THE EFFECT OF EXCHANGE RATES ON THE PERFORMANCE OF PROFESSIONAL SPORTS FRANCHISES IN INTERNATIONAL COMPETITION

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ABSTRACT

Exchange rates are a very important factor for businesses that operate internationally, especially when franchises are in international competition for the same talent pool. As an international league, this paper seeks to analyze how teams' performance in the NHL is affected vis-à-vis a fluctuating value of currency. This analysis is extended to Champions' League soccer, where over 50 countries with different currencies compete in the same international context. Results indicate that currency value has a significant effect on success in international competition.

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Introduction

International athletic competition is a cornerstone of sporting culture, yet it remains to be seen how the international economic climate may affect competition. Team franchises operate by investing in an international labor market of talent in which the most talented players demand the most expensive contracts. This competition ensures that generating revenue to invest in talent is paramount to a team's success. However, in addition to revenue, global exchange rates directly affect a team's payroll budget. As independent agents trying to maximize performance, external, dynamic international economic forces must play a part in the success or failure of club teams competing internationally.

Professional sports are an excellent case study for testing international economic effects on labor markets because performance is so clearly quantifiable. Between the NHL and the UEFA European Cup, it is possible to analyze the performance of different countries' teams against each other directly. The statistical analysis made possible by these features may give new insight into the nature of international labor markets as a whole, as the concepts here may extend to industries where performance is not as quantifiable.

The first dataset merges outcomes of every game between US and Canadian teams in the NHL with exchange rate data. My second dataset compares the results of international club soccer tournaments with the REER of the currency of each team. Results of regressions on both dataset signifies that an increase in the value of a team's native currency has a significant, positive effect on that team's international performance.

This paper is divided into three sections. Part I consists of a literature review and my reason to believe in the effects posited above. Part II describes the data and analysis of the NHL, and Part III extends the discussion to international soccer.

Part I: Literature Review

As a whole, the breadth of literature surrounding professional sports is not as well explored as other areas of economic concern despite offering great structural advantages to the study of labor economics. However, in the last 50 years a new renaissance of statistical accounting techniques has changed the entire landscape of professional sports with a wealth of new analysis. This was started by MLB analyst Simon Rottenberg, who reviewed industrial structure, contractual arrangements, the implications of the reserve rule and player drafts on the distribution of playing talents, competitive balance, monopsonist exploitation and investments in training.

Rottenberg's paper demonstrates that the highly visible attributes of sports performance make the field exceptionally well suited as a case study for labor economics. While most wage regressions in other industries rely on proxies (such as IQ, work experience, etc) to measure a person's performance, direct competition allows for performance in the sporting industry to be measured more efficiently. To this extent, labor questions within the industry such as free agency, drafting policies, and player mobility have been discussed extensively.

While most literature focuses on issues within leagues, I would like to understand how international forces beyond the control of players and teams affect the dynamics of their industry. Because teams participating in international leagues all operate in a different economic environments, more analysis is needed to understand how variations in those environments affect outcome in those leagues.

These questions become more important each day due to the rising interest in sports entertainment. With the expansion of live television broadcasting, international dynamics have become incredibly important to a club's success. As Andreff, Wladimir and Staudohar explain in "The Evolving Model of European Sports Finance," increasing competition among broadcast companies in the past two decades had allowed television contracts to become the biggest source of income for professional teams. The rise of broadcast television has also allowed more teams to expand their brand past their home town. Sports franchises are more valuable than ever, with many professional teams offering public stock offers. As of 2000, there were 33 professional soccer clubs with quotes in their country's stock exchange. Most importantly, "there is no longer a necessary link between the nationality of the professional club and the television broadcaster, or the company that has an investment stake, or the stock underwriter, or the players on the field." In other words, a professional team's revenue is heavily influenced by international markets.

The connection between revenue and performance has been well established, both in theory and empirically. The prevailing theory that more revenue allows for teams to purchase the best talent is generally unquestioned, had has been verified by Dobson and Goddard in "Performance and Revenue in professional league football." Using Granger causality tests, there is significant evidence to suggest "causality running from lagged revenue to current performance than of causality in the opposite direction." Given these findings, it stands to reason that if a team confronts an outside boost in revenue, for example in the form of a favorable foreign exchange rate, there should be a lagged effect on that team's performance relative to teams from other countries.

More specifically, Hall, Szymanski and Zimbalist discuss the relationship between payroll and performance, both in North America's Major League Baseball and in English soccer. Their results suggest that although such a link is weak in MLB, in English soccer the causality can not be rejected. Furthermore, since 1995 they believe causality between payroll and performance runs in both directions. Since foreign exchange rates have a direct effect on the power of a team's payroll, this literature supports my theory that exchange rates have a tangible effect on performance.

As Stefan Szymanski describes in "The Economic Design of Sporting Contests", there are many reasons why European soccer and NHL hockey are ideal case studies for my type of analysis. For instance, for the periods in my analysis there were no salary caps or revenue sharing in both the NHL and European soccer. In European soccer there is no new player draft, thus ensuring that a player's destination is solely chosen by economic standards. These characteristics are important because the macroeconomic effects I'm looking for are more apparent in a free market than a market where there are obstacles to expenditure and player acquisition.[1]

Finally, the research most closely linked to mine comes from a paper in the *Journal of Applied Economics* entitled "The Socio-Economic Determinants of International Soccer Performance." This paper employs an approach very similar to mine

[1] One challenge to my research is the fact that a simple performance-revenue model poses certain obstacles in a regression analysis. As a firm trying to generate revenue, a team draws interest by utilizing a combination of performance and entertainment value. The latter suggests that teams are willing to pay for attributes not directly associated with how well a player will affect the performance of their team, such as whether that player carries a personal fan base. Horowitz and Zappe explain this in detail by discussing how aged players (especially the most successful) use their past careers and "star power" to command disproportionately large contracts.

to analyze national team soccer performance. The authors stress the importance of country-inherent factors such as culture, demography and geography in the context of international soccer performance. They also offer explanations into how GNP and per-capita income create the proper environment for soccer talent to develop. In addition, they also find that consistent with common sense, countries whose average temperature is more suitable for playing soccer tend to produce better talent.

While their research implies that macroeconomic factors are important for the development of national teams, I believe that wealth has a much more direct effect on gaining talent at the club level. Nevertheless, it is reassuring to know that even at the national team level, where we would expect socioeconomic factors to be less pronounced than in the capitalistic club soccer environment, economic factors still pose a significant presence.

"Public Policy and Olympic Success" (2002) expands on these ideas by asserting that apart from unchanging factors such as climate and geography, "comparative analysis reveals that there exists significant scope for public policies to enhance a country's international sporting performance." This well established link between economic investment and sporting performance is important to my analysis because it strengthens the possibility that macroeconomic forces manifest themselves in international soccer outcomes.

Part II: The NHL

The National Hockey League is a professional hockey league in North America composed of 6 Canadian and 24 American teams. The results of these games are widely available, but the results I obtained came from www.hockey-reference.com and contain every game played by every team in the league. The structure of these games has been constant from 1970 until 1998, when the rules changed give teams one point for losing in overtime. Due to the constant nature of the league over this time period, all of my data will come from this time period.

While each team plays the same number of games over the course of the season, which teams each franchise plays against fluctuates from season to season. A team earns 2 points for a win, 1 point for a tie and none for a loss. Table 1 below summarizes the collective record of Canada's teams against American competition as well as average points earned per game against American competition.[2]

[2]An owners' lockout shortened the 1994-95 season 48 games per team due to the the collective bargaining agreement. Notice that the number of games were much fewer during the 1970's.

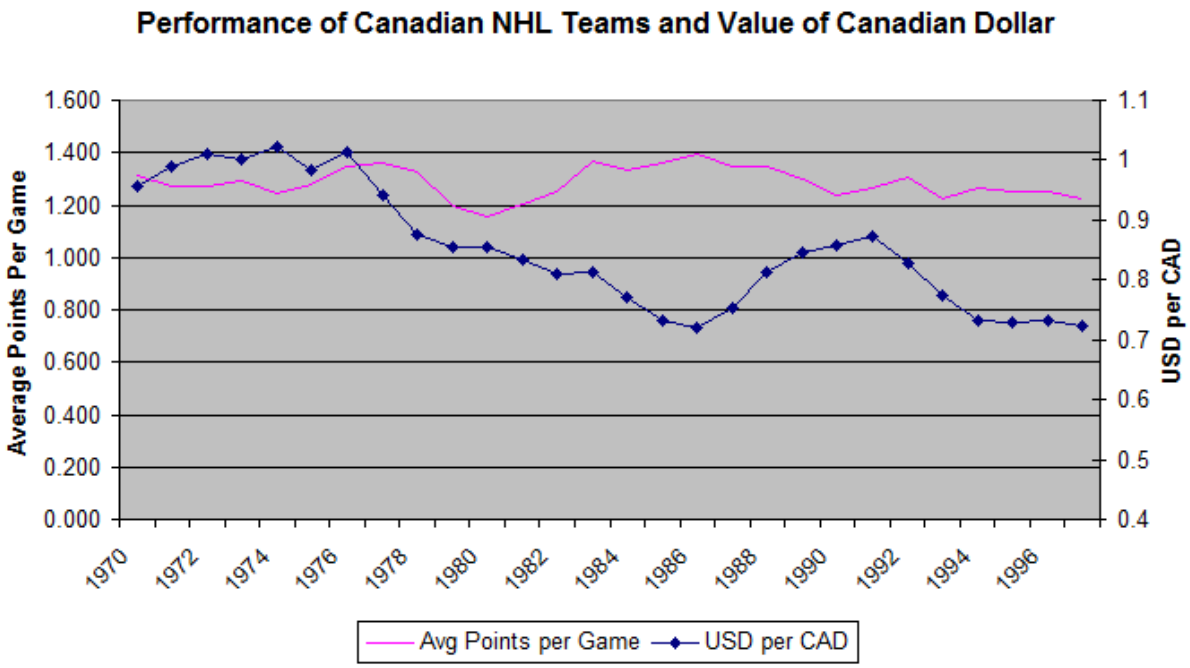
Table 1

Season	W	L	T	Games	Pts per Game
1997-98	147	58	189	394	1.226
1996-97	167	58	214	439	1.248
1995-96	172	56	237	465	1.249
1994-95	115	36	144	295	1.268
1993-94	180	67	264	511	1.221
1992-93	195	52	218	465	1.308
1991-92	159	52	190	401	1.267
1990-91	135	44	202	381	1.239
1989-90	161	47	173	381	1.299
1988-89	177	44	160	381	1.349
1987-88	171	39	171	381	1.346
1986-87	191	40	150	381	1.396
1985-86	175	38	168	381	1.360
1984-85	176	50	155	381	1.331
1983-84	174	35	172	381	1.365
1982-83	153	58	170	381	1.249
1981-82	165	82	156	403	1.206
1980-81	142	78	195	415	1.154
1979-80	138	62	191	391	1.194
1978-79	100	31	82	213	1.324
1977-78	109	32	72	213	1.362
1976-77	108	34	71	213	1.347
1975-76	115	42	108	265	1.275
1974-75	109	45	111	265	1.242
1973-74	91	32	80	203	1.291
1972-73	84	31	82	197	1.269
1971-72	84	31	82	197	1.269
1970-71	87	25	85	197	1.315

These results were merged with data on the US – Canadian Dollar exchange rate between 1970 and 1997. 1970 was chosen as the start date for this dataset because that was the year the Canadian government officially changed their monetary policy to release the Canadian dollar (CAD) from its pegged value of approximately .9275 US dollars (USD). From then on the currency was allowed to float relative to the value of the USD.

Information about the official exchange rate between the USD and CAD was taken from World Development Index Online. This database that compiles information from the International Monetary Fund, which is the preeminent source for international economic data. Below Figure 1 compares the value of the CAD relative to USD over the time period of the dataset employed in this paper.

Figure 1



In order to test the relationship between performance and the official exchange rate, I performed an ordered logistical regression to estimate the effect of exchange rate on the number of points earned against US competition. The exchange rate metric is the natural logarithm of the average value of the CAD in USD over the year in which the

season started. Most trades and player acquisitions are done during the offseason, which occurs between June and October.

Because there are three levels of outcome, we must use an ordered logistical regression instead of a simple logistical regression. The theoretical framework for such a procedure is as follows. Because we are relying on the points system, outcome ($\prod$) of a game has three possible options, win (2) tie(1) or loss (0). Assume that there are then two cutoff levels of performance, one that separates a win from a tie (c_1) and one that separates a tie from a loss (c_2). If we consider each team's ability (including the power of their exchange rate) to be $X\beta$, then outcomes should occur as follows:

$$\prod = 2 \quad \text{if} \quad X\beta + \varepsilon > c_1$$

$$\prod = 1 \quad \text{if} \quad c_1 > X\beta + \varepsilon > c_2$$

$$\prod = 0 \quad \text{if} \quad c_2 > X\beta + \varepsilon$$

Assuming that the ε's are logistic, then the probability of each outcome can be listed as follows:

$$\Pr(\prod = 2) = 1 - \frac{1}{1+\exp(-c1 + X\beta)}$$

$$\Pr(\prod = 1) = \frac{1}{1+\exp(-c1 + X\beta)} - \frac{1}{1+\exp(-c2 + X\beta)}$$

$$\Pr(\prod = 0) = \frac{1}{1+\exp(-c2 + X\beta)}$$

The results of this regression designed to estimate the value of possible β's are shown in Table 2.

Table 2
Ordered Logistic Regression

Number of obs	9598
LR chi2(11)	309.86
Prob > chi2	0.0000
Pseudo R2	0.0162

Points Earned	Coef.	Std. Err.	z	P>|z|	95% Confidence Interval	
Playing at Home	0.676	0.039	17.250	0.000	0.600	0.753
Log (CAD per USD)	-0.458	0.156	-2.940	0.003	-0.763	-0.152

The repressor of playing at home was added to compensate for the advantage of playing on home ice. As the table shows, when the value of Canadian currency rises, there is a commensurate positive effect on the number of points earned against US competition, significant at the 99% level. These results hold true when compensating for Canadian team fixed effects (as shown in Table 3) and also when compensating for Canadian and American team fixed effects (as shown in table 4). These results are significant at the 99% and 90% level, respectively. Note that a decreasing value of CAD per USD implies in increase in the value of Canadian currency.

Table 3
Ordered Logistic Regression including Canadian team fixed effects

Number of obs	9598
LR chi2(11)	600.04
Prob > chi2	0.0000
Pseudo R2	0.0314

Points Earned	Coef.	Std. Err.	z	P>|z|	95% Confidence Interval	
Playing at Home	0.700	0.040	17.630	0.000	0.622	0.777
Log (CAD per USD)	-0.443	0.174	-2.550	0.011	-0.784	-0.102

Table 4
Ordered Logistic Regression including Canadian and American team fixed effects

Number of obs	9598
LR chi2(11)	600.04
Prob > chi2	0.0000
Pseudo R2	0.0314

Points Earned	Coef.	Std. Err.	z	P>|z|	95% Confidence Interval	
Playing at Home	0.717	0.041	17.690	0.000	0.638	0.797
Log (CAD per USD)	-0.311	0.189	-1.640	0.100	-0.681	0.060

These tables categorically illustrate the power of currency value to affect teams' performance against international competition. The negative value of Log (CAN per USD) shows that as the value of Canadian dollar appreciates relative to the US dollar, Canadian hockey teams have a higher probability of winning against US competition. In the next section, a similar methodology will be employed to test these effects in European soccer.

Part III: Champions' League

The European Cup (now known as the Champion's League) was a European soccer tournament that brings together the top teams from each country's national league to compete against each other in an extended setting. It was originally created in 1955 so that the top European club teams could test themselves against one another. Given the high-profile nature of the competing teams, the European Cup has evolved into the Champion's League as arguably the second most important soccer tournament in the world (after the World Cup) and the most important club soccer championship. This league provides an ideal dataset to examine international effects, as different teams from different countries compete directly against one another, allowing for performance to be tested against macroeconomic variables.

Before 1991, there were three different tournaments for countries to qualify for. The highest and most prestigious tournament is the European Cup, followed by the Cup Winner's Cup and finally the UEFA Cup. The qualification for these competitions is determined by each team's performance in their respective domestic leagues.

For the European Cup, the defending champion and the top 15 league champions enter a knockout style tournament. Each matchup consists of two games (one home game each), and the winner is decided by the aggregate number of goals for these two games. If the aggregate score is tied, then the teams enter penalty kicks. Due to the well-established erratic nature of penalty kick scenarios, penalty kick results have been excluded from my data set.

Each domestic league also has its own tournament at the end of their season. The champions of these respective tournaments are entered into the Cup Winner's Cup, unless they are also the regular season league champion (in which case they enter the European Cup.). In this situation, the losing domestic cup finalists are entered into the Cup Winner's Cup.

Finally, a certain number of runners up in the domestic league regular season are entered into the UEFA Cup (unless they qualify for a higher tournament). For the UEFA Cup, formerly known as the Inter-Cities Fairs Cup, a varying number of berths are given to each country based on the UEFA's country coefficient discussed below. Overall, 100 participants qualify for this cup.

Performance statistics are abundant and open to a variety of interpretations. It should be noted that the primary performance statistic used by the UEFA for evaluating the prominence of domestic leagues is the country coefficient. This coefficient is the total number of points earned by teams from that country in UEFA tournament play over the last five years, divided by the number of teams. In addition, the UEFA also has a team coefficient, which ranks each team by the same guidelines. Unfortunately, because these metrics incorporate previous performance they would not be appropriate for a year-by-year analysis, but they do indicate how berths are allocated to each league.

Unlike the hockey analysis, in which there were only two countries, these tournaments include teams from 53 different countries. The same methodology of

applying the official exchange rate is not available, as no one simple official exchange rate applies to all of them.[3]

The tool employed in this paper for measuring the value of currency among many nations is the real effective exchange rate (REER). The REER can be summarized as a measure of the value of the home currency against a geometric average of other currencies, weighted by volume of trade and divided by a price deflator. The IMF uses this metric to determine the competitiveness of a currency relative to that currency's main competitors. Note that in this context competitiveness is defined as "the relative price of foreign in terms of domestic tradable goods… a country's competitiveness 'improves' if the relative price of its tradable goods declines" (Turner, 1997).

The weights applied to each trade partner of the home currency is based on complex formula involving exports, imports, and domestic production in such a way as to capture bilateral trade and competition with third countries. Each weight is a sum of weights in trade of commodities, manufactures, and services.[4] Price indexes are produced from a combination of both the CPI and, where available, Unit Labor Costs.

To obtain the real exchange rate (REER) for country i relative to other countries j, the IMF uses the following expression:

[3] One could set all currencies relative to one unrelated currency, but then the entire dataset would reflect the fluctuations of that root currency.

[4] The choice of weights has been the subject to considerable research by the IMF. For more information on the details the IMF's weighting procedure see Boyoumi, Lee and Jayanthi (2005).

$$REER = \prod_{j \neq i} \left[\frac{P_i R_i}{P_j R_j} \right]^{W_{ij}}$$

where P_i is country i's price index

R_i is nominal exchange rate of currency i in US dollars

P_j is price index of country j

R_j is nominal exchange rate of country j's currency in US Dollars

W_{ij} is country j's weight for country i

The resulting numbers are standardized for each country by setting all REER to 100 for the year 2000. Movements in the REER are not intended to have meaning in absolute terms, but rather serve as a relative expression of the value of each country's currency for a given year. Figure 2 shows a sample of 20 countries with the most complete REER data between 1975 and 2000.

In order to test the relationship between REER and performance, I merged this exchange rate data with the results of every game played in the European Cup, the Cup Winners' Cup, and Champions' League between 1975 and 2000. The breakdown of each country's representation in these tournaments is displayed in Figure 3.

Figure 2

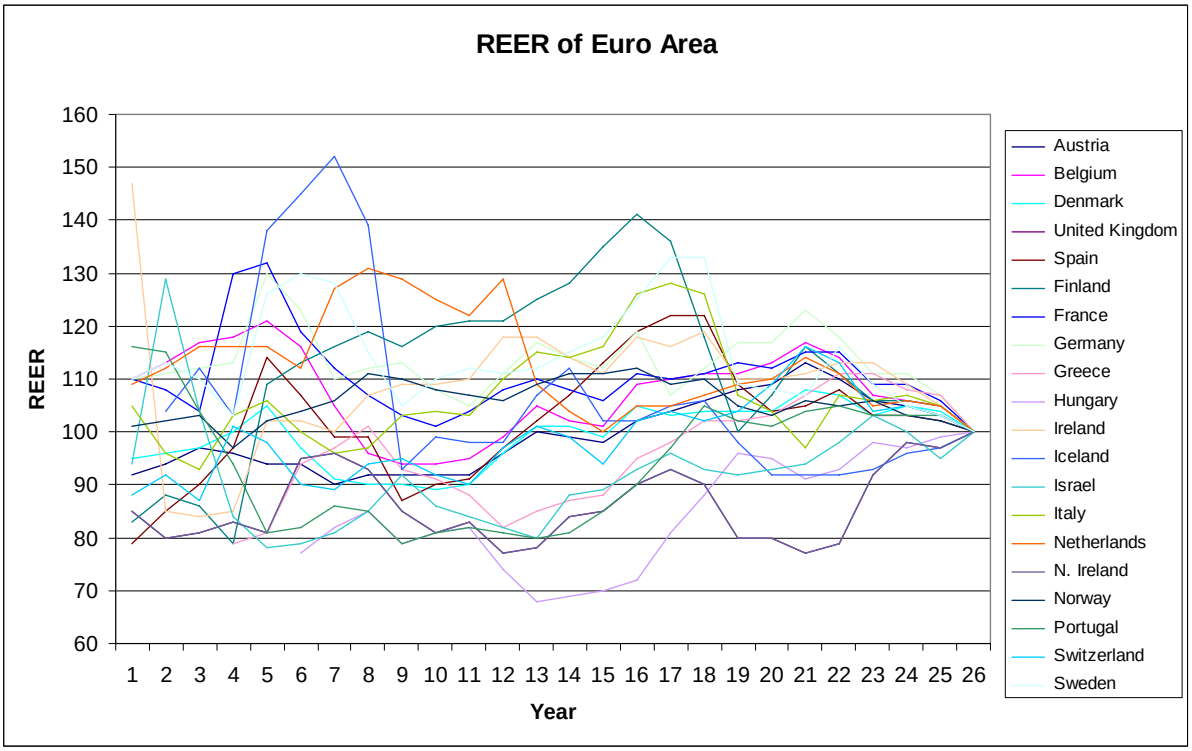
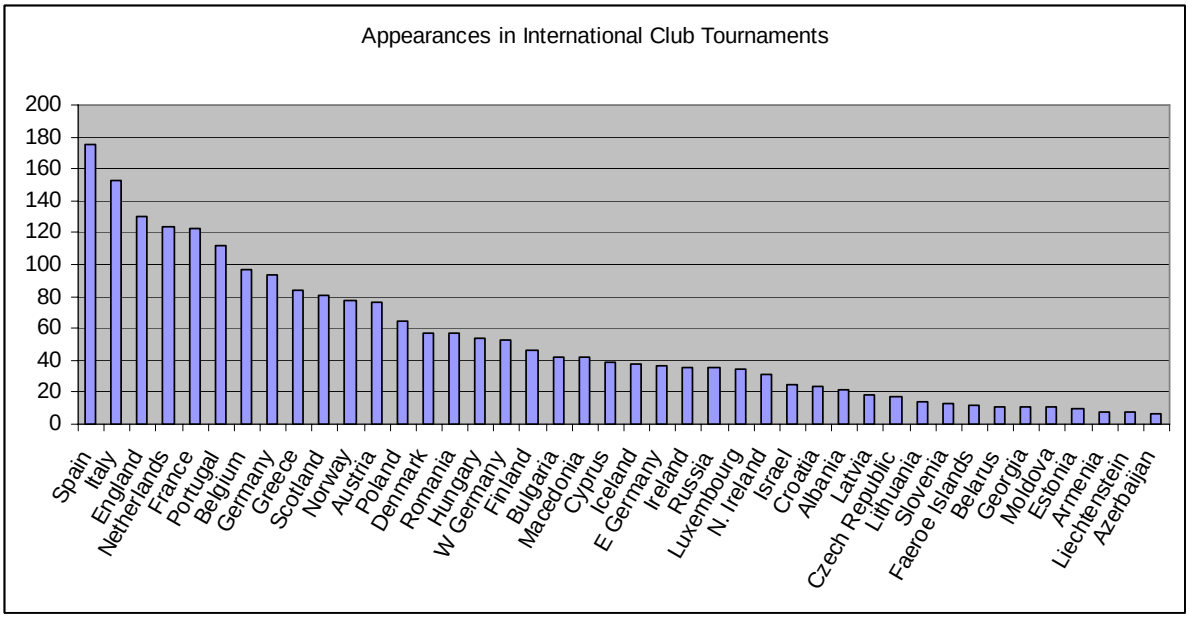


Figure 3



This dataset consists of 1,902 games over this time period. In order to test the relationship between the relative exchange rates and the outcome of these games, conditional logistical regressions were performed. This regression is designed to test the hypothesis that when following equation is true, Team A will win:

$$X_A\beta + \epsilon_A > X_B\beta + \epsilon_B$$

Where X_A is Team A's exchange rate as well as either country or fixed effects. Assuming that □'s are of Type 1 extreme value, then the probability of Team A winning is given by:

$$Pr(A) = \frac{\exp[(X_A - X_B)\beta]}{1 + \exp[(X_A - X_B)\beta]}$$

Table 5
Conditional Logistic Regression

Number of obs	1902
LR chi2(11)	40.97
Prob > chi2	0.0000
Pseudo R2	0.0311

Points Earned	Coef.	Std. Err.	z	P>|z|	95% Confidence Interval	
Playing at Home	0.692	0.120	5.790	0.000	. 4576983	0.927
Log (REER)	0.512	0.230	2.220	0.026	. 0607992	0.963

For this regression, observations in which one at least one team had no data for REER were dropped. The results demonstrate that the power of real effective exchange rates manifest themselves international soccer competition in a manner significant at the 95% level. When a team's home currency is stronger, they have a greater chance of winning a game.

The next regression in Table 6 shows the same regression, this time controlling for country fixed effects.

Table 6
Conditional Logistic Regression including country fixed effects

Number of obs	1902
LR chi2(11)	40.97
Prob > chi2	0.0000
Pseudo R2	0.0311

Points Earned	Coef.	Std. Err.	z	P>|z|	95% Confidence Interval	
Playing at Home	0.782	0.139	5.650	0.000	0.511	1.054
Log (REER)	0.504	0.324	1.550	0.120	-0.132	1.140

Although these results lose significance at the 90% level, the positive coefficient still indicates a positive effect of currency value on probability of winning. Further, the magnitude of the coefficient is the same as in Table 5; only the standard error has been increased.

Conclusion

As businesses of the world continue to expand to global dimensions, the question of international currency dynamics becomes increasingly important. Professional sports leagues present unique testing grounds for these effects due to the uniformity of competitions, extremely quantifiable levels of success and potential for increased investment. The previous literature has shown that the success of sports teams around the world is directly related to their purchasing power in the international talent market.

Though analysis of 27 years of data from the NHL and 30 years of data from international club soccer tournaments we have demonstrated that increased purchasing power significant positive effect on a team's chances of winning. This increased purchasing power stemmed only from fluctuations in the value of teams' home currency.

Whether it's international sports or business in general, the evidence collected in this paper suggests that international business owners and monetary policy makers must pay careful attention to how their currency is performing in the international market.

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