immigration as well as for the contemporaneous level of gdp per capita. The introduction of these controls

[14]It should also be noted that we build our diversity measure from ancestry information as proxied by surnames, which we argue captures the ancestral diversity well. We believe it is a suitable alternative to indices built on the country of birth or nationality. However, our diversity formula is a quantization process that involves measurement error concerns from at least two sources: our surname-to-country prediction, and the corresponding genetic distance measures obtained from the Spolaore and Wacziarg (2009) dataset. We also rely on an IV strategy to account for this type of the endogeneity concerns.

mitigate the concerns of a direct impact of our instrument on the performance of the national soccer team through the potential beneficial economic effects of past immigration.

In order to play for national teams, players need to comply with strict conditions of eligibility and, in particular, need to be nationals of the represented country.[15] Eligible players would therefore be either naturalized immigrants, or children of natives or second-/third-generation immigrants in their adopted country.[16] National teams' diversity is therefore driven by the immigration history of the previous generation of their representing country. Countries with low immigration rates will therefore exhibit, everything else being equal, in a low diversity, transmitted over time within the same native population. This would also be true in countries with high immigration rates but with a concentrated origin of the immigrants. High diversity will be in countries with significant immigrant flows originating from diverse areas. As past immigration to a destination country translates into the heterogeneity in its nationals, we build a historical measure of country diversity that should predict how diverse the national team will be years later.[17]

To construct our instrument, we use data on the ethnic composition of countries provided by the University of Illinois Cline Center for Advanced Social Research. The Composition of Religious and Ethnic Groups (CREG)[18] is a time-varying measure that involves country-specific information on 165 large countries. In the sample, ethnic groups are given narrow definitions (e.g. *Russian*, *Romanian*, *Scottish*), which we converted to a reference country. The classification "others" is used by the data provider to group information on one or more unknown ethnic minorities.

We build a measure of lagged country diversity, following the same diversity formula described above. We produce the following country-level index IV_{it} that we use for the country's team:

$$IV_{it} = \sum_{j=1}^{N_{t-18}} \sum_{k=1}^{N_{t-18}} (p_{jt-18} p_{kt-18} d_{jk}), \; j \neq k \tag{2}$$

where p_{jt-18} and p_{kt-18} are shares of origins j and k immigration stocks, belonging to the set origins in country i at time $t-18$. The instrument is used for the qualification of the final phase.

As a decision rule, the group "others" in country i was assigned a median distant country j from the Spolaore and Wacziarg (2009) dominant groups distance measure. The resulting variable was lagged to account for second-generation migration effects. While the lag choice is somewhat arbitrary, a higher lag would increase the data loss. For this reason, we use in our benchmark analysis an 18-year lag to limit the reduction in the final sample size, but 20-year and 22-year lags are also considered for sensitivity checking (see Section 6 below).

An inconvenience of the CREG dataset is that there are no data for a set of small countries (Kosovo, Malta, San Marino, Luxembourg, Montenegro, Faroe Islands), plus France and Iceland. To account for this issue, we complement the data with Standaert and Rayp (2022) Bilateral Migration Database. For the years 1960-2020, this data source aggregates records from different sources via a state-space model, providing a global bilateral database on the stock of

[15]FIFA added eligibility restrictions for players representing national teams in 1962: 1. Players must be naturalized citizens of the country they represent. 2. If a player is in a national team, he is ineligible to represent another nation. 3. Exceptions only matter if geopolitical changes in the countries occurred. See Hall (2012).

[16]This would have some variation on citizenship granting process that follows from the destination countries' law.

[17]On a similar vein, an instrument that matches population-level to firm-level diversity is employed in Anderson et al. (2011).

[18]Cline Center for Advanced Social Research.

migrants according to their country of birth at year level. The resulting distributions are presented in the right panel of Figure 4 and are compared with the team diversity measure (left panel). The overall picture suggests a general increase in countries' ethnic diversity over time in the European continent (as displayed in the growing average values). However, this growth has been uneven across countries (as shown by the longer right tails). Although we formally assess the relevance of our instrument in the following sections, the patterns in the plots of Figure 4 seem broadly similar in the national teams' diversity and the diversity of the whole population.

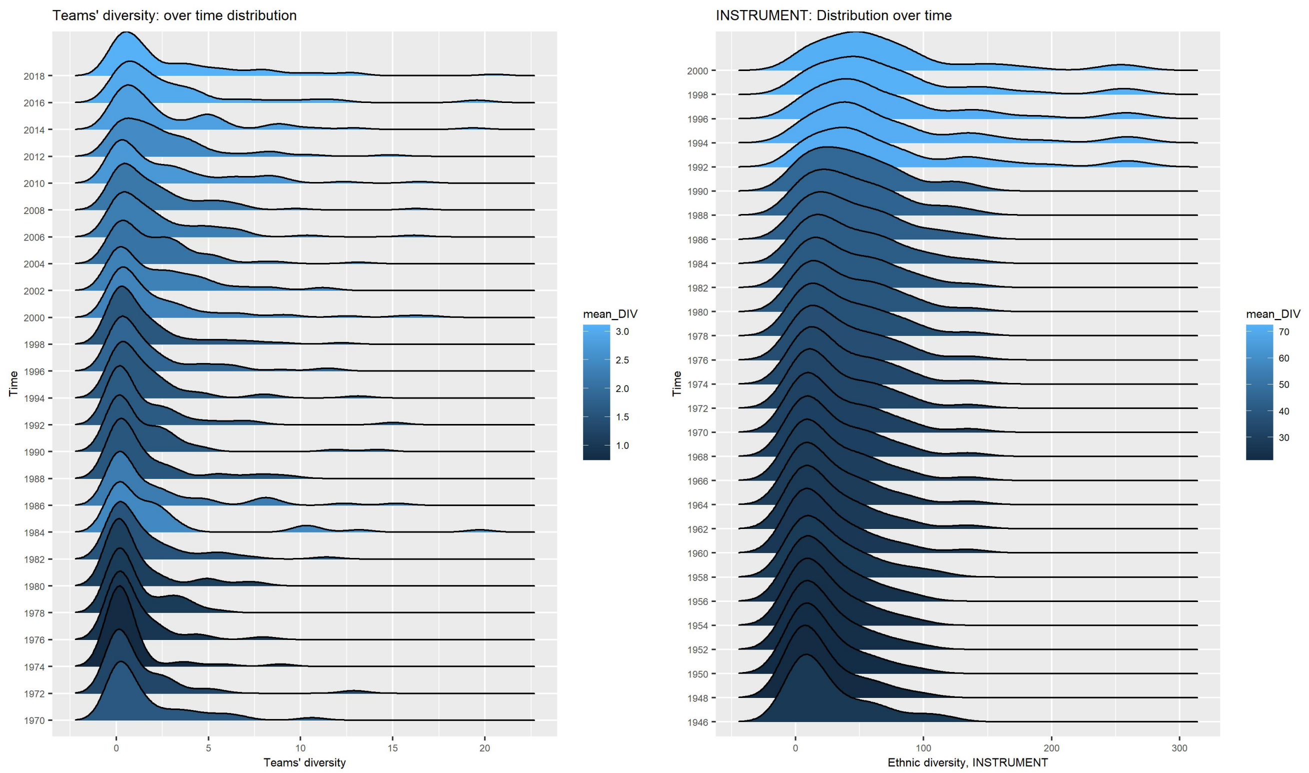


Figure 4. IV diversity over time

Notes: In Figure 4, we present the evolution of the distribution of diversity over time for our diversity index (on the left) and our IV index (on the right). Lighter colors represent higher yearly averages. This picture points to a positive evolution of national teams' diversity that is matched visually with a positive evolution in the lagged mean national diversity of our baseline instrument. This pattern is broadly in line with van Campenhout et al. (2019) who also suggest a growing trend in diversity occurring over time for the World Cup teams as a result of the countries' migratory histories and citizenship regimes.

4 Empirical analysis and Results

We first carry out OLS estimations to obtain the association between diversity and football performances. Since the estimations in these naive OLS regressions are likely to be biased by some confounding factors, we then move to the instrumental variable estimations to uncover a causal link between diversity and sports performance.

4.1 Benchmark estimations

Our benchmark estimation is as follows:

$$Performance_{ijst} = \alpha_i + \alpha_j + \alpha_s + \alpha_t + \beta(Diversity_{ist} - Diversity_{jst}) + X'_{ist}\Gamma + X'_{jst}\Sigma + X'_{ijst}\Delta + \epsilon_{ijst} \quad (3)$$

where the baseline performance indicator is the goal difference between team i and team j facing one another at stage s of championship t. The match takes place in either or both stages s ={qualification, finals} of the two types of international tournaments, i.e., the FIFA World Cup and the UEFA Euro Cup in t ∈ {1970, 1972, 1974, ...2016, 2018}.[19] Our regressor of interest is the difference in levels of ancestral diversity ($Diversity_{ist} - Diversity_{jst}$), where diversity of each team is computed as detailed in Equation (1). We include team, stage and time fixed effects $\alpha_i, \alpha_j, \alpha_s, \alpha_t$ in all our specifications. Vectors X'_{ist} and X'_{jst} include the set of team controls explained in the previous section, whereas X_{ijst} includes pair controls. While fixed effects capture the effect of unobserved factors that are either constant over time or across countries, the set of covariates X'_{ist} and X'_{jst} and X_{ijst} arguably accounts for other time varying observed factors. For instance, a country's financial resources may positively correlate with its national team's performance. At the same time, these resources may have acted as a pull effect for immigration, which would result in a higher level of diversity. We therefore include the log of GDP per capita and lagged immigration in our controls.[20] The demographic size of a country is in our controls as well, as it could also be linked to its diversity and the probability of having talented eligible players in every cohort. Football matches can be impacted also by (current or historical) dyadic features between the two countries such as belonging to the same country at some stage in time. That is why we introduce various pair controls.

4.2 Results

Our baseline findings are shown in Table 2. They include robust standard errors, clustered at the pair level. Team i is referred to as the home team and team j as the away team.The key dependent variable for this framework is the goal difference as we perform the analysis at match level. Table 2 presents results in the left panel (columns 1 to 4) where potential endogeneity concerns arise, and the IV results on the right (columns 5 to 8). Starting with the simplest specification that considers age covariates, results proceed by controlling for variation in appearances, per-capita GDP, population, and lagged immigrant stocks (columns 2 and 6) and add three dyadic covariates in columns 3 and 7, namely, (current or historical) contiguity, sharing a common language, and belonging to the same country at some stage in time.[21] Finally, the last columns of OLS and IV specifications allows for pair fixed effects to replace the fixed effects at the individual team level. In the OLS results, diversity is positive but only significant in column 1, at the 10% level, while it becomes significantly positive at 5% level in all IV specifications. Home team controls like population tend to have opposite signs compared with their away team counterpart, but they appear less significant

[19] The year itself of the event reveals which tournament is played, so there is no need for a tournament fixed effect.

[20] This covariate allows one to isolate the role of diversity in past immigration flows in the instrumental variable from its direct impact on performance by, for instance, increasing the talent pool.

[21] Note that due to a historical agreement in the early phase of international football, the four main regions of the U.K. (England, Scotland, Northern Ireland, and Wales) compete as separate teams.

than the ones relating to the away teams. This could be due to the fact that the population size of the away team is correlated with the number of supporters in the stadium. Past immigration stocks and population, when significant, increase the relative team performance, suggesting an effect related to the enlargement of the talent pool. The same relation appears for GDP per capita which is a positive determinant of performance (though more significantly for the away team), reflecting that teams from richer countries can benefit from better resources, which in turn improve performance.

Concerning the economic magnitude of our coefficient of interest, in the IV specifications, a one-standard-deviation increase in the diversity measure leads to a non-negligible increase in the goal difference of between 0.77 to 1.79 units.

5 Discussion and Mechanism

While our empirical analysis delivers some robust evidence of an influence of genetic diversity on soccer performances, it is important to reflect on the possible channels through which such an effect operates. We therefore aim at providing some indirect evidence in favour of potential mechanisms.[22]We evaluate hereafter the case in favour of two potential complementary channels through which genetic diversity might impact performances.

The first channel that we investigate operates through the complementarity in physical traits associated to a higher genetic diversity. An homogeneous population in terms of genetic endowment will result in a team with relatively homogeneous physical traits such as heights, speed, movement coordination and so on. Soccer performances tend to require some specificity in the physical traits, depending on the role of each player and his position on the pitch. For instance, central defenders need to be toll and physically strong, while an important skill for offensive lateral players is obviously speed. A more diverse population in terms of genetic endowments will more likely provide a sufficient pool of potential players for each position, resulting in a better complementarity at the team level. We can call that the channel of complementarity. To investigate whether there is some support for this channel, we built a new dataset using information from the FIFA online game website (https://sofifa.com/) where we can find proxies for average team body mass (height, weight, ratio), attack (crossing, heading, ...), skill (in dribbling, long passes, accuracy, control) and movement (e.g. acceleration, sprint, ...). Then, once we build the diversity index as in our benchmark analysis for the online national teams, we check the relationship between teams' genetic diversity and a series of team averages concerning body mass, attacking skills, broadly skills and movement speed, present in the dataset. These relationships are shown in Figure 5. In almost all figures, more diversity (represented in the x-axis) is associated with a positive outcome of the body mass, attacking skills and skills broadly defined. This is the case also for most outcomes in the movement speed graphs. Accordingly, these results support the idea that genetic diversity improves complementary among different players in the team, improving ultimately teams' performances.

A second complementarity channel involves access to nationality. Our IV estimations allow to shed some light on the existence of the causal chain between past immigration and soccer performances of the national team. By

[22]A explicit test of the existence of these mechanisms would require a fully structural approach and is obviously beyond the scope of this paper. Such an investigation is therefore left for future work.

Figure 5. Genetic diversity and team average features

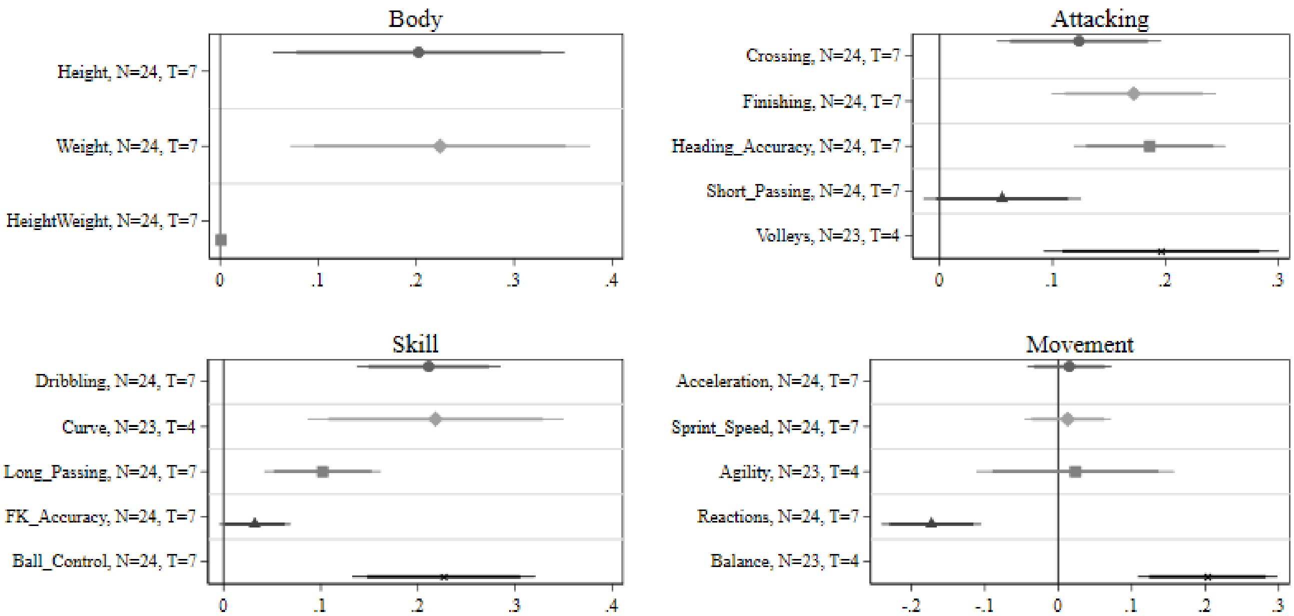
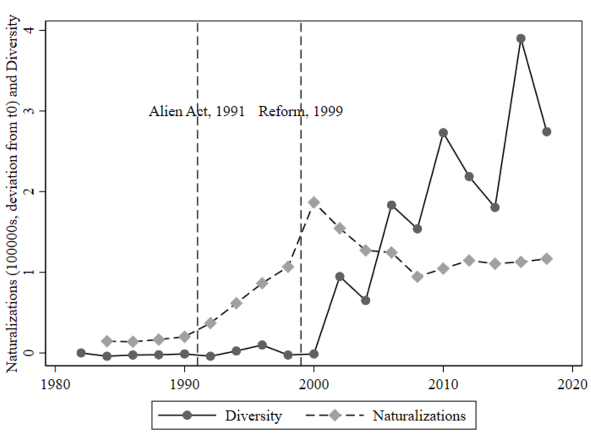
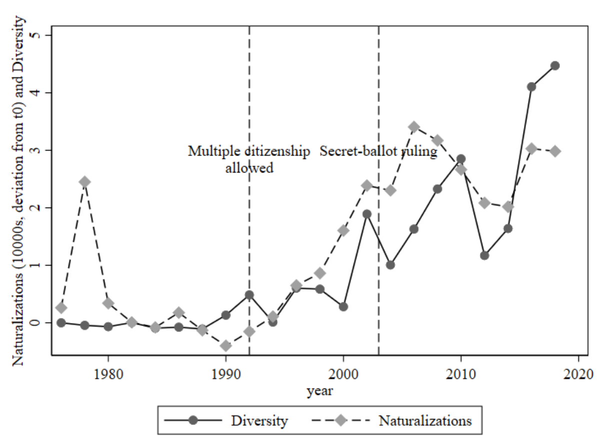


Figure 6. Reforms of access to nationality and genetic diversity

(a) Germany



(b) Switzerland



increasing the genetic diversity of the resident population, immigration exerts in the medium run a positive effect on the performances of the representative national team. Nevertheless, this requires that second generation immigrants can obtain the nationality of the host country since it is a condition of eligibility for the players. To investigate the role of access to nationality, we look at two specific cases involving countries that implemented reforms facilitating the acquisition of nationality for immigrants. The first case is the one of Germany which implemented two reforms in the 90's that favoured the acquisition of the German nationality for second generation immigrants. The Alien Act of 1991 (Auslanddergesetz) introduced explicit criteria for naturalization in terms of age-dependent residency requirements. The citizenship Act of 2000 introduced birthright citizenship, both for immigrants and second generation migrants born in Germany. Both reforms resulted in an increase in the number of naturalized foreigners, with potential consequences in terms of integration and assimilation.[23] The second case concerns Switzerland which was subject to two reforms favouring the acquisition of the Swiss nationality (Handgartner and Hainmueller, 2019). The 1992 reform allowed immigrants to hold multiple citizenship. In 2003, a series of rulings by the Swiss Federal Court forced most municipalities to change their decision-making process from direct to representative democracy, which resulted in a surge of naturalization rates by about 60% (Hainmueller and Hangartner, 2019).

Figure 6a and 6b provide for each country the evolution over time of naturalizations and the level of genetic diversity of the soccer national team. Both figures confirm the increase in the number of naturalizations observed in the aftermath of the reforms. More importantly, in both cases, this increase resulted in a higher level of genetic diversity of the national team. This provides evidence in favour of an important role of the legal conditions of access to nationality for immigrants set and their children by a country for the future performances of the national team. Our analysis provides an intersting and somewhat unintended consequences of these coinditions.

6 Robustness checks

In the following sections, we conduct a number of sensitivity exercises to assess the impact of our methodological options in the benchmark estimations.

Other performance indicators in a match We first check the robustness of our results by using the probability of winning and the number of goals scored or taken as alternative measures of the team's performance. Considering the first alternative, Table 3 proposes a linear probability model with the probability of winning. The outcome in this set of regressions takes value of 1 for a victory of the home team, 0.5 for a tie and 0 for a loss. We find that a standard deviation increase in relative diversity is crucial for the team victory, which increases by 20 to 34% percentage points in our IV results.

A unilateral setting

We check the robustness of our findings by considering an absolute measure of performance of team i based on its rating. This refers to the unilateral dimension of the performance data. In this unilateral setting, our performance indicator is the Elo score of a team. Updated after each game, the Elo score of a team is a function of its previous score, the realized and the expected results (given the opponent's relative strength) and the importance of the tournament. A complete description and formula are found in the online Appendix. Based on match-level information, we construct Elo ratings relative to the results of the EURO and World Cup qualifications and final stages for our whole sample. Our measure is the change in the score from the beginning to the end of the championship stage. For team i, performing

[23] See Garbers and Gathmann (2022a), Garbers and Gathmann 2022b and Gathmann and Keller, 2018 among others.

in stage s, at Championship t, our baseline performance measure for the unilateral setting is therefore

$$Performance_{ist} = Elo\ score_{End,ist} - Elo\ score_{Beginning,ist} \tag{4}$$

We run our benchmark estimations using this performance indicator. As shown in Table 4, and similarly to the benchmark analysis, diversity has a positive effect on the ranking of national teams. Our estimate of the effect of diversity is positive in all our specifications. [24]

Additional controls: initial strength of the team

To better assess the match-level dimension of our results, we propose a specification in which we control for the level of talent, which we proxy with the Elo score levels of each team at the beginning of the competition. In Table 5, we present results that complement the previous outcomes with this additional control. As one could expect, initial scores of the teams are significant, positive predictors of their relative performance. Nevertheless, the effect of diversity remains significantly positive in all the IV-based results, as in the benchmark. This suggests that diversity has a distinctive role in performance during the match, and that positive skill complementarities manifested in the team's coordination.

Alternative regression methods

We assess the robustness of several methodological choices made in the regression analysis within the bilateral framework. We first carry out some sensitivity checks with respect to the way performance is measured. We adopt a set of covariates that is comparable to our preferred specification of the baseline, column 7, which includes the richest set of controls and individual team fixed effects.[25] Columns (1) to (4) of Table 6 report the results of, respectively, a specification where diversity is replaced with its appearance's re-weighted measure; a regression where diversity is computed with the alternative genetic distance measure as proposed in Spolaore and Wacziarg (2009); a specification with a higher lag for our instrument (22 years) and a regression that adds information related to the team coaches as additional controls. Specifically, we control for age, tenure, a foreign nationality dummy, and a measure of coach quality for both the home and the away team. In this set of regressions, the away team's foreign coach dummy is positively associated with the away team performance, as is the coach quality measure (based on awards). The resulting coefficients are very comparable to the baseline evidence.

A second check concerns the use of linear regression models. Since the goal difference is a discrete variable (ranging between −13 and 12), the linear models may become less appropriate as they assume a continuous variable. We address this concern in two different ways. First, we perform an inverse hyperbolic sine (IHS) transform to the variable. This type of procedure has been proposed in the literature by Burbidge et al. (1988) as an alternative to the log transformation. Indeed, such a transformation allows for the inclusion of variables that take zeroes and negative values, while maintaining approximatively the same interpretation of the coefficient as the log form. Second, we conduct a Poisson-based regression with scores as our outcome of interest and we'll present the results in a separate

[24] For the interested readers, we run our entire analysis using this unilateral setting. This analysis is provided in the online Appendix for readibility.

[25] Pair-level fixed effects are very demanding as they imply that the only variation left is that within a pair of adversaries that play repeatedly against each other. Therefore, we deem the specifications accounting for individual-level fixed effects as our preferred ones.

table. Results from Column (5) present the first alternative and suggest that a hyperbolic sine transformation does not lead to different outcomes in the results of interest: a positive coefficient for the diversity measure of roughly 0.83 is significant at 1% level. Column (6) of Table 6 estimates a linear model on the number of goals at home as dependent variable. The coefficient on diversity is significant at 5% level and approximately 0.73.

Finally, an alternative specification on the bilateral diversity is proposed. Instead of the benchmark bilateral diversity measure corresponding to the difference ($Diversity_{home} - Diversity_{away}$) we allow the two terms to enter separately, allowing for the presence of a different effect for the home team and away team. Each term is instrumented, resulting in two first stages. Results indicate coefficients with opposite signs: the goal difference is, as expected, impacted positively by the home team and negatively by the adversary, with significance at a 5% level.

6.1 Placebo analysis

As a final analysis assessing the validity of our results, we perform a placebo analysis using national performances from athletics as the outcome variable. Since the main channel explaining the positive impact of ancestral diversity goes through the complementarity of skills at the team level, we should expect that ancestral diversity does not play any role in explaining the performances at the individual level. Athletics is an accessible and mostly individual sport. We therefore assume the national pool of talent that athletics federations can rely on is comparable to that of football. If the placebo analysis returned significant coefficients of the football team's diversity index on athletics performance, we might have concerns that some omitted variable—such as the presence of a particular set of origins—would positively affect the national talent pool and our performance outcome. This mechanism may go beyond the size of lagged immigration, which we control for.

For the sake of this analysis, we extract information from Wikipedia about the total number of medals and gold medals won by each nation in the European Athletics Indoor Championships[26] and the European Athletics Outdoor Championships,[27] The European Athletics Outdoor Championships is an athletics event that started in 1934 with a quadrennial frequency until 2010 when it switched to a biennial frequency.[28] The number of athletes that each national federation can enroll in any of these championships is based on their performance and is capped from above for each nation and discipline.[29] As noted above, we collect information on the number of medals each nation won in each championship. To match these data with our original biennial data of football events, we consider athletics championships held in year t (if t is an odd year) as having been held in $t + 1$. Whenever we have more than one event in the same year, we average the total medals won by a nation by year. We therefore obtain two indicators of athletic performance at national level: the number of total medals obtained by the national representatives, and the number of gold medals. The results of the placebo exercise are reported in table 7. Specifically, Table 7's dependent

[26]Wikipedia, "European Athletics Indoor Championships." https://en.wikipedia.org/wiki/European Athletics Indoor Championships.

[27]Wikipedia, "European Athletics Championships." https://en.wikipedia.org/wiki/European Athletics Championships.

[28]It is organized by the European Athletics Association (EAA), which is the continental committee of the worldwide International Association of Athletic Federations (IAAF). EAA is based in Switzerland (as are the UEFA and FIFA) and comprises 51 national associations (or members). EAA also organizes the European Athletics Indoor Championships, now a biennial event, but its frequency was yearly until 1990. A gap of three years passed between 2002 and 2005's tournaments.

[29]European Athletics, "Competition regulations," https://european-athletics.com/competition-regulations/.

variables are respectively from left to right the benchmark Elo score changes, the total number of medals and the total of gold medals. [30] The set of covariates is comparable to the rightmost column of our baseline tables. Coefficients of our diversity score in the placebo results turn out to be insignificant, suggesting that diversity in football teams does not impact the performances of an individual sport such as athletics. All in all, this strengthens the case of a positive impact of ancestral diversity through its impact on collective performance through the generated complementarity of skills.[31]

Conclusion

Diversity is a double-edged sword. Greater diversity is beneficial in teamwork since teams can draw on a larger variety of skills and knowledge from a diverse group of people. However, diversity might also lead to decreased team performance and team effectiveness if more diversity brings lack of coordination and increased conflict. In this paper, we assess the effect of ancestral diversity, due to past migration flows, on sport performance. To do so, we have built a new dataset that brings together information about the ancestral diversity of European national football teams playing in the World Cup or European Cup, qualifications and finals, and several time-varying performance indicators for each national team. Ancestral diversity of players may lead to a lack of team spirit on the one hand but, on the other hand, may lead to innovative ways to play. In addition, it is well known that some football-specific skills (e.g., endurance capacity, muscle performance, height, or technical skills) are related to ancestral background (see Lippi et al., 2010). Therefore, ancestral diversity boosts complementarities among players holding different positions on the football team. Hence, overall, we expect ancestral diversity to improve sportive performance. This is confirmed in our analysis. We establish a positive causal relationship between this measure of team diversity and both a team's Elo score and the probability of winning a match. We also prove that this diversity benefits teams beyond any effect stemming from population size, GDP per capita, coach experience, and other factors. The result is quite large and not negligible. Analyzed using a variety of perspectives, and taking into account endogeneity and measurement error concerns via an instrumentation method, the overall evidence produced in our specifications strongly suggests that diversity enhances performance at match level-as proxied by the goal difference-and translates into higher overall team (Elo) scores at the end of the championship.

Our findings complement the flourishing but limited literature on countries' diversity that accounts for intergenerational transmission of traits and its corresponding effects. Our contribution is a novel one as it focuses on the sports team. The results are robust to a large list of checks where we use variation of the diversity measure and of the instrument. We also perform a placebo test to rule out any remaining concerns about some omitted variable, such

[30] Notice that for this Placebo exercise, we use the unilateral dimension of football teams performance introduced in the Robustness Analysis above as this unilateral measure is more appropriate for the athletics setting.

[31] We do not fully exclude the possibility that our results are particularly relevant for a specific set of countries, for which the link with between the endogenous variable and the instrument is strongest. Given the different sizes of the OLS and IV coefficients, this may point out to the presence of LATE effects when the instrumental variable is employed. Given statistical power limitations, we do not disaggregate further this channel, limiting the rationalization of our results to the general dimension.

as the presence of a particular set of origins that would positively affect the national talent pool and our national team diversity. In the placebo test, we show that, as expected, ancestral diversity does not affect the performance of national athletics teams because each athlete competes individually rather than within a team.

Our study is not intended to be a biological one. We examine the effect on performance today of deep-rooted values and traits shaped across generations. Differences in these characteristics and the associated information they bear, proxied by genetic distances, cannot be captured (or measured) by simple country fixed effects or other cultural and institutional characteristics formed in humanity's more recent history. It is important to stress that our results do not carry any implications in terms of superiority or inferiority of particular genetic information of specific origins over other ones. Rather, our interest is on the inherited diversity among the players on a team and how these differences translate into a comparative advantage at the *team level* in sportive performance and innovative play. We find, in fact, that different deep-seated factors embodied by the genetic distances do matter. To conclude, our work highlights a less evident, yet relevant, effect of the mixing of populations worldwide due to international migration. The effects of these population movements have attracted an impressive amount of economic literature interested in the economic as well as cultural effects of migration in the destination and origin countries. Further research in this field shall extend our analysis to larger geographical areas and also to other sports played collectively.

7 Tables section

In this section, we gather the main tables of the paper. Additional tables are gathered in the Appendix and in the online Appendix dedicated to the unilateral analysis.

Table 1. Summary statistics table

	Mean	Standard deviation	N	Min	Max
Performance measures					
Goal difference	0.482	2.068	3877	-8.000	11.000
Goal difference, hyperbolic sine	0.276	1.223	3877	-2.776	3.093
Diversity measures					
Bilateral diversity	0.002	1.044	3877	-5.189	5.372
Bilateral diversity, appearance	0.001	1.042	3877	-6.507	5.182
Bilateral diversity, SW	0.002	1.039	3877	-4.714	5.356
Diversity, home	0.052	1.048	3877	-0.707	6.626
Diversity, away	0.050	1.041	3877	-0.710	6.775
Team level variables					
Stand. dev. squad age, home	3.686	0.884	3877	1.953	13.278
Squad age, home	27.659	1.030	3877	24.286	31.045
Stand. dev. squad age, away	3.683	0.884	3877	1.953	13.278
Squad age, away	27.670	1.028	3877	24.286	31.045
Squad age, squared, home	766.094	56.999	3877	589.796	963.820
Squad age, squared, away	766.702	56.886	3877	589.796	963.820
Stand. dev. appearances, home	236.287	63.793	3877	59.594	451.440
Stand. dev. appearances, away	235.348	64.335	3877	67.750	451.440
Foreign coach, home	0.176	0.381	3877	0.000	1.000
Foreign coach, away	0.178	0.383	3877	0.000	1.000
Coach age, home	51.126	8.118	3877	28.000	74.000
Coach age, away	51.194	8.117	3877	28.000	74.000
Macroeconomic variables					
Population (mln), home	24.493	29.011	3877	0.224	148.689
Population (mln), away	24.263	29.025	3877	0.224	148.689
Log of GDP/capita, home	9.692	1.028	3877	6.836	11.584
Log of GDP/capita, away	9.682	1.033	3877	6.836	11.584
Log immig. stocks, 18y lag, home	12.665	2.461	3576	0.000	16.294
Log immig. stocks, 18y lag, away	12.630	2.459	3576	0.000	16.294
Adversary's strength, home	1674.520	108.400	3877	1416.287	2117.771
Adversary's strength, away	1673.245	111.092	3877	1400.824	2140.289
Contiguity	0.095	0.293	3877	0.000	1.000
Same nation	0.021	0.144	3877	0.000	1.000
Common language	0.050	0.219	3877	0.000	1.000
IV					
IV, home vs. away	-0.430	55.808	3877	-203.043	203.043

Notes: All specifications involve a dataset of matches held in the qualification and final stages of the EURO or World Cup, where both adversaries belong to the UEFA affiliation.

Table 2. Performance and ancestral diversity

	Dependent variable: goal difference							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	OLS	OLS	IV	IV	IV	IV
Variable of interest								
Bilateral diversity	0.075^{*}	0.018	0.016	0.020	0.777^{**}	1.543^{**}	1.345^{**}	1.786^{**}
	(0.042)	(0.040)	(0.040)	(0.053)	(0.299)	(0.535)	(0.422)	(0.822)
Control variables								
Log of GDP/capita, home		-0.012	0.019	-0.039		0.107	0.079	-0.058
		(0.207)	(0.208)	(0.303)		(0.259)	(0.246)	(0.384)
Log of GDP/capita, away		-0.467^{**}	-0.463^{**}	-0.099		-0.727^{**}	-0.630^{**}	-0.200
		(0.216)	(0.217)	(0.301)		(0.291)	(0.267)	(0.430)
Log immig. stocks, 18y lag, home		0.067	0.050	0.032		0.156^{**}	0.151^{**}	0.196^{*}
		(0.043)	(0.045)	(0.067)		(0.062)	(0.063)	(0.115)
Log immig. stocks, 18y lag, away		-0.096^{**}	-0.100^{**}	-0.064		-0.156^{**}	-0.180^{**}	-0.163^{*}
		(0.045)	(0.047)	(0.065)		(0.060)	(0.060)	(0.094)
Population (mln), home			-0.004	-0.003			0.002	0.006
			(0.003)	(0.004)			(0.004)	(0.007)
Population (mln), away			-0.001	-0.003			-0.008^{*}	-0.013^{*}
			(0.003)	(0.004)			(0.004)	(0.007)
Observations	3877	3568	3568	2832	3877	3568	3568	2832
Kleibergen-Paap LM test					0.00	0.00	0.00	0.00
Kleibergen-Paap F test					51.57	22.32	33.24	9.76
Team FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Minute appearances		Yes	Yes	Yes		Yes	Yes	Yes
Geo-political controls			Yes				Yes	
Pair FE				Yes				Yes

Notes: Estimation sample: football national teams from the UEFA affiliation, performing in World Cup and EUROs in the years 1970-2018 (for columns 1 and 5) / years 1978-2018 (for all other columns). Dependent variable: Goal difference. OLS results appear on the left (columns 1 to 4). Column 5 to Column 8 display IV results. The first 3 columns of OLS and IV include individual team and year fixed effects, as well as a stage dummy Columns 4 and 8 replace individual-team with pair fixed effects. Standard errors are clustered at team pair level. For each IV specification, we present the p-value from the Kleibergen-Paap Lagrange Multiplier test for the instrument relevance, as well as the F-statistics from Kleibergen-Paap F-test for weak instruments. Stars correspond to the following p-values: * p < .10, *** p < .05, *** p < .001.

Table 3. Probability of winning and ancestral diversity

	Dependent variable: probability of winning							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	OLS	OLS	IV	IV	IV	IV
Variable of interest								
Bilateral diversity	0.018*	0.004	0.004	0.002	0.203**	0.339**	0.282**	0.283*
	(0.009)	(0.009)	(0.009)	(0.012)	(0.062)	(0.113)	(0.088)	(0.165)
Log of GDP/capita, home		-0.001	-0.002	0.013		0.025	0.010	0.010
		(0.046)	(0.046)	(0.070)		(0.057)	(0.053)	(0.077)
Log of GDP/capita, away		0.073*	0.071*	0.122**		0.016	0.036	0.105
		(0.043)	(0.043)	(0.061)		(0.062)	(0.055)	(0.078)
Log immig. stocks, 18y lag, home		0.010	0.010	0.006		0.030**	0.032**	0.032
		(0.010)	(0.010)	(0.015)		(0.013)	(0.013)	(0.023)
Log immig. stocks, 18y lag, away		-0.013	-0.013	-0.002		-0.026**	-0.030**	-0.018
		(0.009)	(0.009)	(0.013)		(0.012)	(0.011)	(0.017)
Population (mln), home			-0.000	0.000			0.001	0.002
			(0.001)	(0.001)			(0.001)	(0.001)
Population (mln), away			-0.000	-0.001			-0.001*	-0.002*
			(0.001)	(0.001)			(0.001)	(0.001)
Observations	3877	3568	3568	2832	3877	3568	3568	2832
Kleibergen-Paap LM test					0.00	0.00	0.00	0.00
Kleibergen-Paap F test					51.57	22.32	33.24	9.76
Team FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Minute appearances		Yes	Yes	Yes		Yes	Yes	Yes
Geo-political controls			Yes				Yes	
Pair FE				Yes				Yes

Estimation sample: football national teams from the UEFA affiliation, performing in World Cup and EUROs in the years 1970-2018 (for columns 1 and 5) / years 1978-2018 (for all other columns). Dependent variable: Match outcome, equal 0 if home team loses, 0.5 for a tie and 1 for a victory. OLS results appear on the left (columns 1 to 4). Column 5 to Column 8 display IV results. The first 3 columns of OLS and IV include individual team and year fixed effects, as well as a stage dummy Columns 4 and 8 replace individual-team with pair fixed effects. Standard errors are clustered at team pair level. For each IV specification, we present the p-value from the Kleibergen-Paap Lagrange Multiplier test for the instrument relevance, as well as the F-statistics from Kleibergen-Paap F-test for weak instruments. Stars correspond to the following p-values: * $p < .10$, *** $p < .05$, *** $p < .001$.

Table 4. Football performance and ancestral diversity of national teams: unilateral estimations

	Dependent variable: change in rating of national football team (Elo score)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	OLS	OLS	IV	IV	IV	IV
Variable of interest								
Diversity	2.841^{**}	2.596^{**}	2.715^{**}	2.515^{*}	23.588^{**}	22.058^{**}	24.948^{**}	33.813^{**}
	(1.140)	(1.147)	(1.111)	(1.371)	(11.230)	(10.923)	(12.272)	(17.191)
Control variables								
Stand. dev. appearances		0.275^{***}	0.276^{***}	0.310^{***}		0.292^{***}	0.294^{***}	0.320^{***}
		(0.023)	(0.023)	(0.028)		(0.026)	(0.027)	(0.032)
Log of GDP/capita			8.707	9.638			17.870^{**}	16.335^{*}
			(6.494)	(7.759)			(8.070)	(9.096)
Population (mln)			0.324				0.145	
			(0.208)				(0.420)	
Log immig. stocks, 18y lag				-0.520				1.372
				(1.373)				(1.799)
Observations	1900	1900	1900	1676	1900	1900	1900	1676
Kleibergen-Paap LM test					0.00	0.00	0.00	0.00
Kleibergen-Paap F test					18.70	18.66	16.80	11.02
Team FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Baseline estimates for the unilateral framework. Estimation sample: football national teams from the UEFA affiliation, performing in World Cup and EUROs in the years 1970–2018 (for columns 1–3, 5–7) / years 1978–2018 (in columns 4 and 8). Dependent variable: changes in the Elo score of the national team (end vs. beginning of the championship stage). In all regressions, we include team and year fixed effects, as well as a stage dummy. Columns 1–4 display OLS results, with heteroskedastic robust standard errors in parentheses, clustered at team level. Columns 5–8 display IV results, with heteroskedastic robust standard errors in parentheses, corrected for arbitrary autocorrelation of degree 1. For each IV specification, we present the p-value from the Kleibergen-Paap Lagrange Multiplier test for the instrument relevance, as well as the F-statistics from Kleibergen-Paap F test for weak instruments. Stars correspond to the following p-values: * $p < .10$, *** $p < .05$, *** $p < .001$.

Table 5. Performance and diversity: controlling for initial strength

	Dependent variable: goal difference							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	OLS	OLS	IV	IV	IV	IV
Variable of interest								
Bilateral diversity	0.081*	0.023	0.021	0.029	0.658**	1.425**	1.244**	1.595**
	(0.041)	(0.040)	(0.040)	(0.053)	(0.284)	(0.499)	(0.397)	(0.748)
Control variables								
Initial Elo score, home	0.002***	0.001**	0.001**	0.002**	0.002***	0.001**	0.001**	0.002**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Initial Elo score, away	-0.002***	-0.001**	-0.001**	-0.001**	-0.002***	-0.001**	-0.001**	-0.002**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Log of GDP/capita, home		0.036	0.068	0.084		0.177	0.151	0.110
		(0.207)	(0.208)	(0.305)		(0.253)	(0.241)	(0.370)
Log of GDP/capita, away		-0.513**	-0.507**	-0.205		-0.765**	-0.671**	-0.324
		(0.217)	(0.217)	(0.302)		(0.283)	(0.262)	(0.410)
Log immig. stocks, 18y lag, home		0.050	0.033	-0.005		0.121**	0.116**	0.127
		(0.043)	(0.045)	(0.068)		(0.058)	(0.059)	(0.104)
Log immig. stocks, 18y lag, away		-0.080*	-0.085*	-0.039		-0.131**	-0.155**	-0.121
		(0.046)	(0.047)	(0.064)		(0.057)	(0.058)	(0.086)
Population (mln), home			-0.004	-0.004			0.001	0.004
			(0.003)	(0.004)			(0.004)	(0.007)
Population (mln), away			-0.001	-0.004			-0.007*	-0.012*
			(0.003)	(0.004)			(0.004)	(0.006)
Observations	3877	3568	3568	2832	3877	3568	3568	2832
Kleibergen-Paap LM test					0.00	0.00	0.00	0.00
Kleibergen-Paap F test					52.77	24.01	35.49	10.50
Team FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Minute appearances		Yes	Yes	Yes		Yes	Yes	Yes
Geo-political controls			Yes				Yes	
Pair FE				Yes				Yes

Notes: Estimation sample: football national teams from the UEFA affiliation, performing in World Cup and EUROs in the years 1970-2018 (for columns 1 and 5) / years 1978-2018 (for all other columns). Dependent variable: Goal difference. OLS results appear on the left (columns 1 to 4). Column 5 to Column 8 display IV results. The first 3 columns of OLS and IV include individual team and year fixed effects, as well as a stage dummy Columns 4 and 8 replace individual-team with pair fixed effects. Standard errors are clustered at team pair level. For each IV specification, we present the p-value from the Kleibergen-Paap Lagrange Multiplier test for the instrument relevance, as well as the F-statistics from Kleibergen-Paap F-test for weak instruments. Stars correspond to the following p-values: * p < .10, *** p < .05, *** p < .001.

Table 6. Further results

	Dependent variable: goal difference				hyperbolic sine	home score	goal difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	IV: Diversity, appearance	**IV:** Diversity, SW	**IV:** 22 years lag	**IV:** Coach info	**IV:**Goal difference, hyperbolic sine	**IV:**Outcome: home score	**IV:**Diversity, home vs. away
Variable of interest							
Bilateral diversity			1.052***	1.275**	0.833***	0.727**	
			(0.292)	(0.403)	(0.246)	(0.318)	
Bilateral diversity, appearance	1.457**						
	(0.472)						
Bilateral diversity, SW		1.900**					
		(0.664)					
Diversity, home							1.100**
							(0.471)
Diversity, away							-0.870**
							(0.425)
Control variables							
Log of GDP/capita, home	0.193	0.179	0.059	0.066	0.023	0.138	0.121
	(0.253)	(0.291)	(0.238)	(0.244)	(0.147)	(0.174)	(0.282)
Log of GDP/capita, away	-0.575**	-0.705**	-0.415*	-0.586**	-0.147	-0.626**	-0.597**
	(0.263)	(0.326)	(0.251)	(0.264)	(0.153)	(0.205)	(0.283)
Log immig. stocks, 18y lag, home	0.165**	0.203**	0.127**	0.144**	0.096**	0.061	0.160**
	(0.067)	(0.081)	(0.058)	(0.061)	(0.038)	(0.044)	(0.067)
Log immig. stocks, 18y lag, away	-0.211**	-0.223**	-0.163**	-0.173**	-0.108**	-0.099**	-0.174**
	(0.066)	(0.074)	(0.055)	(0.059)	(0.033)	(0.047)	(0.064)
Population (mln), home	-0.001	0.005	-0.001	0.002	0.002	-0.001	0.002
	(0.003)	(0.005)	(0.004)	(0.004)	(0.002)	(0.003)	(0.004)
Population (mln), away	-0.006	-0.011**	-0.005	-0.008*	-0.005**	-0.002	-0.007*
	(0.004)	(0.005)	(0.003)	(0.004)	(0.002)	(0.003)	(0.004)
Observations	3568	3568	3351	3568	3568	3568	3568
Kleibergen-Paap LM test	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kleibergen-Paap F test	29.88	16.98	55.71	34.90	33.24	33.24	11.37
Team FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Minute appearances	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Estimation sample: football national teams from the UEFA affiliation, performing in World Cup and EUROs from the first year available for the instrument to 2018. Dependent variable: goal difference for columns 1–4 and 7, its hyperbolic sine transformation in Column 5 and the goals scored by the home team in Column 6. In all regressions, we include team and year fixed effects, as well as a stage dummy, comparably to column 3 and 7 of the baseline table 2. Columns 1–7 display IV results, with heteroskedastic robust standard errors in parentheses, clustered at team pair level. For each IV specification, we present the p-value from the Kleibergen-Paap Lagrange Multiplier test for the instrument relevance, as well as the F-statistics from Kleibergen-Paap F test for weak instruments. Stars correspond to the following p-values: * $p < .10$, *** $p < .05$, *** $p < .001$.

Table 7. Placebo, baseline estimations for the sake of comparison

	Benchmark		Placebo			
	(1) Elo Score change	(2) Elo Score change	(3) Total medals	(4) Total medals	(5) Gold medals	(6) Gold medals
Variable of interest						
Diversity	25.762**	39.812*	-0.223	-1.178	0.053	0.003
	(12.541)	(22.208)	(0.527)	(0.983)	(0.220)	(0.363)
Log of GDP/capita	17.752**	16.813*	-0.242	-0.318	-0.105	-0.051
	(8.254)	(9.799)	(0.352)	(0.446)	(0.157)	(0.196)
Population (mln)	0.130	-0.286	0.172***	0.243***	0.057***	0.076***
	(0.423)	(0.727)	(0.031)	(0.048)	(0.012)	(0.017)
Stand. dev. appearances	0.272***	0.292***	0.000	0.000	-0.000	-0.000
	(0.026)	(0.034)	(0.001)	(0.001)	(0.001)	(0.001)
Log immig. stocks, 18y lag		1.673		-0.069		-0.014
		(2.007)		(0.096)		(0.042)
Observations	1900	1676	1900	1676	1900	1676
Kleibergen-Paap LM test	16.20	7.07	16.20	7.07	16.20	7.07
Kleibergen-Paap F test	16.52	7.16	16.52	7.16	16.52	7.16
Team FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Estimates for the placebo analysis. Estimation sample: football national teams from the UEFA affiliation, performing in World Cup and EUROs in the years 1970–2018 (for columns 1, 3, 5) / years 1978–2018 (in columns 2, 4, 6). Dependent variables from left to right: changes in the Elo score of the national team (end vs. beginning of the championship stage); total medals in athletics; gold medals in athletics. In all regressions, we include team and year fixed effects, as well as a stage dummy. All columns display IV results, with heteroskedastic robust standard errors in parentheses, corrected for arbitrary autocorrelation of degree 1. For each IV specification, we present the p-value from the Kleibergen-Paap Lagrange Multiplier test for the instrument relevance, as well as the F-statistics from Kleibergen-Paap F test for weak instruments. Stars correspond to the following p-values: * p < .10, *** p < .05, *** p < .001.

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8 Appendices

Table 8. Description of variables in the benchmark analysis

Variable name	Variable description	Variable source
Performance measures		
Goal difference	Goals of team i *home* - Goals of team j. *away*	Mart Jürisoo
Goal difference, hyperbolic sine	Hyperbolic sine transformation of *Goal difference*	*see Goal difference*
Diversity measures		
Bilateral diversity	Diversity score of team i *home* - Diversity score of team j *away*. Benchmark measure, genetic distances are based on dominant populations	Surname predictions: forebears.io. Genetic distance measures: Spolaore and Wacziarg (2009)
Bilateral diversity, appearance	Diversity score of team i *home* - Diversity score of team j *away*. Alternative measure, weighted by minute appearances	As above
Bilateral diversity, SW	Diversity score of team i *home* - Diversity score of team j *away*. Alternative measure, based on weighted genetic distances.	As above
Diversity, home (Diversity, away)	Diversity score of team i *home* (team j *away*)	As above
Team-level variables		
Stand. dev. squad age, home (Stand. dev. squad age, away)	Standard deviation of team i *home* (team j *away*) members' age	Constructed from squad-level data on worldfootball.net
Squad age, home (Squad age, away)	Average of team i *home* (team j *away*) members' age	As above
Squad age, squared, home (Squad age, squared, away)	Square of squad age, home (*away*)	As above
Stand. dev. appearances, home (Stand. dev. appearances, away)	Player turnover for team i *home* (team j *away*), as computed from the minute appearances	As above
Foreign coach, home (Foreign coach, away)	Dummy =1 if the team i *home* (team j *away*)'s manager is foreign	As above
Coach age, home (Coach age, away)	Age of team i *home* (team j *away*)'s coach (approximated), computed as year of championship minus year of birth	As above
Macroeconomic variables		
Population (mln), home (Population (mln), away)	Team i *home* (team j *away*)'s country population size (millions of units)	WDI, SP.POP.TOTL total population; Head et al. (2010)
Log of GDP/capita, home (log of GDP/capita, away)	Log of per capita GDP for team i *home* (team j *away*)'s country	UN Statistics Division: National Accounts Main Aggregates Database
Log immig. stocks, 18y lag, home (Log immig. stocks, 18y lag, away)	Log of the stocks of immigrants for team i *home* (team j *away*)'s country, lagged 18 years	WDI, International migrant stock (see Unilateral table for details.) Complemented with (Özden et al., 2011)
Adversary's strength, home (Adversary's strength, away)	Average Elo score level of the teams faced, measured at the beginning of the stage	Own computation from match-level data
Contiguity	Dummy =1 if the team i *home* and j *away*) share/ have shared historically a border	Spolaore and Wacziarg (2009)
Same nation	Dummy =1 if the team i *home* and j *away*) are/ have been historically part of the same nation	As above
Common language	Dummy =1 if the team i *home* and j *away*) share/ have shared historically an official language	As above

It is obvious that the matching algorithm is efficient but not perfect. The match between the ethnicity and the surname is rather good (85 per cent of correct predictions). Two types of errors in terms of their incidence occur. The most detrimental error is the case of the striker Batshuayi that is spuriously attributed to the Belgian ethnicity (rather than to the Democratic Republic of the Congo). This error is due to the fact that this surname is rare and/or the coverage of surnames incidence in the DRC is rather poor. Most of the prediction errors have little if no impact on the diversity level. The reason is that surnames have either some French or Dutch connotations. This leads to spurious predictions in the case of Courtois, Lambert, and Meunier on the French side and in the case of Van Der Linden or Thissen in the Dutch case. Nevertheless, when attributed to an ethnicity of a neighboring country, there is no impact on the diversity measure since the genetic distance between Belgium and these countries is zero. The errors outlined in the Belgian case are also due to the particular linguistic situation of the country that has official languages (French, Dutch, and German) that originate in the neighboring countries.

Examples of our predicting algorithm

	BELGIUM TEAM, 2018 World Cup Finals		**SWEDEN TEAM, 2018** World Cup Finals
Adnan_Januzaj	Kosovo	Andreas_Granqvist	Sweden
Axel_Witsel	Netherlands	Emil_Forsberg	Sweden
Dedryck_Boyata	DR Congo	Emil_Krafth	Sweden
Dries_Mertens	Belgium	Filip_Helander	Finland
Eden_Hazard	United States	Gustav_Svensson	Sweden
Jan_Vertonghen	Belgium	Isaac_Kiese_Thelin	Sweden
Kevin_De_Bruyne	Belgium	Jimmy_Durmaz	Turkey
Leander_Dendoncker	Belgium	Johan_Johnsson	Sweden
Marouane_Fellaini	Morocco	John_Guidetti	Italy
Michy_Batshuayi	Belgium	Kristoffer_Nordfeldt	Sweden
Mousa_Dembélé	Mali	Ludwig_Augustinsson	Sweden
Nacer_Chadli	Morocco	Marcus_Berg	Norway
Romelu_Lukaku	DR Congo	Marcus_Rohdén	Sweden
Simon_Mignolet	Belgium	Martin_Olsson	Sweden
Thibaut_Courtois	France	Mikael_Lustig	Sweden
Thomas_Meunier	France	Ola_Toivonen	Finland
Thomas_Vermaelen	Belgium	Oscar_Hiljemark	Sweden
Thorgan_Hazard	United States	Pontus_Jansson	Sweden
Toby_Alderweireld	Belgium	Robin_Olsen	Norway
Vincent_Kompany	DR Congo	Sebastian_Larsson	Sweden
Yannick_Carrasco	Spain	Victor_Lindelöf	Sweden
Youri_Tielemans	Belgium	Viktor_Claesson	Sweden

Notes: Example of predicted origins for the Belgian squad and the Swedish squad for the 2018 World Cup final stage.

	BELGIUM TEAM, 1990 World Cup Finals
Bruno_Versavel	Belgium
Enzo_Scifo	Italy
Eric_Gerets	Belgium
Filip_De_Wilde	Belgium
Franky_Van_Der_Elst	Belgium
François_De_Sart	Belgium
Georges_Grün	Germany
Gilbert_Bodart	Belgium
Jan_Ceulemans	Belgium
Lei_Clijsters	Belgium
Lorenzo_Staelens	Belgium
Marc_Degryse	Belgium
Marc_Emmers	Belgium
Marc_Wilmots	Belgium
Michel_De_Wolf	Belgium
Michel_Preud_homme	Belgium
Nico_Claesen	Belgium
Pascal_Plovie	Belgium
Patrick_Vervoort	Belgium
Philippe_Albert	Germany
Stéphane_Demol	Belgium

	SWEDEN TEAM, 1990 World Cup Finals
Anders_Limpar	Hungary
Glenn_Hysén	Sweden
Jan_Eriksson	Sweden
Joakim_Nilsson	Sweden
Johnny_Ekström	Sweden
Jonas_Thern	Sweden
Klas_Ingesson	Sweden
Lars_Eriksson	Sweden
Leif_Engqvist	Sweden
Mats_Gren	Sweden
Mats_Magnusson	Sweden
Niklas_Nyhlén	Sweden
Peter_Larsson	Sweden
Roger_Ljung	Sweden
Roland_Nilsson	Sweden
Stefan_Pettersson	Sweden
Stefan_Schwarz	Germany
Sven_Andersson	Sweden
Thomas_Ravelli	Italy
Tomas_Brolin	Sweden
Ulrik_Jansson	Sweden

Notes: Example of predicted origins for the Belgian squad and the Swedish squad for the 1990 World Cup final stage.

	BELGIUM TEAM, 1970 World Cup Finals		SWEDEN TEAM, 1970 World Cup Finals
Alfons_Peeters	Belgium	Björn_Nordqvist	Sweden
Christian_Piot	France	Bo_Larsson	Sweden
Erwin_Vandendaele	Belgium	Claes_Cronqvist	Sweden
Frans_Janssens	Belgium	Gunnar_Larsson	Sweden
Georges_Heylens	Belgium	Göran_Nicklasson	Sweden
Jacques_Beurlet	Belgium	Hans_Selander	Sweden
Jacques_Duquesne	Belgium	Inge_Ejderstedt	Sweden
Jan_Verheyen	Belgium	Jan_Olsson	Sweden
Jean_Dockx	Belgium	Krister_Kristensson	Sweden
Jean_Thissen	Netherlands	Kurt_Axelsson	Sweden
Léon_Jeck	Germany	Leif_Målberg	Sweden
Léon_Semmeling	Belgium	Ove_Grahn	Sweden
Marie_Trappeniers	Belgium	Ove_Kindvall	Sweden
Maurice_Martens	Belgium	Roland_Grip	Sweden
Nicolas_Dewalque	Belgium	Ronney_Pettersson	Sweden
Odilon_Polleunis	Belgium	Ronnie_Hellström	Sweden
Paul_Van_Himst	Belgium	Sten_Pålsson	Sweden
Pierre_Carteus	Belgium	Thomas_Nordahl	Norway
Raoul_Lambert	France	Tom_Turesson	Sweden
Wilfried_Puis	Belgium	Tommy_Svensson	Sweden
Wilfried_Van_Moer	Belgium	Örjan_Persson	Sweden

Notes: Example of predicted origins for the Belgian squad and the Swedish squad for the 1970 World Cup final stage.

To accommodate the discrete and non-negative nature of the goals-scored outcomes, we use a count data model estimated by poisson pseudo-maximum likelihood. To account for endogeneity concerns, we use a control function approach (see for instance Lin and Wooldridge (2019) for a discussion of the relevance of this approach, and Miroudot and Rigo (2021) for an application of the technique to a gravity model setting). Table 9 presents average marginal effects of diversity on the two teams' outcomes considered separately. Our dependent variable is the number of goals made by the home team in one set of regressions and by the away team in a second set of regressions. We standardize our regressors of interest to simplify the interpretation of the partial effects and present average marginal effects (AME) in Table 9. We maintain the same sets of controls as the benchmark. The AME results suggest an effect broadly in line with our previous findings. As the top part of Table 9 displays, the diversity of the home team (respectively, away team) when the effect is significant and positively (respectively, negatively) affects its performance. The diversity of the opponent negatively affects it. The expected goal count increases from 0.43 to 0.52 (columns 1 to 3) for a given increase of a standard deviation increase in the home team diversity, while it decreases by roughly the same amounts, from 0.375 to 0.63 (columns 3, 4, and 5) for a given increase of the away team diversity. Results are broadly similar in the away score specifications, shown at the bottom of Table 9. In this specification, however, it is only the relative team's diversity that significantly (and positively) affects its performance.

Table 9. Additional results: goals for, goals against

	Dependent variable: home team's goals scored			
	(1) **IV:**Poisson, control function	(2) **IV:**Poisson, control function	(3) **IV:**Poisson, control function	(4) **IV:**Poisson, control function
AMEs diversity away	-0.235	-0.685	-0.597	-0.182
	[-0.66; 0.17]	[-1.37; -0.06]	[-1.13; -0.06]	[-1.23; 0.97]
AMEs diversity home	0.462	0.646	0.650	1.252
	[0.03; 0.96]	[-0.10; 1.61]	[0.04; 1.39]	[-0.15; 2.70]
	Dependent variable: away team's goals scored			
	(1) **IV:**Poisson, control function	(2) **IV:**Poisson, control function	(3) **IV:**Poisson, control function	(4) **IV:**Poisson, control function
AMEs diversity away	0.422	0.532	0.395	0.314
	[0.15; 0.77]	[0.05; 1.15]	[-0.00; 0.86]	[-0.69; 1.86]
AMEs diversity home	-0.197	-0.526	-0.451	-1.403
	[-0.53; 0.09]	[-1.33; -0.01]	[-1.05; -0.05]	[-3.69; -0.38]
Observations	3877	3568	3568	2510
Team FE	Yes	Yes	Yes	No
Year FE	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes
Minute appearances		Yes	Yes	Yes
Geo-political controls			Yes	Yes
Pair FE				Yes

Notes: Average marginal effects. Estimation sample: football national teams from the UEFA affiliation, performing in World Cup and EUROs in the years 1970–2018 (for columns 1–3) / years 1978–2018 (in columns 4–5). Dependent variable: home team's number of goals scored in the top sub-table, away team's number of goals scored in the top sub-table. In all regressions, we include team and year fixed effects, as well as a stage dummy. Columns 1–5 display results from a Poisson, control-function regression, with 2000 bootstrap replications, clustered at the pair level. 90% confidence intervals in parentheses. Stars correspond to the following p-values: * p < .10, *** p < .05, *** p < .001.