Muscle drain versus brain gain: technology transfer through player emigration and manager immigration

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Running title: Muscle drain versus brain gain in association football

To test theories of migration and economic development, this article examines whether international football teams benefit from having players playing abroad in stronger leagues and from employing managers from countries with stronger leagues. The results provide evidence in support of the former effect. However, there is a negative impact from employing managers from countries with superior leagues.

I. Introduction

To test theories of migration and economic development (e.g. Beine *et al*., 2011; Docquier et al., 2008; Stark and Wang, 2002), a number of recent papers have investigated whether national association football (soccer) teams benefit from having players playing club football outside their domestic league (Berlinschi *et al*., 2013 ; Baur and Lehmann, 2007 ; Gelade and Dobson, 2007 ; Frick, 2009). Although such 'muscle drain' has the potential to weaken national football teams by lowering the standard of the domestic league, the empirical evidence tends to support the hypothesis that, through competing in higher quality leagues and having access to superior training and tactical methods, players playing abroad improve the performance of the national team (Berlinschi *et al*., 2013; Baur and Lehmann, 2007)[1] .

While the players market has become an increasingly global one, the same is also true of the market for international managers with many national football teams hiring foreign managers ('brain gain'). We therefore address a gap in the literature by investigating whether a nation's standing in international football (measured by their ranking points) is improved by having a foreign manager. Following the literature on technology transfer through players playing in overseas leagues, we take into account the quality of the league of the country from which the manager comes. Like much of the literature to date, we find that having players playing outside their domestic league in stronger leagues has a positive impact on the performance of the national football

[1] A related literature (e.g. Alvarez et al, 2011 and Binder and Findlay, 2012) looks at whether there is an impact on the performance of a national team from having non-domestic players within those national leagues, i.e. whether there is a "crowding-out" of domestic talent.

team. By contrast, we find a negative and significant impact of having an overseas manager.

II. Literature Review

Four papers have investigated empirically whether the performance of national teams is improved by players playing outside of the domestic league.[2] Baur and Lehmann (2007), using data on the countries that qualified for the 2006 World Cup, find that there is a significant and positive impact on country ranking of player imports, while the impact of player exports is positive but insignificant. Similarly, Frick (2009) finds that having players playing abroad has no systematic impact on the chance of a team qualifying for the later stages of an international tournament. By contrast, Gelade and Dobson (2007) find strong support for a positive impact on national team performance from the export of players. Berlinschi *et al.* (2013) show a positive impact of player migration to European leagues on origin countries ranking points. They are the first to note that the quality of the league matters, rather than whether the league is overseas or not. Our approach to capturing league quality differs from that taken by Berlinschi *et al*. (2013) in that, rather than assuming that all leagues outside of Europe are of the same standard, we take account of the heterogeneous nature of leagues outside of Europe.

III. Data and Econometric Model

The dependent variable is the Fédération Internationale de Football Association (FIFA) rankings points that a country accumulates in a year. This differs from the headline

[2] A related paper by Yamamura (2009) finds that the ranking points of developing countries catch-up with those of developed countries. However, his model does not explicitly take account of player migration.

FIFA rankings points which are a weighted average of points accumulated over four years.[3] Because the benefits of exporting players and importing managers may take time to materialize, we estimate the model using FIFA ranking points accumulated in 2010, 2011 and 2012 as the dependent variable.[4] This approach should also alleviate concerns about endogeneity as future national team performance cannot determine current player exports or manager imports.

To construct the player export variable, we follow Berlinschi *et al.* (2013) by assuming that there is greater scope for technology transfer from stronger leagues. Our player export variable for each country *i* is therefore calculated by subtracting the ranking points of the domestic league of player *p* (i.e. the league for the country that they represent in international football) from the ranking points of the league in which player *p* plays for his club.[5] A weighted average of this figure is then taken with the weights given by the number of appearances that player *p* made for their national team in 2010.

$$playerexport_i = \sum_p^N \frac{\left((leaguepoints_{ip} - domesticpoints_{ip})(appearances_{ip})\right)}{\sum_p^N appearances_{ip}} \quad (1)$$

[3] Details on how the rankings are calculated are provided here: http://www.fifa.com/worldranking/procedureandschedule/menprocedure/index.html

[4] The migration index used by Berlinschi et al (2013) relates to between 2 and 3 years prior to the ranking points used in their estimation, acknowledging that 'acquiring football skills is a process that takes time'. We find little difference between using lagged or concurrent player export variables.

[5] In our dataset, out of a total of 6049 players, 1634 play in a stronger league than their home league (and therefore have a positive value (for leaguepoints *minus* domestic points)) while only 183 play in a weaker league than their home league (and have a negative value). Just over 30%, therefore, of international players in 2010 played outside their own national league.

The league ranking points for 2010 are taken from the International Federation of Football History (IFFHS - http://www.iffhs.de/?b6e28fa3002f76b55a76917f7370eff3702bb1c2bb17). Data on clubs and number of international appearances for 2010 are taken from National Football Teams (NFT http://www.national-football-teams.com/).[6]

It is unreasonable to expect that players playing in countries with a stronger top division would benefit their national team in the same way if they played in lower divisions. We therefore experiment with three specifications of $leaguepoints_{ip}$. Firstly, we set $leaguepoints_{ip}$ equal to $domesticpoints_{ip}$ if a player plays in a country with a superior top league but outside the top division. Secondly, and similarly to Berlinschi *et al.* (2003), we divide $leaguepoints_{ip}$ by the division number. Thirdly, we give the same value of $leaguepoints_{ip}$ to all players in a given country. Results using the first approach are presented below but the sign and significance of the key coefficients are invariant to how this variable is calculated. [7]

The other variable in which we are primarily interested is the foreign manager variable. Because managers from countries with stronger leagues are likely to be familiar with superior tactics and training methods, this variable is calculated in an analogous manner to the player export variable:

$$managerimport_i = domesticpoints_i - leaguepoints_i \quad (2$$

[6] Substitute appearances are counted as one third of a full appearance.

[7] Results from alternative specifications are available on request from the authors.

To construct this variable, we collected data on the nationality of countries' managers in 2010. As some national sides changed managers during the year, it would have been helpful if data on the number of games for each manager were available. As it was not, the results presented below use the nationality of the manager at the end of 2010. We also experimented with calculating this variable under the assumption that different managers were in charge for an equal share of games in 2010. The results were very similar to those presented below.

Our model is therefore the following:

$$points_i = \beta_1 playerexport_i + \beta_2 managerimport_i + \beta_3 X_i + \varepsilon_i \quad (3$$

where $points_i$ is the FIFA rankings points for country i in 2010, 2011 or 2012, $playerexport_i$ and $managerimport_i$ have been discussed above and X_i is a vector of control variables. Following the literature we include in X_i variables to capture the influence of the climate, the footballing culture of a country (federation age), and the financial and human resources available to a country (GDP per capita, total population and their squares). We also include a full set of football confederation dummies. Further details on these variables are provided in Table 1.

Table 1. Variable Definitions

Variable	Definition	Source
Points	Ranking points in December 2010, 2011 and 2012	FIFA
Player Export	See text	IFFHS and NFT
Manager Import	See text	Wikipedia and IFFHS
League Points	Ranking points for 2010 for the league of the country in which the player plays or the league of the country which the manager manages	IFFHS
Domestic points	Ranking points for 2010 for the league of the home country of the player or manager	IFFHS
Climate[8]	(Average temperature[a] in capital city– 14)^2	World Bank
Federation Age	Number of years since the country's football federation was founded	NFT
GDP per capita	GDP per head of country in 2010 ($ thousands)	UN
Population	Population of country in 2010 (millions)	UN
Confederation dummies	Dummy variables for each confederation (with Confederation of African Football as the baseline category)	UN

Notes: [a] Temperature is measured in degrees Celsius

IV. Results

The results from estimation of Equation (3) are provided in Table 2. The coefficients on the control variables all have the expected sign: a more extreme climate is associated with poorer performance; countries with a greater football culture tend to have more ranking points; GDP per capita and population both have positive but diminishing effects on national team performance.

Regardless of the year from which the FIFA rankings are taken, the coefficient on the player export variable is positive and statistically significant, indicating that having players playing abroad in better leagues has the expected beneficial impact on national team performance. This confirms the results of Berlinschi *et al.* (2013) and Gelade and Dobson (2007). By contrast, the coefficient on the manager import variable is negative

[8] Following Berlinschi et al (2013), Macmillan and Smith (2007) and Hoffmann et al. (2002) this specification implies that an annual average temperature of 14° C is the optimal temperature for football.

and statistically significant. This suggests that cultural differences between management and players are difficult to surmount in international football and that national sides should employ domestic managers.

Table 2. Results from estimation of equation (3) using ordinary least squares

	(1)	(2)	(3)
Dependent Variable:	Points 2010	Points 2011	Points 2012
Player Export	0.332***	0.335***	0.218***
	(0.088)	(0.073)	(0.082)
Manager Import	-0.123***	-0.107***	-0.076**
	(0.040)	(0.033)	(0.037)
Climate	-0.479**	-0.372**	-0.357*
	(0.204)	(0.170)	(0.190)
Federation Age	0.576	0.678*	1.575***
	(0.424)	(0.354)	(0.396)
GDP per capita	4.580***	1.179	2.222*
	(1.317)	(1.100)	(1.230)
GDP per capita^2	-0.039***	-0.010	-0.025**
	(0.013)	(0.011)	(0.012)
Population	1.532***	0.961***	0.642**
	(0.325)	(0.272)	(0.304)
Population^2	-0.001***	-0.001***	-0.000*
	(0.000)	(0.000)	(0.000)
Confederation dummies	Yes	Yes	Yes
R-squared	0.549	0.463	0.420
Observations	179	179	179

Notes: ***/**/* denotes significance at the 1%/5%/10% level

V. Conclusion

This article has sought to estimate the impact of the increasingly globalized marketplace for football playing and management talent on national team performance. Specifically, it is the first article in the literature to explore the impact of both the 'muscle drain' of players to non-domestic leagues and the 'brain gain' from overseas managers. Our results indicate that having players playing outside their domestic league in stronger leagues has a positive impact on the performance of the national team. For overseas

managers, we find that the impact on ranking points is negative and significant. These results suggest that national football sides should employ domestic managers.

References

Alvarez, J., Forrest, D., Sanz, I. & Tena, J. D. (2011) Impact of importing foreign talent on performance levels of local co-workers, *Labour Economics,* **18,** 287-296.

Baur, D. G. & Lehmann, S. (2007) Does the Mobility of Football Players Influence the Success of the National Team?, IIIS Discussion Paper No. 217, Institute for International Integration Studies, Dublin.

Beine, M., Docquier, F. & Oden-Defoort, C. (2011) A Panel Data Analysis of the Brain Gain, *World Development,* **39,** 523-532.

Berlinschi, R., Schokkaert, J. & Swinnen, J. (2013) When drains and gains coincide: Migration and international football performance, *Labour Economics,* **21,** 1-14.

Binder, J. J. & Findlay, M. (2012) The Effects of the Bosman Ruling on National and Club Teams in Europe, *Journal of Sports Economics*, **13,** 107-129.

Docquier, F., Faye, O. & Pestieau, P. (2008) Is migration a good substitute for education subsidies?, *Journal of Development Economics,* **86,** 263-276.

Frick, B. (2009) Globalization and Factor Mobility: The Impact of the ``Bosman-Ruling'' on Player Migration in Professional Soccer, *Journal of Sports Economics,* **10,** 88-106.

Gelade, G. A. & Dobson, P. (2007) Predicting the Comparative Strengths of National Football Teams, *Social Science Quarterly*, **88,** 244-258.

Hoffmann, R., Lee, C. G. & Ramasamy, B. (2002) The Socio-Economic Determinants of International Soccer Performance, *Journal of Applied Economics,* **5,** 253-272.

Macmillan, P. & Smith, I. (2007) Explaining International Soccer Rankings, *Journal of Sports Economics*, **8,** 202-213.

Stark, O. & Wang, Y. (2002) Inducing human capital formation: migration as a substitute for subsidies, *Journal of Public Economics*, **86,** 29-46.

Yamamura, E. (2009) Technology transfer and convergence of performance: an economic study of FIFA football ranking, *Applied Economics Letters*, **16,** 261-266.