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**When Drains and Gains Coincide:
Migration and International Football Performance**

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Abstract

We analyze the impact of human capital formation through migration on performance by studying the impact of football players' migration to foreign clubs on their origin countries' international football performance. In our model, migration to foreign clubs allows players to improve their skills. Its impact on national team performance is positive and increasing with the difference in quality between foreign and home country clubs. To test this prediction, we have collected information on the club of employment of national team players for most countries in the world. We have constructed an original migration index, weighing each emigrant player by the quality of the foreign club employing him. We find strong and robust support for the theoretical prediction that migration of national team players improves international football performance, particularly for countries with lower quality football clubs.

JEL Classification: F22, J24, L83

Keywords: Migration, Human Capital, International Football Performance

1. Introduction

It is well known today that international migration affects the level of human capital in origin countries in both positive and negative ways. In the short term, migration of skilled workers leads to a direct loss of human capital for the origin countries of migrants. In the long term, migration may induce human capital gains through several channels. The possibility of migration increases individual incentives to invest in human capital. Migrants' remittances may allow more families to afford such investments. Some migrants return to their origin countries after a while, with new skills acquired abroad. Depending on circumstances, the net impact of skilled migration on human capital may be either negative or positive, what is sometimes referred to as "brain drain" or "brain gain".¹

A particularly interesting sector to study these effects is sports, where international migration is a very important phenomenon. The share of migrants in the main sports leagues in Europe and North America is very large compared to other economic sectors, in particular for the top leagues. In this paper we focus on football (soccer) player migration, which has grown largely over the past decade. Migration of football players accelerated with the 1995 Bosman ruling of the European Court of Justice, which removed restrictions on the number of players originating from European countries that could be recruited by European clubs, and which was extended to other origin countries (and sports) by the Malaja, Kolpak and Simutenkov cases and the 2000 Cotonou agreement.² In some cases, European first division teams now employ 100%

¹ See e.g. Mountford (1997), Adams (2003), Stark (2004), Özden and Schiff (2005), Boucher et al. (2009), Beine et al. (2001, 2008), Dustmann et al. (2011).

² The Malaja, Kolpak and Simutenkov cases extend the Bosman jurisprudence to different sports and to citizens of Central Eastern European and Commonwealth of Independent States (CIS) countries (Andreff, 2006). The 2000 Cotonou agreement, signed by the European Union and 77 African, Caribbean and Pacific countries, allows athlete transfers from the latter area under the qualification of assimilated Europeans (Chaix, 2004). For discussions on the implications of the Bosman ruling, see e.g. Simmons (1997), Szymanski (1999), Antonioni and Cubbin (2000), Ericson (2000), Feess and Muehlheusser (2003), Penn (2006), Kleven et al. (2011).

migrant players. Similarly to the familiar brain drain concerns, the globalization of the market for football players has been accused of causing a “muscle drain” for developing countries, depriving them of their most talented players to the benefit of professional leagues in rich countries.³

Interestingly, a particularity of football player migration differentiates muscle drain from the brain drain. Unlike most skilled migrants, who can only work in one country at a time, football players can play for their home country national team while being hired by a foreign country club. Thus, not only are national teams not deprived of migrants’ talents, but they may actually benefit from the additional skills acquired by these players in top foreign leagues.

However, there is no clear empirical evidence on this issue. Some sports analysts argue that football player migration indeed raises the quality of developing countries’ national teams.⁴ Other analysts dispute this.⁵ Ad hoc observations do suggest that developing countries have done better since the start of substantial migration of their football players to rich country competitions. African teams have performed increasingly well in World Cups in the past decades. For example, Ghana, with many national team players employed by European clubs, managed to reach the quarter final in the 2010 World Cup. This is an important achievement for an African country, with only two precedents: Cameroon in 1990 and Senegal in 2002.

This paper goes beyond anecdotal evidence by providing a rigorous econometric analysis of the impact of national team player migration on the international football performance of sending countries. It contributes to two recent fields of the economics literature: the migration

³ See e.g. Gerrard (2002), Magee and Sugden (2002), Andreff (2004, 2009), Darby (2007a, 2007b), Darby et al. (2007). See Swinnen and Vandemoortele (2008) for a review.

⁴ See e.g. Milanovic (2005), Gelade and Dobson (2007), Rodrik (2008), Frick (2009), Özden (2010), Besson et al. (2011).

⁵ See e.g. Giulianotti (1999), Maguire (2008), Andreff (2004, 2009).

literature that analyses empirically the impact of skilled migration on the level of human capital in sending countries and the sports economics literature that analyses the determinants of international football performance.

Recent datasets on migration rates by skill levels have allowed empirical analyses of the impact of skilled migration on human capital accumulation in sending countries. Some papers focused on the positive effect that the possibility of migration may have on individual returns to investments in human capital (Beine et al., 2008, 2010; Beine et al., 2011). Other papers analyzed the role played by migrants' remittances in overcoming liquidity constraints for investing in human capital (Faini, 2007; Niimi et al., 2008; Amuedo-Dorantes and Pozo, 2010) or the role played by migrants in transmitting behavioral norms from their host to home countries (Beine, Docquier and Schiff, 2008). The impact of human capital acquired abroad and brought to sending countries by temporary/return migrants is one of the less well documented areas in this literature.⁶ Existing studies usually compare return migrants and non-migrants with respect to their educational attainments or their incomes (Wahba, 2007; De Vreyer et al., 2010; Gibson and McKenzie, 2012). Both of these measures have some caveats. The education level does not take into account productivity enhancing skills such as exposure to different working practices and new technologies, while the income level is affected by factors other than productivity, such as social networks and job seniority, in particular when labor markets are imperfect. The professional sports sector is one of the few sectors for which objective productivity measures are available (Kahn, 2000; Holmes, 2011; Simmons and Berri, 2011). Moreover, institutional constraints specific to the sports sector (one needs to be a citizen in order to represent a country's national team) and data availability (the clubs of employment of national team players can easily

⁶ For a review, see Docquier and Rapoport (2012).

be found on the internet) make high-level football a very interesting case study of human capital gains obtained through migration.

Empirical studies in sports economics have shown that international football performance is determined by economic, demographic, cultural, climatic, historical, institutional and political factors (Hoffmann et al., 2002; Houston and Wilson, 2002; Torgler, 2006; Macmillan and Smith, 2007; Leeds and Leeds, 2009). To the best of our knowledge, six academic papers have analyzed, directly or indirectly, the effects of national team player migration to foreign leagues on the international football performance of sending countries.

Milanovic (2005) is the first to consider this question. He focuses on the impact of player migration on inequality between teams, rather than on team performance. He develops a theoretical model predicting that the opening of football markets reduces inequality between national teams due to skills spillover between players. He provides descriptive statistics from the history of the World Cup suggesting that inequality between national teams, as measured by the average goal difference between winners and losers, gradually decreased between 1950 and 2002. Gelade and Dobson (2007) are the first to provide an econometric analysis of the impact of migration on national team performance. They estimate the effect of an expatriate index, measured by the percentage of national team players training abroad, on the comparative strength of national football teams. While controlling for the size of the talent pool, football culture, economic resources and the climate, they find a positive and highly significant coefficient for their expatriate index. On the basis of data on the 32 national teams that qualified for the 2006 World Cup in Germany, Baur and Lehmann (2007) regress Fédération Internationale de Football Association (FIFA) rankings on the number of imported and exported players. They find that national teams with a higher percentage of players under contract abroad perform better. Using

panel data on the participation to semifinals and finals in the World Cup and the European Championship from 1978 until 2006, Frick (2009) finds that the migration of players to the financially rewarding leagues in Western Europe does not improve national team performance. Yamamura (2009, 2012) provides empirical evidence on the existence of football technology spillovers from developed to developing countries. The author considers the average world ranking points for the best leagues, i.e. Italy, England, Germany and Spain, as a proxy for the most advanced technology level and finds that technology transfers have a positive impact on the performance of developing countries' national teams.

A related research question is the impact of football player migration on the international football performance of receiving countries. As in the general immigration debate, the focus in the sports sector lies on potential negative effects on domestic players, such as their crowding-out by migrant players. However, existing studies on football have found immigration to have either a positive or no effect on international football performance (see e.g. Baur and Lehmann, 2007; Karaca, 2008; Poli, 2009; Binder and Findlay, 2012) and a related study on basketball shows that domestic players' skills are improved from interacting with migrant players (Alvarez et al., 2011).

Our contribution to this literature is threefold. First, we provide a simple theoretical framework predicting that the impact of migration on national team performance is positive and that it increases with the difference in quality between foreign and home football clubs. Second, we construct a migration index à la Spilimbergo (2009), that weighs migrants by the quality of the clubs employing them. Our index is a more accurate measure of human capital gains from migration than the percentage of migrant players used in the literature, since the quality of training varies considerably among the clubs to which players migrate. Third, our econometric

specification is designed in a way that reduces several possible endogeneity biases from previous studies. Our dataset includes all national teams and not only those that qualified for some international tournament in order to avoid sample selection biases. We include several proxies for the quality of football in each country in order to avoid omitted variable biases.⁷ Finally, in order to account for potential reverse causality between national team performance and population and migration, we use population size instead of the number of regular football players as a proxy for each country's talent pool⁸ and we perform instrumental variables estimations.⁹

Our theoretical framework assumes that there are two countries in the world, which differ in the quality of their football clubs. National team players' skills are determined by their innate talent and the quality of training in the club for which they play. Players' revenues are an increasing function of their skills. Each player decides whether or not to migrate to a foreign club. Migration is costly, but it increases player's skills and revenue to the extent that the quality of training and competitions is superior in the foreign club. We show that only the most talented players will migrate if the skills gained through migration are proportional to talent. We compute the migration rate for national team players and we show that it has a positive impact on national team performance. This impact increases with the difference in quality between foreign and home clubs.

We test these predictions using cross country data on national team performance and the club of employment of national squad players. We find that our weighted migration index has a

⁷ The quality of football in each country affects both national team performance and players' migration patterns.

⁸ The performance of the national team may influence the popularity of the game, and therefore the number of regular players.

⁹ Countries that are able to form better football players should have a better performing national team, but also a higher migration index, since better players are more likely to migrate to top foreign leagues.

positive and significant impact on the performance of national squads and that this impact is higher for countries with lower quality football clubs. This result is very robust across different specifications.

2. Theoretical Framework

Consider a world with two countries: home and foreign. Each country has a football club and a national football team with N players. Player i , $i = 1, \dots, N$ in the home national team has an innate talent t_i and player i , $i = 1, \dots, N$ in the foreign national team has an innate talent t_i^* . Given that our focus is on (highly skilled) national team players, we can reasonably assume that their skills are to a large extent observable to foreign recruiters. Players are ranked by increasing talent, such that $t_1 < t_2 < \dots < t_N$ and $t_1^* < t_2^* < \dots < t_N^*$. Let $t = \sum_{i=1}^N t_i$ be the total stock of talent in the home national team and $t^* = \sum_{i=1}^N t_i^*$ be the total stock of talent in the foreign national team.

The talent of each player and the training quality in the club for which he plays determine his skills for football. We assume that the skills s_i of player i are given by the function:

$$s_i = k_i t_i, \quad (1)$$

where k_i is the training quality in the club employing player i . Training quality refers to all parameters affecting players' skills: the quality of infrastructure and coaching, as well as learning spillovers from playing with or against other high quality players. For simplicity, assume that each player takes training quality as given, equal to k in the home club and k^* in the foreign club, with $k^* > k$.¹⁰ Several factors may explain why foreign clubs offer better training. The

¹⁰ We model training quality as exogenous in order to keep the model as simple as possible. While training quality also depends on the average level of talent and skills of the clubs' players, it is reasonable to assume that each player takes this average quality as given when making the migration decision. An interesting extension would be to endogenize training quality at home and abroad by allowing it to depend on migration decisions. Then migration

foreign country may be richer and therefore it may have more resources to invest in football infrastructure, medical care and other training facilities. Alternatively, the foreign country may have a longer football history, and therefore have acquired superior techniques, better coaches, etc.

We reasonably assume that players' wages are an increasing function of their skills (Bridgewater et al., 2011). A player with skills s_i earns a wage γs_i , with $\gamma > 0$.¹¹ Players can choose to play for the foreign club, but they cannot play for the foreign national team. By migrating to a foreign club, home country national team players improve their skills and wages, as $\gamma k t_i < \gamma k^* t_i$.

In line with the international migration literature, we suppose that migrating abroad entails a cost c for the players. This cost includes moving expenditures, but also emotional and social costs of leaving one's home country, learning a new language, adapting to a new culture, etc.

would affect not only migrating players' human capital, but also the human capital of origin and destination country players. The spillover effect on destination country players has been analyzed empirically in the case of basketball by Alvarez et al. (2011).

¹¹ This assumption implies that for given skills, players earn the same wages at home and abroad. Our results would hold if we alternatively assumed that for given skills wages are higher abroad.

No player from the foreign national team will migrate to the home club, since that would imply bearing the migration cost and earning lower revenues. Home national team player i will migrate to the foreign club if:

$$\gamma k t_i < \gamma k^* t_i - c, \quad (2)$$

which is equivalent to

$$t_i > t_{\bar{i}} \equiv c/\gamma(k^* - k). \quad (3)$$

Condition (3) implies that only sufficiently talented players emigrate. Emigrant players are positively selected because the benefit of migration is increasing with player's talent, while the cost is the same for everyone.¹² A player with a talent level equal to $t_{\bar{i}}$ is exactly indifferent between migrating and remaining at home. Condition (3) also implies that the minimum talent level inducing migration increases with the migration cost and decreases with the difference in training quality between foreign and home clubs.

As players are ranked by increasing talent level, only players $i > \bar{i}$ migrate, where \bar{i} is defined as follows: $\bar{i} = 0$ if $t_{\bar{i}} < t_1$, $\bar{i} = N$ if $t_{\bar{i}} > t_N$ and $\bar{i} = \tilde{i}$ if $t_i \leq t_{\tilde{i}} < t_{\tilde{i}+1}$ for some \tilde{i} between 1 and N .

¹² This feature is not essential for subsequent results, which would also hold if migrants were randomly selected from the pool of players.

Define the football migration rate m as the share of national team talent playing for a foreign club:

$$m \equiv \sum_{i=\bar{i}+1}^N t_i / \sum_{i=1}^N t_i. \quad (4)$$

Define the performance of the home national team as the probability to win a game against the foreign national team. Following the sports economics literature (e.g. Szymanski, 2003; Kesenne, 2007), we assume that this probability is given by the contest success function:

$$p = s / (s + s^*), \quad (5)$$

where p is the probability that the home team wins a game against the foreign team, $s = \sum_{i=1}^N s_i$ is the stock of skills in the home national team and $s^* = \sum_{i=1}^N s_i^*$ is the stock of skills in the foreign national team.¹³

As all players $i > \bar{i}$ from the home national team migrate to a foreign club, where they get a training equal to k^* , the performance of the home national team will be equal to:

$$p = (k \sum_{i=1}^{\bar{i}} t_i + k^* \sum_{i=\bar{i}+1}^N t_i) / (k \sum_{i=1}^{\bar{i}} t_i + k^* \sum_{i=\bar{i}+1}^N t_i + k^* \sum_{i=1}^N t_i^*). \quad (6)$$

Using (4) and (6), we can express performance as a function of the migration rate:

$$p = [tm(k^* - k) + kt] / [tm(k^* - k) + kt + k^*t^*]. \quad (7)$$

Deriving p with respect to m gives:

$$\partial p / \partial m = t(k^* - k)k^*t^* / (tm(k^* - k) + kt + k^*t^*)^2 > 0. \quad (8)$$

It follows from (8) that the impact of migration on national team performance is positive and increasing with the difference in training quality between home and foreign clubs, $k^* - k$.¹⁴

¹³ By choosing an additive function for players' skills determining team performance, we abstract from human capital externalities, i.e. the productivity of players depending on the skills of their team mates. Considering such externalities would be an interesting extension of our model.

¹⁴ It is easy to check that the relative performance of the foreign team is negatively affected by migration, i.e. $\partial p^* / \partial m < 0$, even if the absolute skills of its players are unchanged, as they do not migrate and benefit from the same training quality. This result is driven by the assumption that there are no human capital externalities and that immigration does not affect the quality of training in foreign teams.

In our model, migration improves players' human capital because it allows them to obtain higher quality training abroad. For simplicity, we abstracted from other channels through which migration affects human capital, such as higher investments in training due to the prospects of migration that has been extensively modeled and tested in the migration literature. Moreover, as we assume that the quality of training in clubs is exogenous and there are no human capital externalities, migration only affects migrating players' skills and revenues.

This simple theoretical framework predicts that football players' migration to foreign clubs has a positive impact on the performance of their home national team and that this impact is higher, the higher the difference in quality between foreign and home clubs. The following section provides empirical evidence supporting these predictions.

3. Empirical Framework

We test the predictions of the model using cross country data on FIFA countries' national team performance and the club of employment of their players. The following sections provide the definitions of the variables used, the data sources, the estimation techniques, the regression results and some extensions and robustness checks.

3.1. Variables and Data

Following the football economics literature, we measure national team performance by the number of FIFA points each national team has obtained during games played against other national teams. The number of points per game depends on the outcome of the game, on the importance of the game, on the strength of the opponent and on the strength of the regional

confederation.¹⁵ The performance of a team is computed as the sum of current year performance and a three-year weighted average of previous annual performances, with a gradual decline in importance of results. The data on the number of FIFA points is taken for February 2010 from FIFA. Table 1 gives the twenty national teams with the highest number of FIFA points, most of which originate from Europe.

In order to measure the migration rate of national team players, we have collected data on the club of employment for players from all national teams in the world. The composition of national teams varies slightly every year. We use the national squad composition during the 2007 or 2008 confederation championships for all countries participating in a confederation championship. In particular, for Asian football confederation (AFC) countries we use the 2007 AFC Asian Cup squads, for African football confederation (CAF) countries, we use the 2008 Africa Cup of Nations squads, for North Central American and Caribbean confederation (CONCACAF) countries we use the 2007 CONCACAF Gold Cup squads, for South American confederation (CONMEBOL) countries we use the 2007 Copa América squads and for European confederation (UEFA) countries we use the UEFA Euro 2008 squads. This data has been gathered from Wikipedia. Squad compositions at championships of the Oceania football confederation (OFC) were not available. Data for OFC countries and for countries not participating in confederation championships were provided by Benjamin Strack-Zimmermann.

¹⁵ FIFA assigns an equal weight to results of friendly games and to results of games in minor tournaments. One could favor the exclusion of the results of friendly games from the calculation since these games lack the performance incentives of competitive games. Macmillan and Smith (2007) show that the World Football Elo Ratings, an alternative index which assigns a lower weight to results of friendly games than to results of games in minor tournaments, is highly correlated with the number of FIFA points and that regression results are not sensitive to the choice of the performance measure.

If the necessary information concerning the club of employment of players was unknown in Benjamin Strack-Zimmermann's database, we consulted Global Sports Media.¹⁶

Note that we use 2010 data for national team performance and 2007 or 2008 data for national squad composition. The reason for using lagged data for the national squad composition is that players who have emigrated only recently are unlikely to have significantly increased their human capital abroad, since acquiring football skills is a process that takes time (Alvarez et al., 2011).

As mentioned in the introduction, the literature has used the percentage of emigrant national team players as a measure of the migration rate (Gelade and Dobson, 2007; Frick, 2009). However, this index does not take into account the fact that some players migrate to average foreign leagues, where the quality of training is only slightly better than what they could obtain at home, while other players migrate to top European leagues, where the quality of training is the best in the world. Depending on where players migrate, the same number of migrants could correspond to very different human capital gains for the national team. In order to better quantify the human capital gain due to migration, we construct a migration index that weighs each migrant player by strength of the league and the division of the club to which he migrates.

We measure the strength of a league by its UEFA ranking. This ranking is associated with the sum of UEFA coefficients obtained by each league in the past five years. The UEFA coefficients are calculated based on the performance of football teams from each country in the main European club competitions, the Champions League and the Europa League. In general, each participating team gets two points for a win, one point for a draw and some bonus points for

¹⁶ For around 100 out of more than 5,000 players (mainly originating from CONCACAF countries), no information could be found on their club of employment. We considered those players to be non-migrants, i.e. they did not affect their country's migration index.

proceeding further in the tournament. The UEFA coefficient assigned to a country is the sum of points obtained by all the participating teams from that country divided by the number of those teams. The data are provided by Bert Kassies. In order to get rid of the inverse relationship between a country's position in the ranking and the quality of its clubs, we assign the following relative ranking to league i (Barajas et al., 2005):

$$r_i = (n_{UEFA} + 1 - p_{rank,i})/n_{UEFA}, \quad (9)$$

where r_i is the relative UEFA ranking assigned to country i , n_{UEFA} is the number of UEFA countries and $p_{rank,i}$ is the position of country i in the UEFA ranking.

We take into account differences in training qualities between different divisions in the same league by giving a weight equal to 1 to first division clubs, a weight equal to 1/2 to second division clubs, a weight equal to 1/3 to third division clubs, etc.

We assign the following migration index to each national team:

$$Migr = \frac{1}{n} \sum_i r_i \sum_d \frac{1}{d} n_{id}, \quad (10)$$

where n is the total number of players in the national squad, n_{id} is the number of national squad players that train in a foreign club in division d in UEFA league i , and r_i is the relative UEFA ranking of league i .

Note that the use of the ranking instead of the coefficients may lead to a less accurate measure than the use of the UEFA coefficients as it reduces the relative weight of the highest ranked leagues. In our sample, which consists predominantly of highly skilled players, most players migrate to the highest ranked leagues. For example, more than half of the migrating national team players migrate to the “Big Five” European Leagues (England, Spain, Germany, Italy and France). So, using the UEFA ranking instead of the UEFA coefficients reduces the size of the migration index, which, if anything, would lead to a downward bias in our results. Hence

our estimations can be interpreted as a lower bound. Additionally, the advantage of using the UEFA ranking rather than the UEFA coefficients is that it allows us to construct a migration index between 0 (no national team player training in a foreign UEFA league) and 1 (all national team players training in the first division of the highest ranked foreign UEFA league) which is much easier to interpret. Table 2 provides the twenty national squads with the highest migration index.

Note that only national team players migrating to UEFA leagues are considered in our migration index. This is not an important restriction, given that in the African continent, which is the confederation with the highest number of migrating players to another confederation than UEFA, only around 30 out of more than 500 migrating players were not playing in UEFA countries.

An additional argument for using a migration index weighted in this way is the fact that it probably better reflects migrating players' foreign experience. A player training in a highly ranked UEFA league has probably had a longer experience abroad than a player training in a lower ranked league, since most players do not migrate directly from their home domestic league to the strongest European leagues. Lower rated European leagues often act as "nursery hubs" or as "transition countries for top players" (Dejonghe, 2001; Andreff, 2009).

We control for a number of explanatory variables, in line with the literature on international football performance. Following Hoffmann et al. (2002), Houston and Wilson (2002), Torgler (2006) and Macmillan and Smith (2007), we include GDP per capita and its quadratic form as control variables. Individuals living in wealthier countries are more likely to participate in leisure activities and subsequently in competitive sports. Furthermore, wealthier countries have more resources to spend on health care, training facilities and other productivity

enhancing inputs. We therefore expect a positive impact of income per capita on international football performance. However as income increases after a certain threshold, other leisure activities become available to a larger share of the population, possibly reducing the popularity of football. We may therefore expect a negative coefficient for GDP per capita squared. Data on GDP per capita is taken from the International Monetary Fund (IMF) World Economic Outlook 2009.¹⁷

We control for countries' population size, as a proxy for the pool of talent (Bernard and Busse, 2004). Following Macmillan and Smith (2007), we also include a quadratic form to allow for a decreasing impact of the population size on international football performance. We use the CIA World Factbook population data for the year 2009.

A temperature variable is introduced to take into account the effect of climate on football performance. Extreme hot or cold temperatures discourage participation in outdoor activities. Following earlier contributions (Hoffmann et al., 2002; Macmillan and Smith, 2007), we measure temperature by the squared deviation of average annual temperatures from 14° C in the capital city. Average annual temperature in capital cities is gathered from Weatherbase, a database which keeps track of around 20-year-averages of the largest cities in the world.

Countries able to form better football players should have better performing national teams, but also higher migration indexes, since better players are more likely to migrate to top foreign leagues. In order to avoid an upward bias of the migration coefficient, we need to control for countries' ability to form good football players. We include four control variables as proxies for the quality of football in each country. First, we control for football culture, measured by the year of foundation of the national football association, in line with Macmillan and Smith

¹⁷ We also use data on GDP per capita from The Central Intelligence Agency (CIA) World Factbook and Eurostat since the IMF does not provide data for a few small countries and for regional football associations such as the countries of the United Kingdom.

(2007).¹⁸ Countries with a longer football culture have had more time to acquire specific tactical and organizational skills, so we expect this coefficient to be negative. This data has been provided by Benjamin Strack-Zimmermann. Second, we control for countries' historical performance in international football competitions, measured by the number of World Cup appearances, following previous literature (Houston and Wilson, 2002; Yamamura, 2009, 2012).¹⁹ This data is taken from FIFA. This coefficient is expected to be positive. Third, we control for the quality of football institutions, measured by the performance of each country's football teams in the main club competitions, in line with Leeds and Leeds (2009). More specifically, we measure the quality of football institutions of country *i* by the number of times a club from that country won the Champions League of the confederation to which the country belongs. We use data from the foundation of the confederation's Champions League until the 2009/10 season. The data are taken from the official websites of the confederations. In order to take into account differences in Champions Leagues between confederations, this number is weighted by the coefficient assigned by FIFA to each confederation.²⁰ Finally, we include confederation dummies in order to capture remaining differences in football quality among continents. We take the CONCACAF confederation as the benchmark confederation.

¹⁸ Some former members of socialist political entities like the Soviet Union, Yugoslavia and Czechoslovakia have relatively recent foundations, but presumably a football tradition dating back to the affiliation with those former entities. For those countries for which absorption into the respective entity was before the foundation of that entity's national football association, we substituted the year of foundation by the year of foundation of the entity's national football association if a country's national football association had not been founded before the foundation of that entity's national football association. For those countries for which absorption into the respective entity was after the foundation of that entity's national football association, we substituted the year of foundation by the year of absorption into the respective entity if a country's national football association had not been founded before the foundation of that entity's national football association. A similar approach is undertaken in Gelade and Dobson (2007), while others (Macmillan and Smith, 2007; Leeds and Leeds, 2009) try to overcome this problem by including dummies for former republic or communist members.

¹⁹ In line with FIFA, we consider Russia, Serbia and both the Czech Republic and Slovakia as the successor teams of the Soviet Union, Yugoslavia and Czechoslovakia. Note also that we do not include 2006 and 2010 World Cup appearances in order to avoid endogeneity.

²⁰ This coefficient is the one used by FIFA for assigning a number of points per game: 1 for UEFA and for CONMEBOL, 0.88 for CONCACAF, 0.86 for CAF and 0.85 for AFC and for OFC.

Our dataset includes 202 countries. Data on national squad composition was insufficient for the Central African Republic, Eritrea, British Virgin Islands, Montserrat and Papua New Guinea, so these six countries are excluded from the regressions. Table 3 provides the descriptive statistics.

3.2. Empirical Specification

We estimate the following equation:

$$Points_i = \beta_0 + \beta_1 Migr_i + \beta_2 GDP_i + \beta_3 GDP_i^2 + \beta_4 Pop_i + \beta_5 Pop_i^2 + \beta_6 Cult_i + \beta_7 Temp_i + \beta_8 Hist_i + \beta_9 Inst_i + \sum_{j=10}^{14} \beta_j Conf_{ij} + u_i, \quad (11)$$

where $Points_i$ is the number of FIFA points for country i , $Migr_i$ is the migration index, GDP_i is GDP per capita, Pop_i is the population size, $Temp_i$ is the temperature variable, $Cult_i$ is football culture, $Hist_i$ is historical performance, $Inst_i$ is the quality of football institutions, $Conf_{ij}$ are confederation dummies and u_i is an error term.

Equation (11) is estimated using ordinary least squares (OLS). The results are discussed in the following sections.

3.3. Regression Results

We first test the theoretical prediction that migration of players to foreign leagues improves national team performance. Table 4 reports estimation results for different specifications based on model (11). The unconditional specification in column (1) yields a positive and statistically significant coefficient for the migration index, consistent with the theoretical prediction.

Columns (2)-(8) report regression results including the control variables one by one. In columns (2) and (3), we control for per capita income and population size. In line with previous studies, we find positive and significant coefficients for these two variables and negative and significant coefficients for their squared terms. Regressions (4)-(8) respectively include football culture, temperature, historical performance, football institutions and confederation dummies as control variables. All the controls' coefficients have the expected signs and are significant. This indicates that these regressions are not prone to potential problems of multicollinearity. Adding the control variables decreases the magnitude of the migration coefficient. In particular, as expected, controlling for countries' ability to form good football players (football culture, historical performance, football institutions and confederation dummies) significantly lowers the migration coefficient. However, it remains positive and significant at less than 1% level in all specifications.

The final specification in column (8) suggests that holding other factors constant, one standard deviation increase in the migration index raises the number of FIFA points by 0.35 standard deviations. To take some concrete examples, assuming a national football team consists of 23 players, the maximum number of players of national football team squads that qualified for 2008 confederation championships, the transfer of one additional player to a club in the English premier league in 2008 would increase the migration index by 4.3 percentage points. Our estimations suggest that this would lead to an increase in FIFA points by 21.6 points. GDP per capita of a typical country would have to increase by 7.272 thousand dollars to generate a similar result. If a national football team consists of 30 players, on average the total number of players of national football team squads that did not qualify for confederation championships, the transfer of one additional player to a club in the English Premier League in 2008 would increase the

migration index by 3.3 percentage points. This would lead to an increase in FIFA points by 16.5 points.

Second, we test the theoretical prediction that the impact of migration on national team performance is higher, the higher the difference in the quality of clubs between destination and origin countries. We test this hypothesis in two ways. First, we include an interaction term between the football institutions variable, which is a proxy for the quality of football clubs in the origin country of migrants, and the migration index. We expect this interaction term to be negative, since migration should be more valuable for countries with worse football clubs. Second, we exclude UEFA countries from our sample. We expect the migration coefficient to be higher for the restricted sample, since UEFA countries have better quality football clubs.

Regression results including the interaction term between football institutions and the migration index are presented in Table 5. The migration index remains significant at the 1% level. Its interaction with football institutions is negative and significant at the 5% level. The results excluding UEFA countries are reported in Table 6.²¹ The coefficient of the migration index remains positive and significant at the 1% level. The coefficient of the migration index (657.5) is higher than in the estimations using the whole sample (501.4).

These results are in line with our theoretical predictions that migration increases national team performance and that this effect is more important for countries with lower quality football clubs.

²¹ Excluding UEFA countries from the sample decreases considerably the variation in the variables representing historical performance and the quality of football institutions, which gives rise to problems of multicollinearity. This explains why these two variables are insignificant in Table 6. If we exclude either of these two variables from the regression, the coefficient of the other variable is significant.

3.4. Extensions and Robustness Checks

In this section, we consider a number of robustness checks and extensions of our basic model. Note first that our results are robust to using 2009 or 2011 data for national team performance and to using logarithms rather than linear and quadratic forms of countries' GDP per capita and population size. In line with Alvarez et al. (2011), we have also tested the hypothesis of decreasing returns to migration by including the squared migration index among the control variables, but it was not significant in most specifications, so we decided to drop it.

Our first robustness check is the use of the FIFA ranking as an alternative measure of international football performance. The FIFA ranking is the ranking associated with the number of FIFA points each national team has obtained during games played against other national teams. Note that the use of the ranking instead of the points leads to a loss of information on the variation in performance between nations. We estimate the following equation:

$$\begin{aligned} \text{Ranking}_i = & \beta_0 + \beta_1 \text{Migr}_i + \beta_2 \text{GDP}_i + \beta_3 \text{GDP}_i^2 + \beta_4 \text{Pop}_i + \beta_5 \text{Pop}_i^2 + \beta_6 \text{Cult}_i + \beta_7 \text{Temp}_i \\ & + \beta_8 \text{Hist}_i + \beta_9 \text{Inst}_i + \sum_{j=10}^{14} \beta_j \text{Conf}_{ij} + u_i. \end{aligned} \quad (12)$$

Since ranking is a count variable, the appropriate estimation technique for equation (12) is a Poisson regression (Cameron and Trivedi, 1998). Poisson regression imposes equidispersion, with conditional variance equal to conditional mean. However, in many applications count data are overdispersed, with conditional variance exceeding conditional mean. The standard alternative distribution used is the negative binomial, with variance assumed to be a quadratic function of the mean. Overdispersion tests such as the Likelihood Ratio test indicate that the negative binomial model is to be preferred. Hence, due to excess dispersion of the rank variable, we estimate (12) using negative binomial regression. The results of this regression are given in

Table 7. They confirm our original findings (the signs of coefficients are reversed due to the inverse relationship between a country's performance and its ranking).

A second robustness check deals with the countries with a zero migration index. Since these countries are numerous in Asia, North America and Oceania, we should check whether they drive our results. Estimation results excluding those countries are shown in Table 8. The estimated coefficients of the migration term decrease in magnitude, but they remain highly significant.

Our third robustness check deals with the players that had once migrated to a UEFA league, but had returned to their home leagues at the date at which we constructed the migration index. These players acquired skills during their UEFA experience, but are not included in our migration index. Including these earlier migration patterns in the migration index should increase the value of its estimated coefficient. Table 9 reports the regression results when the migration index includes returned players.²² In line with the expectations, the migration coefficient is higher.

Another robustness check concerns the definition of a migrant football player. Some football players are born in a country as second generation migrants, but represent the national football team of their parents' origin country. As these players did not incur the migration cost c in order to join the foreign club, their talent level does not need to be above the threshold level inducing migration, so it should be lower on average. If the human capital gain from training in a better club is positively related to player's talent level, one would expect migrants who did not incur the migration cost to have a lower impact on international football performance. We test this hypothesis by excluding players born in a foreign UEFA country from our migration index.

²² When constructing this extended migration index, we weighted return migrants by the 2007 or 2008 UEFA ranking r_i of the last UEFA league in which they played.

The results are given in Table 10. The coefficient of the migration index is indeed higher than in the baseline model.

When constructing our migration index, we have proxied player spillovers from the foreign club to the home national team by the ranking of the league and the division to which the player's club belongs. However, the spillover effects from migration could be higher for players that migrate to higher quality clubs within a league and for players that appear in the majority of competition games at their club, since an important part of football skills is acquired by participating in competition games. In order to address these issues, we provide two additional tests that refine our measure of spillover effects. First, we can refine our migration index by giving a higher weight to clubs ranked in the top half at the end of the season.²³ More specifically, we assign a weight equal to 1 to top half ranked first division clubs, a weight equal to 1/2 to bottom half ranked first division clubs, a weight equal to 1/3 to top half ranked second division clubs, etc. Second, we can exclude players that do not regularly contribute to their club's performance in games. More specifically, we exclude migrant players that did not appear in at least ten games during the season under consideration. The results are presented in Table 11 and Table 12. Once more, the positive effect of migration on national team performance is confirmed. In line with the expectations, the coefficient of the migration index is higher compared to the baseline results.

Measuring national teams' historical performance by the number of World Cup presents some caveats. In particular, most African countries were colonies for many years in which the World Cup was organized, and therefore have less World Cup appearances than countries from other confederations (Alegi, 2010). To deal with this caveat, we consider lagged international

²³ Since there is considerable seasonal variation in club ranking (but not in club quality), we choose not to weigh each player by exact club ranking.

football performance instead of the number of World Cup appearances as a measure of historical performance. We respectively use the number of FIFA points and the FIFA ranking in 1994, the year before the Bosman ruling.²⁴ The results are given in Table 13. Due to the high correlation between lagged and current international football performance, the migration coefficient drops significantly compared to the initial regression results, but it remains positive and significant at the 1%. As these regressions control for international football performance in a period with little migration of football players, they strongly support the human capital gain from migration hypothesis.²⁵

The removal of migration restrictions in 1995 could have benefited more to small countries: while highly skilled players from larger countries probably had already migrated before 1995, the best players from smaller countries could migrate with a higher probability after 1995 than before 1995. Table 14 reports the results when we restrict our sample to the countries with a population size less than the average population size of the original sample. The coefficient of the migration index increases, suggesting that the removal of restrictions on migration benefited smaller countries relatively more.

A final issue of concern is the possibility of reverse causality: countries that are able to form better football players should have better performing national teams, but also higher migration indexes, since better players are more likely to migrate to top foreign leagues.²⁶ If this is the case, the migration coefficient could be upward biased. To investigate this potential

²⁴ Hence, another advantage of using these alternative controls is that they are good proxies for the quality of football in each country when migration of football players was subject to very strict regulations. We return to this issue in the final robustness checks.

²⁵ All our results are robust to this different specification of the historical performance variable. The results are available upon request.

²⁶ This is further encouraged by existing regulations concerning the employment of emigrant football players. For example, in the English Premier League, players from outside the European Union must have participated in at least 75% of the home national team games during the two years before a transfer takes place and originate from a country amongst the top 70 national football teams in the FIFA ranking (Poli, 2009).

endogeneity problem, we follow two approaches, namely difference-in-difference estimation and instrumental variables (IV) estimation.

We use difference-in-difference estimation to compare football performance when restrictions on player migration were low (in 2010) with performance when migration restrictions were high (1994; the year before the Bosman ruling, which marked the removal of border restrictions on football player migration). We estimate the difference in performance as a function of the difference in migration rates and control variables²⁷:

$$\Delta Ranking_{i,2010-1994} = \beta_0 + \beta_1 \Delta Migr_{i,2008-1992} + \beta_2 \Delta GDP_{i,2010-1994} + \beta_3 \Delta Pop_{i,2010-1994} + \beta_4 \Delta Inst_{i,2010-1994} + u_i. \quad (13)$$

In this equation, we use differences in ranking rather than differences in points because the point system's calculation changed considerably between 1994 and 2010. Compared to our main specification (11), the control variables representing a country's temperature, football culture and historical performance are excluded since differences in these variables cancel out. Confederation dummies are excluded since they are jointly insignificant. Equation (13) is estimated using OLS. As the number of time periods is equal to two, the difference in difference estimation is equivalent to a fixed effects panel data regression.

Table 15 reports the results. In all columns (1)-(4), the evolution of the migration index has a positive and significant influence on the evolution of national team performance between 1994 and 2010 (negative and significant effect on the country's position in the FIFA ranking). The final specification (4) suggests that a ten percentage point increase in the migration index variation improves the variation of the country's position in the FIFA ranking between 1994 and 2010 by around 5 places, *ceteris paribus*.

²⁷ In order to construct the 1994 migration index, we had to make some assumptions regarding squad size and missing data, since national squad composition data was incomplete for some countries (see notes under Table 15).

Next, we use the IV estimation approach. We instrument football migration with colonial and political factors, as proxies for migration costs and constraints. Several authors have argued that international migration patterns of football players are reinforced by historical colonial ties (e.g. Maguire and Stead, 1998; Poli, 2006; Darby, 2007a,b). Such ties reduce migration costs (due to familiarity with the destinations' culture, language and institutions, as well as presence of home country networks). This suggests that countries with historical colonial ties with UEFA countries should have a higher migration index. Several non-sovereign countries, which still have some dependency links to their former European colonial powers, are recognized as independent FIFA members (Shobe, 2008). To take into account the particularities of these countries, we also include a dummy for current colonial links among the instruments. Finally, it is well known that international migration rates are also influenced by political factors (Leeds and Leeds, 2009). In particular, emigration from communist countries is generally more difficult, due to more stringent constraints in both origin and destination countries. This suggests a lower migration index for communist countries. Hence, we consider the following three instruments of the migration index: dummy variables for past and current colonial links with the main migration destination of national team players and a dummy variable for communist countries.²⁸ Data on colonial links are taken from Centre d'Etudes Prospectives et d'Information Internationales (CEPII), data on government types are gathered from the CIA World Factbook.

We carry out two-stage least squares IV estimations of equation (11) and (12). Confederation dummies are excluded since they are jointly insignificant. There is no function in standard software programs to command IV regressions for negative binomial methods.

²⁸ As we need a value for the main football migration destination in order to construct colonial dummy variables, IV regressions are based on the sample including only countries with a positive migration index. A previous robustness check has shown that restricting the sample to countries with a positive migration index does not significantly alter regression results.

Therefore, when conducting IV estimation of equation (12), we first regress the endogenous variable – the migration index – on the control variables and the three instruments by using OLS (the first stage regressions). We then predict the values of the endogenous variable and regress the dependent variable – FIFA ranking – on the predicted value of the endogenous variable and the other control variables by using negative binomial regression (the second-stage regressions).²⁹

Our instruments satisfy the instrument relevance condition (as shown by the F-tests on the first stage and on the excluded instruments, the Kleibergen-Paap test and the Anderson-Rubin test included in Table 16) and the exogeneity condition (as shown by the Hansen overidentification test included in Table 16).

First stage regressions indicate that instruments are significant and of the expected sign (see Table 16). In particular, countries that had (have) colonial links are found to display higher (lower) migration indexes and communist countries are found to display lower migration indexes.³⁰ Table 17 reports the two-stage least squares IV estimates of equation (11) and (12). The main findings of the IV estimations are largely similar to the OLS estimations (see Table 8). We find evidence of a positive effect of migration on national team performance. The sign and significance of the control variables are also consistent with previous results.

²⁹ This approach is standard in the literature on negative binomial IV estimation (e.g. Vadlamannati, 2012). Our results are robust to performing two-stage least squares IV estimation of equation (12) by using the Poisson method – a method of which the IV software command is available – and to performing two-stage least squares IV estimation of equation (12) using a log-linear model to approximate the negative binomial model.

³⁰ As IV regressions are based on a sample including only countries with a positive migration index, countries with current colonial links are the ones with the lowest migration indexes.

4. Conclusion

We investigated the effect of migration of football players to foreign clubs on the performance of national teams. We built a simple theoretical framework predicting that the effect of migration on national team performance is positive and that it increases with the difference in the quality of training between foreign and home clubs. The positive effect of migration is due to the superior skills that migrating players acquire in foreign clubs and that they take back with them when representing their national team.

We used cross country data on national team performance and on the club of employment of national team players to test these predictions. We quantified the effect of skill acquisitions abroad by assigning to each national team a migration index that weighs each migrant player with the quality of the foreign club where he is training. After controlling for a variety of other factors, we find significant and robust support for the theoretical predictions. This evidence suggests that while developing countries' football clubs may experience a "muscle drain", their national teams experience a "muscle gain" at the same time.

These results on the impact of migration and human capital accumulation may not be easily generalized to other sectors than sports. Systematic return of migrants, even temporary, is important. However, the football experience might inspire similar practices in other professions. Policy makers could design programs that facilitate the return of skilled migrants for short periods of time in order to share the skills and technology acquired abroad with their home countries peers.³¹

³¹ Some projects of this type have already been initiated. For example, the International Organization for Migration has recently launched a program financing short term working visits of expatriated Moldovan scientists to an academic institution in their origin country, aiming at improving skill spillovers and scientific collaboration between Moldovan and foreign academic institutions.

Improved human capital from training and playing in foreign clubs might not be the only positive externality on migrants' origin countries. Authorities, parents and youngsters may be willing to put more resources and effort in football training after observing role models making successful careers in European football leagues. This is the well-known incentive effect in the brain gain literature. If the system for searching and developing youth players works efficiently, the quality and quantity of supply of young football players might increase in sending countries. This might increase the quality and attractiveness of the sending countries' football leagues in the longer term. Investigating this long term impact of successful football migrants on the quality of the home country football league could be an interesting future research avenue.

An alternative tool for improving football players' skills could be to import foreign coaches instead of exporting domestic players. A number of African countries have used this strategy. Assessing the efficiency of this alternative instrument for increasing human capital in football, but also other sectors, could be another interesting direction for future research.

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Appendix

Table 1: Twenty national football teams with highest FIFA points in February 2010

Country	Points
<i>Spain</i>	1627
<i>Brazil</i>	1568
<i>Netherlands</i>	1288
<i>Italy</i>	1209
<i>Portugal</i>	1176
<i>Germany</i>	1173
<i>France</i>	1117
<i>Argentina</i>	1082
<i>England</i>	1076
<i>Egypt</i>	1069
<i>Croatia</i>	1053
<i>Greece</i>	1030
<i>Russia</i>	1026
<i>USA</i>	963
<i>Nigeria</i>	956
<i>Chile</i>	955
<i>Mexico</i>	947
<i>Switzerland</i>	924
<i>Serbia</i>	916
<i>Cameroon</i>	914

Source: FIFA.

Table 2: Twenty national football teams with highest migration index

Country	Migration index
<i>Côte d'Ivoire</i>	0.906
<i>Senegal</i>	0.823
<i>Brazil</i>	0.808
<i>Czech Republic</i>	0.804
<i>Republic of Ireland</i>	0.797
<i>Croatia</i>	0.788
<i>Cameroon</i>	0.783
<i>Nigeria</i>	0.781
<i>Ghana</i>	0.73
<i>Switzerland</i>	0.687
<i>Australia</i>	0.67
<i>Argentina</i>	0.668
<i>Sweden</i>	0.641
<i>Northern Ireland</i>	0.607
<i>Slovakia</i>	0.603
<i>Uruguay</i>	0.599
<i>Montenegro</i>	0.593
<i>Guinea</i>	0.592
<i>Netherlands</i>	0.589
<i>Mali</i>	0.587

Table 3: Descriptive statistics

Variables	Mean	Max.	Min.	Std. Dev.
<i>FIFA points</i>	394.282	1627	0	342.817
<i>Migration index</i>	0.201	0.906	0	0.236
<i>GDP per capita (in 1,000\$)</i>	15.155	118	0.009	16.937
<i>Population (in 1,000,000 inhabitants)</i>	33.5	1338.613	0.012	129.169
<i>Football culture</i>	1938.876	2002	1863	27.766
<i>Temperature</i>	81.644	256	0	68.522
<i>Historical performance</i>	1.663	17	0	3.363
<i>Football institutions</i>	1.07	23.76	0	3.17

Notes: (i) See text for variables description.

Table 4: Determinants of international football performance measured by FIFA points

Dependent variable: FIFA points								
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Constant</i>	204.655 (0.000)	122.093 (0.000)	65.442 (0.007)	6331.32 (0.000)	5270.529 (0.000)	2738.333 (0.004)	2855.08 (0.002)	2585.704 (0.015)
<i>Migration</i>	944.758 (0.000)	892.4376 (0.000)	858.724 (0.000)	766.001 (0.000)	708.412 (0.000)	565.442 (0.000)	588.366 (0.000)	501.391 (0.000)
<i>GDP per capita</i>		9.341 (0.000)	9.938 (0.000)	6.406 (0.001)	6.223 (0.001)	2.744 (0.091)	3.498 (0.033)	4.450 (0.014)
<i>(GDP per capita)²</i>		-0.094 (0.000)	-0.096 (0.000)	-0.068 (0.001)	-0.068 (0.001)	-0.032 (0.06)	-0.038 (0.023)	-0.049 (0.008)
<i>Population</i>			2.791 (0.000)	2.402 (0.000)	2.334 (0.000)	1.242 (0.06)	1.063 (0.008)	1.191 (0.005)
<i>Population²</i>			-0.002 (0.000)	-0.002 (0.000)	-0.002 (0.000)	-0.001 (0.006)	-0.001 (0.009)	-0.001 (0.006)
<i>Football culture</i>				-3.198 (0.000)	-2.606 (0.000)	-1.305 (0.007)	-1.37 (0.004)	-1.256 (0.022)
<i>Temperature</i>					-0.856 (0.000)	-0.559 (0.004)	-0.551 (0.004)	-0.411 (0.034)
<i>Historical performance</i>						41.025 (0.000)	27.399 (0.001)	23.352 (0.006)
<i>Football institutions</i>							20.664 (0.047)	22.406 (0.036)
Confederation dummies	No	No	No	No	No	No	No	Yes
Observations	202	202	202	202	202	202	202	202
R ²	0.425	0.473	0.557	0.608	0.632	0.718	0.738	0.749

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method: ordinary least squares. (iii) Significant variables of interest in bold.

Table 5: Determinants of international football performance, including an interaction term between football institutions and the migration index

Variables	Dependent variable	FIFA points
<i>Constant</i>		2075.75 (0.06)
<i>Migration</i>		593.594 (0.000)
<i>GDP per capita</i>		4.009 (0.026)
<i>(GDP per capita)²</i>		-0.043 (0.018)
<i>Population</i>		1.229 (0.003)
<i>Population²</i>		-0.001 (0.004)
<i>Football culture</i>		-1.007 (0.077)
<i>Temperature</i>		-0.316 (0.086)
<i>Historical performance</i>		23.328 (0.004)
<i>Football institutions</i>		41.054 (0.008)
<i>Football institutions*migration</i>		-54.073 (0.021)
Confederation dummies		Yes
Observations		202
R ²		0.762

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method: ordinary least squares. (iii) Significant variables of interest in bold.

Table 6: Determinants of international football performance, excluding UEFA countries

Variables	Dependent variable	FIFA points
<i>Constant</i>		2398.067 (0.008)
<i>Migration</i>		657.541 (0.000)
<i>GDP per capita</i>		3.386 (0.184)
<i>(GDP per capita)²</i>		-0.016 (0.67)
<i>Population</i>		0.85 (0.037)
<i>Population²</i>		-0.001 (0.039)
<i>Football culture</i>		-1.142 (0.014)
<i>Temperature</i>		-0.56 (0.003)
<i>Historical performance</i>		12.758 (0.494)
<i>Football institutions</i>		16.43 (0.246)
Confederation dummies		Yes
Observations		149
R ²		0.758

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method: ordinary least squares. (iii) Significant variables of interest in bold.

Table 7: Determinants of international football performance measured by FIFA ranking

Dependent variable: FIFA ranking								
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Constant</i>	4.933 (0.000)	5.072 (0.000)	5.206 (0.000)	-7.007 (0.008)	-5.380 (0.044)	-0.053 (0.979)	-0.525 (0.798)	-0.407 (0.859)
<i>Migration</i>	-2.062 (0.000)	-2.017 (0.000)	-2.016 (0.000)	-1.825 (0.000)	-1.699 (0.000)	-1.247 (0.000)	-1.323 (0.000)	-1.162 (0.000)
<i>GDP per capita</i>		-0.0155 (0.001)	-0.019 (0.000)	-0.013 (0.001)	-0.013 (0.002)	-0.004 (0.215)	-0.006 (0.074)	-0.009 (0.021)
<i>(GDP per capita)²</i>		0.000 (0.001)	0.000 (0.000)	0.000 (0.001)	0.000 (0.001)	0.000 (0.145)	0.000 (0.054)	0.000 (0.012)
<i>Population</i>			-0.006 (0.000)	-0.005 (0.000)	-0.005 (0.000)	-0.003 (0.002)	-0.003 (0.003)	-0.003 (0.003)
<i>Population²</i>			0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.002)	0.000 (0.004)	0.000 (0.004)
<i>Football culture</i>				0.006 (0.000)	0.005 (0.000)	0.003 (0.014)	0.003 (0.007)	0.003 (0.018)
<i>Temperature</i>					0.002 (0.001)	0.001 (0.012)	0.001 (0.015)	0.001 (0.045)
<i>Historical performance</i>						-0.113 (0.000)	-0.078 (0.001)	-0.07 (0.002)
<i>Football institutions</i>							-0.068 (0.01)	-0.069 (0.01)
Confederation dummies	No	No	No	No	No	No	No	Yes
Observations	202	202	202	202	202	202	202	202
R ²	0.477	0.485	0.536	0.589	0.599	0.692	0.708	0.708

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method: negative binomial. (iii) Significant variables of interest in bold.

Table 8: Determinants of international football performance, excluding countries with a zero migration index

Variables	Dependent variable	FIFA points (1)	FIFA ranking (2)
<i>Constant</i>		3254.13 (0.067)	-1.744 (0.653)
<i>Migration</i>		461.39 (0.000)	-1.105 (0.000)
<i>GDP per capita</i>		4.477 (0.107)	-0.009 (0.118)
<i>(GDP per capita)²</i>		-0.059 (0.018)	0.000 (0.034)
<i>Population</i>		1.671 (0.007)	-0.004 (0.002)
<i>Population²</i>		-0.001 (0.007)	0.000 (0.003)
<i>Football culture</i>		-1.58 (0.084)	0.003 (0.084)
<i>Temperature</i>		-0.54 (0.07)	0.001 (0.081)
<i>Historical performance</i>		20.475 (0.02)	-0.064 (0.007)
<i>Football institutions</i>		20.226 (0.056)	-0.061 (0.016)
Confederation dummies		Yes	Yes
Observations		145	145
R ²		0.706	0.633

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method column (1): ordinary least squares, estimation method column (2): negative binomial. (iii) Significant variables of interest in bold.

Table 9: Determinants of international football performance, including former migrants who returned home

Variables	Dependent variable	FIFA points (1)	FIFA ranking (2)
<i>Constant</i>		2405.117 (0.022)	-0.078 (0.973)
<i>Migration</i>		525.342 (0.000)	-1.23 (0.000)
<i>GDP per capita</i>		3.957 (0.025)	-0.008 (0.032)
<i>(GDP per capita)²</i>		-0.045 (0.011)	0.000 (0.018)
<i>Population</i>		1.213 (0.005)	-0.003 (0.002)
<i>Population²</i>		-0.001 (0.004)	0.000 (0.002)
<i>Football culture</i>		-1.165 (0.031)	0.003 (0.024)
<i>Temperature</i>		-0.396 (0.039)	0.001 (0.046)
<i>Historical performance</i>		22.976 (0.008)	-0.066 (0.005)
<i>Football institutions</i>		20.893 (0.057)	-0.067 (0.012)
Confederation dummies		Yes	Yes
Observations		202	202
R ²		0.755	0.723

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method column (1): ordinary least squares, estimation method column (2): negative binomial. (iii) Significant variables of interest in bold.

Table 10: Determinants of international football performance, excluding migrants who were born in a foreign UEFA country

Variables	Dependent variable	FIFA points (1)	FIFA ranking (2)
<i>Constant</i>		2585.657 (0.01)	-0.372 (0.86)
<i>Migration</i>		540.259 (0.000)	-1.292 (0.000)
<i>GDP per capita</i>		4.675 (0.009)	-0.009 (0.009)
<i>(GDP per capita)²</i>		-0.051 (0.005)	0.000 (0.006)
<i>Population</i>		1.199 (0.004)	-0.003 (0.001)
<i>Population²</i>		-0.001 (0.005)	0.000 (0.002)
<i>Football culture</i>		-1.255 (0.015)	0.003 (0.011)
<i>Temperature</i>		-0.408 (0.04)	0.001 (0.048)
<i>Historical performance</i>		22.326 (0.009)	-0.067 (0.004)
<i>Football institutions</i>		22.697 (0.036)	-0.07 (0.01)
Confederation dummies		Yes	Yes
Observations		202	202
R ²		0.749	0.717

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method column (1): ordinary least squares, estimation method column (2): negative binomial. (iii) Significant variables of interest in bold.

Table 11: Determinants of international football performance, migration index weighted by club ranking within a division

Variables	Dependent Variable	FIFA points (1)	FIFA ranking (2)
<i>Constant</i>		2781.469 (0.006)	-0.802 (0.706)
<i>Migration</i>		650.93 (0.000)	-1.575 (0.000)
<i>GDP per capita</i>		4.536 (0.011)	-0.009 (0.016)
<i>(GDP per capita)²</i>		-0.049 (0.006)	0.000 (0.01)
<i>Population</i>		1.225 (0.005)	-0.003 (0.002)
<i>Population²</i>		-0.001 (0.005)	0.000 (0.003)
<i>Football culture</i>		-1.354 (0.01)	0.003 (0.006)
<i>Temperature</i>		-0.421 (0.03)	0.001 (0.044)
<i>Historical performance</i>		21.163 (0.013)	-0.064 (0.006)
<i>Football institutions</i>		20.938 (0.05)	-0.067 (0.013)
Confederation dummies		Yes	Yes
Observations		202	202
R ²		0.755	0.717

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method column (1): ordinary least squares, estimation method column (2): negative binomial. (iii) Significant variables of interest in bold.

Table 12: Determinants of international football performance, excluding players that do not appear in at least ten games at their foreign club

Variables	Dependent Variable	FIFA points (1)	FIFA ranking (2)
<i>Constant</i>		2185.35 (0.032)	0.805 (0.709)
<i>Migration</i>		526.435 (0.000)	-1.238 (0.000)
<i>GDP per capita</i>		5.774 (0.001)	-0.012 (0.000)
<i>(GDP per capita)²</i>		-0.062 (0.000)	0.000 (0.000)
<i>Population</i>		1.205 (0.005)	-0.003 (0.002)
<i>Population²</i>		-0.001 (0.007)	0.000 (0.003)
<i>Football culture</i>		-1.053 (0.045)	0.002 (0.05)
<i>Temperature</i>		-0.351 (0.078)	0.001 (0.075)
<i>Historical performance</i>		19.157 (0.024)	-0.058 (0.01)
<i>Football institutions</i>		23.895 (0.027)	-0.075 (0.007)
Confederation dummies		Yes	Yes
Observations		192	192
R ²		0.757	0.752

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method column (1): ordinary least squares, estimation method column (2): negative binomial. (iii) Significant variables of interest in bold. (iv) 10 countries are dropped since no adequate information on players' appearances in club games is available.

Table 13: Determinants of international football performance, different specification of historical performance

Variables	Dependent Variable	FIFA points (1)	FIFA ranking (2)
<i>Constant</i>		-695.809 (0.592)	5.071 (0.097)
<i>Migration</i>		319.281 (0.001)	-0.793 (0.002)
<i>GDP per capita</i>		0.725 (0.647)	-0.004 (0.299)
<i>(GDP per capita)²</i>		-0.022 (0.136)	0.000 (0.106)
<i>Population</i>		0.907 (0.005)	-0.003 (0.005)
<i>Population²</i>		-0.001 (0.003)	0.000 (0.004)
<i>Football culture</i>		0.428 (0.523)	-0.000 (0.762)
<i>Temperature</i>		-0.248 (0.251)	0.000 (0.356)
<i>Historical performance</i>		8.645 (0.000)	0.006 (0.000)
<i>Football institutions</i>		21.757 (0.008)	-0.081 (0.000)
Confederation dummies		Yes	Yes
Observations		166	166
R ²		0.79	0.714

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method column (1): ordinary least squares, estimation method column (2): negative binomial. (iii) Significant variables of interest in bold. (iv) 36 countries are dropped since they were not yet included in the official FIFA rankings in 1994.

Table 14: Determinants of international football performance, excluding countries with above-average population size

Variables	Dependent Variable	FIFA points (1)	FIFA ranking (2)
<i>Constant</i>		1114.315 (0.309)	2.315 (0.342)
<i>Migration</i>		581.339 (0.000)	-1.319 (0.000)
<i>GDP per capita</i>		5.782 (0.002)	-0.011 (0.005)
<i>(GDP per capita)²</i>		-0.051 (0.004)	0.000 (0.007)
<i>Population</i>		20.188 (0.002)	-0.043 (0.001)
<i>Population²</i>		-0.503 (0.015)	0.001 (0.015)
<i>Football culture</i>		-0.541 (0.337)	0.001 (0.238)
<i>Temperature</i>		-0.298 (0.131)	0.001 (0.12)
<i>Historical performance</i>		8.531 (0.296)	-0.029 (0.14)
<i>Football institutions</i>		53.316 (0.001)	-0.138 (0.001)
Confederation dummies		Yes	Yes
Observations		166	166
R ²		0.758	0.72

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method column (1): ordinary least squares, estimation method column (2): negative binomial. (iii) Significant variables of interest in bold.

Table 15: Determinants of the variation in international football performance between 1994 and 2010

Dependent variable: Difference in FIFA ranking				
Variables	(1)	(2)	(3)	(4)
<i>Constant</i>	14.666 (0.000)	12.448 (0.015)	10.398 (0.054)	10.171 (0.063)
<i>Difference in migration</i>	-54.561 (0.000)	-53.475 (0.001)	-52.362 (0.001)	-53.425 (0.001)
<i>Difference in GDP per capita</i>		0.24 (0.325)	0.299 (0.234)	0.3 (0.234)
<i>Difference in population</i>			0.171 (0.015)	0.168 (0.013)
<i>Difference in football institutions</i>				0.592 (0.554)
Confederation dummies	No	No	No	No
Observations	119	119	119	119
R ²	0.099	0.104	0.121	0.122

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method: ordinary least squares. (iii) Significant variables of interest in bold. (iv) Complete data on national squad compositions are often lacking for countries that did not participate in the confederation championships. For the computation of the migration index of these countries, we assume that the total number of national team players equals the confederation championships' number of national team players and that players whose names were not available did not migrate.

Table 16: Determinants of international football performance, first stage IV regressions

Variables	Dependent Variable	Migration
<i>Constant</i>		0.116 (0.939)
<i>GDP per capita</i>		0.002 (0.519)
<i>(GDP per capita)²</i>		-0.000 (0.285)
<i>Population</i>		-0.001 (0.307)
<i>Population²</i>		0.000 (0.228)
<i>Football culture</i>		0.000 (0.943)
<i>Temperature</i>		-0.000 (0.255)
<i>Historical performance</i>		0.028 (0.000)
<i>Football institutions</i>		-0.01 (0.106)
<i>Former colony</i>		0.104 (0.018)
<i>Current colony</i>		-0.247 (0.000)
<i>Communism</i>		-0.229 (0.000)
Confederation dummies		No
Observations		145
R ²		0.674

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method: ordinary least squares. (iii) Significant variables of interest in bold.

Table 17: Determinants of international football performance, second stage IV regressions

Variables	Dependent variable	FIFA points (1)	FIFA ranking (2)
<i>Constant</i>		3141.212 (0.018)	-1.207 (0.697)
<i>Migration</i>		468.199 (0.031)	-1.231 (0.000)
<i>GDP per capita</i>		3.445 (0.098)	-0.007 (0.157)
<i>(GDP per capita)²</i>		-0.048 (0.013)	0.000 (0.019)
<i>Population</i>		1.361 (0.019)	-0.003 (0.029)
<i>Population²</i>		-0.001 (0.015)	0.000 (0.023)
<i>Football culture</i>		-1.49 (0.027)	0.003 (0.062)
<i>Temperature</i>		-0.611 (0.01)	0.002 (0.006)
<i>Historical performance</i>		27.466 (0.004)	-0.109 (0.000)
<i>Football institutions</i>		18.024 (0.063)	-0.049 (0.052)
Confederation dummies		No	No
F-statistic first stage		35.99 (0.000)	35.99 (0.000)
F-statistic excluded instruments		29.57 (0.000)	29.57 (0.000)
Kleibergen-Paap statistic		29.572 (<0.05)	N/A N/A
Anderson-Rubin statistic		11.77 (0.008)	N/A N/A
Hansen J statistic		3.103 (0.212)	N/A N/A
Observations		145	145
R ²		0.684	0.648

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method: two-stage least squares. (iii) Significant variables of interest in bold. (iv) Instruments for migration: dummy variables for historical colonial links with main migration destination, current colonial links with main migration destination and communist countries. (v) See Baum (2012) for more information on the different statistics and the null hypotheses being tested.