Determinants of Division I NCAA Soccer Participation

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Abstract. Previous research has shown the importance of industrialization and immigration in the sport of men's soccer in the early 20th century. We test economic determinants for soccer and offer new evidence on the relationship between socioeconomic factors and labor supply for NCAA soccer participation. The findings offer important insights for college recruiters, high school athlete families and coaches, and community and economic development policymakers seeking a better understanding of the cultural and economic influences affecting their competitive environments. Exploiting a sample of 30,935 Division 1 college athletes on rosters in 2018 and economic and demographic characteristics from zip code tabulation areas matched to these athletes, we observe income incentives and agglomeration economies at work. NCAA soccer players tend to come from higher income counties, but we also find that regions tend to develop sport-specific specializations over time, (specifically, the Northeastern states), becoming hotbeds for player development and college recruiting.

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1. Introduction

Soccer is a seemingly inexpensive sport. All you need is a ball, a field, and a few players to make a go of it. Yet most Americans regard it as a mere caricature of suburban prosperity in the United States. More perplexing, the U.S. Men's Team has never been a serious contender on the world stage, and all of the income and marketing power in the country has achieved only a fraction of the revenues of the major U.S. sports. Since the NCAA is the ultimate proving ground for aspiring athletes in the U.S., we turn there for a logical explanation.

Sports teams and organizations share their knowledge directly and indirectly through the competitive landscape. Youth travel soccer is decidedly market-oriented. Indeed critics repeatedly level the "pay-to-play" argument against the U.S. Soccer Federation for the perennially weak showings of the U.S. Men's Soccer Team on the world stage. The argument assumes community-funded soccer would attract better athletes away from the more popular sports. An alternative view recognizes soccer's growth in the U.S., driven by market forces, as entrepreneurs have worked to provide a good that is under-supplied in many communities across the country. Forced to compete for resources and players in towns where traditional American sports are deeply embedded in the community culture, soccer has gained through entrepreneurial pursuits (Caudros 2006). Add to this the influence of Title IX, through restrictions and incentives on college athletic programs, and the economic analysis of the collegiate sports is compelling.

Urban and regional economic theory provides a convenient lens for rigorous analysis of spatial phenomena. Youth sports apparently gain from regional concentration, similar to firms clustering in cities to benefit from labor pooling, knowledge spillovers, and the sharing of intermediate inputs, collectively referred to as agglomeration economies. Initial clusters of

specific sport hotbeds may happen by accident, as Bigalke (2018) demonstrates for men's soccer and the Northeast with the 1930 U.S. World Cup team. The urban and regional literature has repeatedly documented this for places including Dalton, Georgia and carpet making, banking in Charlotte, technology in Silicon Valley and many more. Over time, the benefits of agglomeration tend to increase the concentration and economic value-added (Henderson 2003, Rosenthal and Strange 2001).

We examine Division 1 soccer participation through a sample of over 30,000 athletes on rosters in 2018. We limit the empirical analysis to major team sports and find regional clustering consistent with economic theory. Our findings reinforce much of the work expounded in Kuper and Szymanski's (2014) *Soccernomics,* but we show evidence of a weaker climb to prominence than they suggest for the U.S. among the world's elite soccer nations. Examining the collegiate soccer player pool reveals important spatial and economic attributes of areas producing relatively higher numbers of soccer athletes at major universities and emphasizes a pecuniary tradeoff in favor of other major U.S. sports. The remainder of the paper proceeds as follows. We discuss the background for the research and economic intuition in Section 2 and present the empirical analysis in Section 3. We conclude with the results discussion in Section 4.

2. Background

Sports participation studies typically focus on sport as a leisure or fitness activity. Consumers maximize utility across a set of leisure and labor alternatives and allocate time and income to the consumption of sport according to relative prices of available goods (Kokolakakis et al. 2014, 2012; Humphreys and Roseki 2007, 2006). Other studies have examined the benefits of sports participation in high school in terms of college completion and income generation in the future

(Barron, Ewing, and Waddell 2000). Sports economists have examined other more traditional microeconomic problems through the lens of sport, including anti-trust and industrial organization as well as labor markets more generally (Leeds and Allmen, 2016; Downward, Dawson, and Dejonghe 2009). Our study focuses exclusively on NCAA sanctioned competitive sport participation. It does not apply to the European markets in general but makes a unique contribution to the sports economics literature. We believe this is the first study to examine the determinants of American collegiate soccer participation from a microeconomic framework and a local market geographical perspective.

Given the relatively low popularity of collegiate and professional soccer in the United States, the decision for an athlete of high ability to choose to play soccer, over football or baseball, for example, would seem an inferior one. However, at the margin we assume the representative player-household chooses the best option relative to a host of limiting economic and spatial factors, including the local resources available and the competitive environment inclusive of other sports. We expect to find that certain areas are good places for soccer players to develop, and these places likely see more public and private resources go to soccer and have more people experienced with the sport. See Figures 1 and 2 for evidence of the variation in the number of soccer players per capita from each state playing D1 soccer (as measured by number of players in our dataset appearing on rosters at FBS hosting universities per 100,000 citizens).

Figure 1. Sending NCAA Men's Soccer per Capita
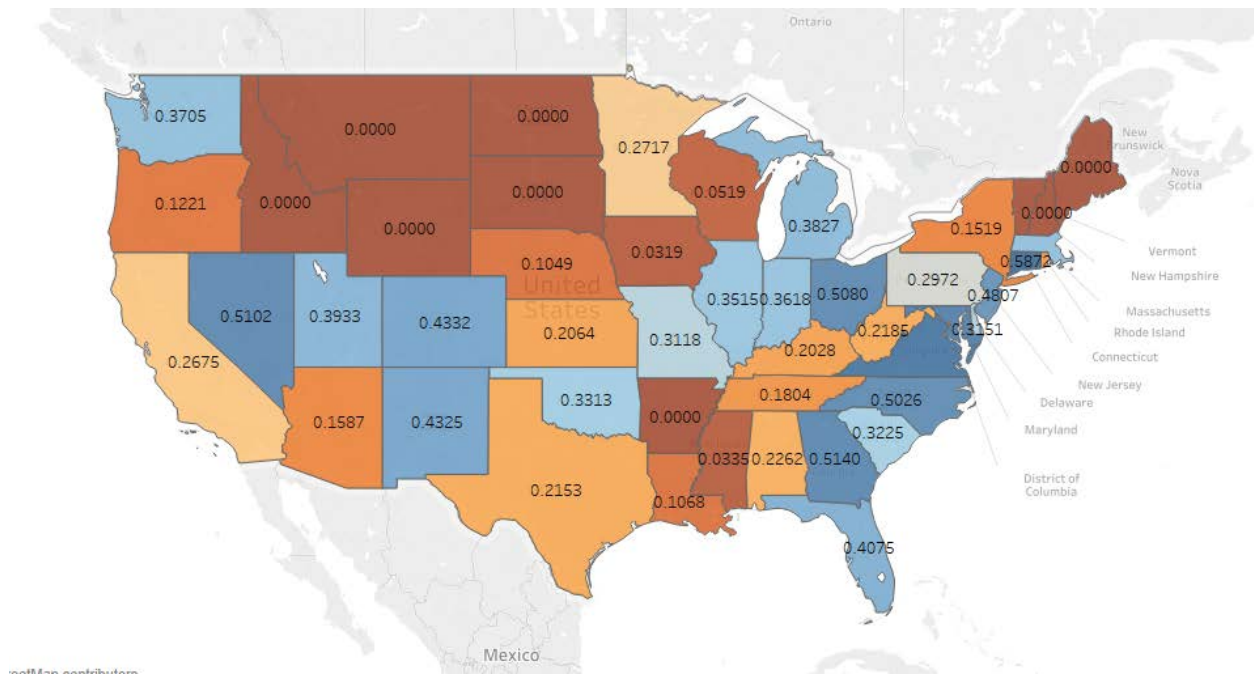
Source: 2018 NCAA Division 1 FBS School Rosters

Figure 2. Sending NCAA Women's Soccer per Capita
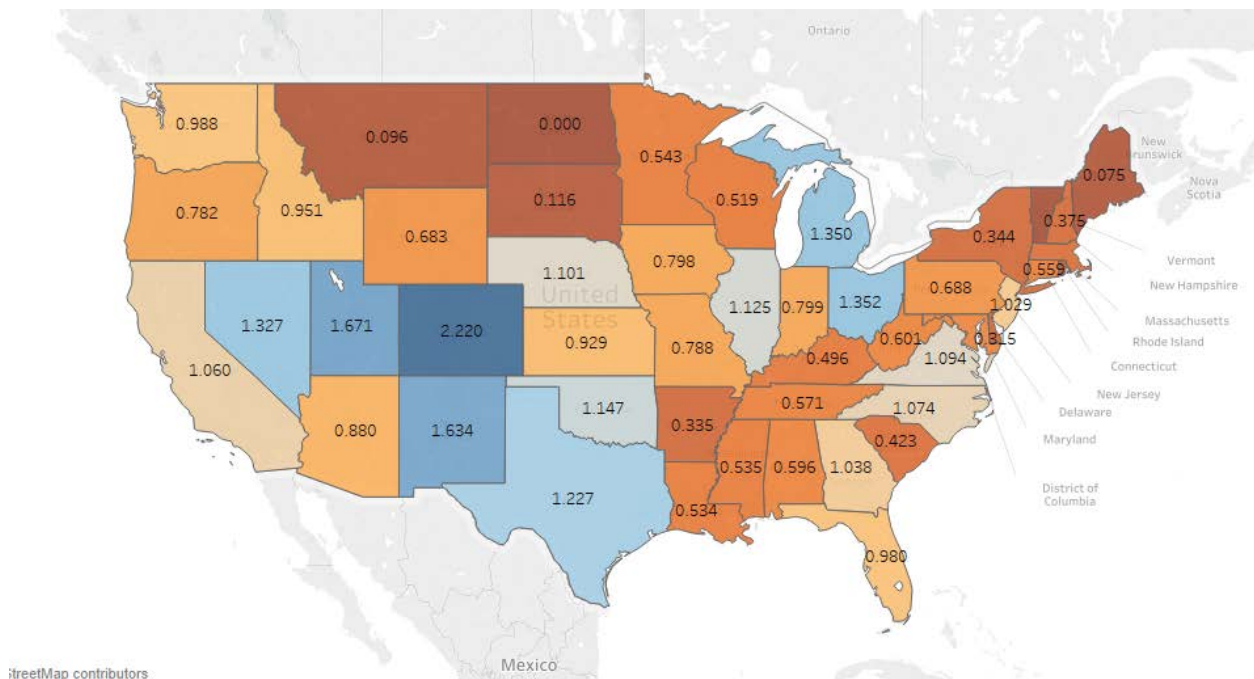
Earning a college degree is challenging without the additional demands of playing an NCAA sanctioned competitive sport, yet for athletes the economic and psychic rewards are alluring. Young athletes and their families invest significant resources to increase the probability of receiving a Division 1 athletic scholarship. Assuming a constant supply of athletes, this probability increases with the number of scholarships available for each sport. Beyond college, some sports offer potentially lucrative professional opportunities, increasing the implicit value of the scholarship. This potential for earnings as a professional athlete varies across sports and is relatively low for men's soccer in the United States, although for women it represents one of the few professional team opportunities.

Consider the aggregate totals for men's and women's team sports in our sample of D1 programs, the Football Bowl System schools.[1] For men, the largest pool for these major team sport athletic scholarships is American football. Sixty-four percent of the male athletes in our sample, 14,400 of 22,424, are football players, nearly 12 times as many football players as soccer players. American-style football requires twice as many players to field offensive and defensive units and another third for special teams, yet this alone would suggest only two to three times as many football players than soccer players for an even distribution of teams across sports. There is not an even distribution. Only 60 of the 130 FBS schools host men's soccer teams. For women, soccer represents the largest pool, with 3,028 athletes, or thirty-six percent of the four

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[1] The FBS schools generally represent the most recognizable colleges. Soccer and hockey, for example, have D1 programs in their own sports at non-FBS schools as well; however, these schools tend to be less widely known, so we consider having an FBS football program as a manageable proxy for a highly visible, high-level sports program for purposes of this research. Inclusion of non-FBS schools does not add to the current study but presents opportunities for future research.

major team sports we examine. Each of the 130 FBS schools fields a women's soccer team. See Table 1 for the totals for men and women team sports.

Table 1. Men's and Women's Sports by the Numbers

Men's Sports	Athletes	Share of Male Athletes in Sample
Football	14,400	64%
Baseball	4,016	18%
Basketball	1,703	8%
Soccer	**1,212**	**5%**
Hockey	1,093	5%
Total	22,424	

Women's Sports	Athletes	Share of Female Athletes in Sample
Soccer	**3,028**	**36%**
Softball	2,292	27%
Volleyball	1,695	20%
Basketball	1,496	18%
Total	8,511	

Source: 2018 NCAA Division 1 FBS School Rosters

Sanderson and Siegfried (2015) provides an insightful discussion of the monetary incentives for colleges and universities with Division I sports programs and the vast financial differences across sports. For the male soccer athlete, the financial rewards in the form of scholarships available and potential for earnings as a professional athlete after college are much smaller when compared with the other major men's professional sports. Additionally, resources for youth soccer may reflect or partially contribute to the incentive differences. Regional disparities in median household income and educational attainment may skew the participation levels across men's team sports. These factors increase the relative value of an athletic scholarship for male athletes in the Southeast.

Other regional disparities may affect the environment for youth sport and individual development as well. The overall athlete data show the South and West send the most athletes

across all sports. Climate is an obvious factor in favor of these two regions, enabling more practice time for the outdoor sports. The availability of abundant, inexpensive land may also promote the development of large-scale recreational and athletic facilities, whereas higher-valued commercial and residential uses compete for land in more densely populated metros, such as those of the Northeast. Culture is another external factor that is difficult to measure. Soccer has greater economic and cultural significance in other countries. In the United States, soccer may have greater popularity where global influences due to immigration have been greater over time. This popularity should translate indirectly to ability, increasing the competitive environment where one's skills are refined. Ultimately, how these and other factors collectively affect an area's sports performance environment is an empirical question. In Table 2.A., we show that soccer athletes as a share of all team sport athletes in our sample is greatest in Northeastern states, while Table 2.B. shows that the most populous states send the greatest number of soccer athletes. The greater proportion of soccer athletes in the Northeast suggests culture, partly due to immigration and partly due to income and education, affects outcomes. However, fundamental economic factors may best predict NCAA soccer participation. In Section 3 we present our data, empirical models, and results.

Table 2.A. Soccer as a Share of Total Athletes by State*

	Men's Soccer			Women's Soccer	
Top 5 States	Soccer Concentration	Soccer Players	Top 5 States	Soccer Concentration	Soccer Players
Connecticut	13%	24	Colorado	65%	131
Washington	11%	35	New Jersey	60%	91
Massachusetts	11%	32	Utah	57%	52
New Jersey	10%	50	New Mexico	53%	36
Colorado	10%	29	Massachusetts	53%	30

*States with at least 1 million population producing at least 15 soccer players.
Source: 2018 NCAA Division 1 FBS School Rosters

Table 2.B. Soccer Players by State

	Men's Soccer			Women's Soccer	
Top 5 States	Soccer Players		Top 5 States	Soccer Players	
California	130		California	431	
Florida	101		Texas	367	
Texas	78		Florida	201	
North Carolina	69		Ohio	148	
Georgia	60		Illinois	140	

Source: 2018 NCAA Division 1 FBS School Rosters

3. Empirical Analysis

3.1 Data

We obtained individual athlete data from 2018 team roster web pages available on the websites of the 130 universities hosting FBS football programs. Rosters for each sport provide position-specific information for each player as well as their hometown and high school of record, including zip code. With this geographical information, we add county level economic and demographic data. Where reporting was incomplete, such as no zip code reported, we attempted to match the player's hometown with their corresponding high school to determine precise zip code. The National Center for Education Statistics (NCES.ed.gov

https://nces.ed.gov/ccd/pubschuniv.asp) provides a database of all U.S. public and private high schools with addresses. For approximately 10% of the athletes on rosters, we could not reliably match reported information to the high schools in our database. Reasons for a failed match include the following: student attended high school in another country, student was home

schooled, no high school was reported, or the name of the high school provided on the website was either not present in the database or no unambiguous match was present.

Our economic and demographic indicators come from the 2016 American Community Survey 5-year estimates for counties. Excluding U.S. territories, as well as Kalawao County, Hawaii (Which is an isolated peninsula that has served as a leper colony since 1870, and is now solely populated by the surviving colony members who chose to remain there even after the mandatory quarantine was lifted in 1969, along with caregivers and support personnel), and Loving Texas, with a population of 74. Both of these counties had incomplete data on housing values, and perhaps not surprisingly, had no representation of athletes on rosters of any sport in our dataset. This leaves 3,140 counties remaining in the dataset. We include measures for income, population, population density, education, race, and age. A binary variable for each county captures roster information from Bigalke (2018) that indicates whether a county is in one of the five states that produced U.S. Team soccer players for the 1930 FIFA World Cup in Uruguay. These states were New York, New Jersey, Pennsylvania, Massachusetts, and Missouri. Ten of the sixteen players on the 1930 team came from these states, with the remaining six players coming from Great Britain. The 1930 team was the most successful U.S. Men's World Cup soccer team in history. This indicator attempts to capture a cultural or local scale effect that income or education may not explain. Finally, a count variable for the number of FBS schools in each state captures an element of demand for athletes. For complete data source information, definitions, and summary statistics, see Tables 3 and 4.

Table 3. Variable Definitions and Sources

Variable	Definition and Source
Men's soccer players	Number of men's soccer players from county on any FBS NCAA 2018 roster
Women's soccer players	Number of women's soccer players from county on any FBS NCAA 2018 roster
Gender population 18-24 (male)	Percent of county population ages 18-24, male
Gender population 18-24 (female)	Percent of county population ages 18-24, female
Uruguay 1930	Binary indicator for county in NJ, NY, PA, MA, MO (calculated from Bigalke 2018)
Population	County population from 2016 American Community Survey 5-year estimate
Median HH Income	County median household income from 2016 ACS 5-year estimate
Median Home Value	County median value of owner-occupied housing from 2016 ACS 5-year estimate
Pct. HS Grad	Percent of county population age 25+ with HS diploma or higher (2016 ACS/5-year)
Pct. Bachelor's Degree	Percent of county population age 25+ with Bachelor's degree or higher (2016 ACS/5-year)
Population per square mile	County population density calculation as a function of land area (sq. mi.)
Percent black	Percent of county population that is black race (2016 ACS/5-year)
FBS schools	Number of FBS football program schools in state as of 2018 (NCAA)

Table 4. Summary Statistics of Dependent and Independent Variables

Variable	Obs	Mean		Std. Dev.		Min	Max	
Men's soccer players	3140		0.31		1.39	0		21
Women's soccer players	3140		0.94		4.20	0		85
Gender population 18-24 (male)	3140		5,110		16,552	1		531,727
Gender population 18-24 (female)	3140		4,857		15,994	0		516,564
Uruguay 1930	3142		0.09		0.28	0		1
Population	3140		102,231		328,387	289		10,100,000
Median HH Income	3140	$	49,740	$	13,145	19264	$	129,588
Median Home Value	3140	$	141,343	$	85,051	18700	$	995,900
Pct HS Grad	3140		86.2		6.5	41.3		98.9
Pct. Bachelor's Degree	3140		21.2		9.3	4.9		78.1
Population per square mile	3140		224		1,284	0.03		49,105
Percent black	3140		0.09		0.15	0		0.87
FBS schools	3140		3.7		3.1	0		12

3.2 Modeling and Results

We model NCAA soccer participation at the county level to understand where soccer athletes

come from and what factors tend to support greater numbers of soccer athletes from a given

region playing NCAA Division 1 soccer at FBS schools. Our modeling approach needs to

incorporate individual motivation as well as the regional economic and demographic

environment. Ideally, we could observe household level characteristics over time, following the

approach of Farrell and Shields (2002). Their study of leisure sport participation exploits data on individuals in households in England and models the unobserved propensity to participate in leisure sports. They estimate a random effects probit model of the following form:

$$S^*_{ih} = x'_{ih}\beta + v_{ih} \qquad i = 1,2,...,n, \qquad h = 1,2,...,H, \qquad (1)$$

$$V_{ih} = \alpha_h + \mu_{ih} \qquad (2)$$

and

$$Si_h = \begin{cases} 1 & \text{if } S^*_{ih} > 0, \\ 0 & \text{otherwise} \end{cases}$$

where S is observed sports participation for the ith individual from household h. Exogenous, observable factors include demographic characteristics, region aspects, and individual health. The composite error term, v_{ih}, captures unobservable household preferences toward leisure sports.

Since we do not have household data or individual player characteristics other than those previously noted, we could not feasibly estimate the probability of an individual's decision to play NCAA soccer with the methodology of Farrell and Shields (2002). Instead, we model the county propensity to supply more or fewer NCAA soccer athletes. There are several methods we could employ, but the two most tractable include a logit model estimation of the share of athletes per county and an ordinary least squares regression of the number of players per county as a function of a mix of observable right-hand side variables. The OLS model is straightforward and convenient to interpret. We report the OLS results here, but the findings from logit estimation are consistent with these results and available upon request.

The general model predicting the number of county male soccer players takes the following form and is otherwise identical for female soccer players:

$$SC_{is} = x'_i\beta_j + f_i\gamma + w_i d + u_i \quad i = 1,2,...,n \quad s = 1,2,...,S \qquad (3)$$

where SC_{is} is the total number of male soccer players coming from a county, i, of state s and ranges from 0 to 21. For females the count ranges from 0 to 85. In each model, we have 3,140 county level observations, i. State level fixed effects control for unobservable differences across counties within a state. Analogous to Farrell and Shields (2002), each county is technically a member of a state, and a state may induce better or worse conditions for the development of NCAA soccer athletes. Our estimation clusters the standard errors by state to ensure accurate variance calculations for inference testing. The vector, x, includes economic and demographic variables. The variable f represents the number of FBS programs in a state and ranges from 0 to 12. Finally, w is the binary indicator for whether the county is in one of the five states that provided players for the 1930 FIFA Men's World Cup team.

The first set of results examines the supply of NCAA soccer players controlling for the general population of their home county. In Table 5, we find that a doubling of population produces a near doubling of soccer players per county. The coefficient on population, converted to population in hundreds of thousands, is 0.289. The mean population for a county in our sample is 102,231, while the mean number of NCAA-bound soccer players per county is 0.31. Thus, an increase of 100,000 people produces an additional 0.289 players, almost double the mean of 0.31. We find a similar effect for females. The coefficient on population is much stronger, 0.958, per 100,000 population, but the mean number of female players is greater at 0.94. Population density has a negative effect, but it is minor in magnitude. This is an interesting result compared with population's positive effect. It is consistent with scarcity of land supply that forces youth development organizations further from the central city, out to the suburbs. Higher income in the suburbs may also contribute to the negative density effect.

Income has a positive effect on NCAA soccer player production. For males, increasing county median household income $10,000 yields 48 percent more soccer players, an elasticity value of 2.4. The effect is even greater for females. The coefficient of 0.591 yields an elasticity of 3.1. Similarly, we find a more educated population is consistent with greater soccer player production. For males, the coefficient on *Pct. Bach* is 0.028. A one unit increase in the percentage of the population with at least a bachelor's degree, an increase of 5 percent at the mean, yields 9 percent more soccer players. For females, the same increase yields 8 percent more soccer players.

We also controlled for the states that produced male players for the 1930 FIFA World Cup competition in Uruguay, the *Uruguay 1930* variable to see if a possible outsized regional interest in soccer persisted nearly a century later. The coefficient was significant at the 5 percent level for males but insignificant for females. The coefficient in the model for male soccer players is 1.34. Recall, this is a binary indicator. A county in one of these five states has 1.34 more male soccer players on a Division 1 roster. At the mean of 0.31 male players per county, these states, all other things equal, have 4.3 times the number of college-bound soccer players. We find this apparent persistence of the cultural tradition of playing soccer interesting, and potentially important for future analysis of patterns of sports adoption in a particular area.

We also tested the model for the 18-24 year-old population in a county to see if the relevant population pool increased the precision of the estimation. The R-squared is slightly lower for these models, 0.5504 for men compared with 0.5868 in the previous model, and 0.6064 for women compared with 0.6406 in the previous model. The coefficient estimates are similar. The effect of more population in the 18-24 year-old range is near unitary elastic for males. An

increase of 1,000 18-24 year-olds, about 20 percent, produces 17.5 percent more players. For

females, a 20.6% increase in 18-24 year-old population yields 20% more players.

Table 5. Soccer players by county

Variable	Men's Soccer Coefficient	t-Stat	Women's Soccer Coefficient	t-Stat
Population	2.89E-06	6.37	9.58E-06	14.09
Median HHI	1.50E-05	3.53	5.91E-05	4.7
Median Home Value	-6.97E-07	-0.59	-4.92E-06	-1.68
Pct. HS Grad	-1.79E-02	-3.35	-3.68E-02	-2.54
Pct. Bach	2.81E-02	4.25	7.72E-02	4.59
Pop. Per Mile	8.30E-05	-2.85	-3.86E-04	-6.26
Pct. Black	5.54E-01	2.59	9.81E-01	1.87
FBS Schools	6.75E-03	0.39	5.64E-03	0.13
Uruguay 1930	1.34E+00	2.11	1.48E+00	0.98
Constant	2.27E-01	0.66	7.05E-02	0.05

(OLS using county level data, 3140 observations. R-squared = 0.5868 for Men's, 0.6406 for Women's. State dummy variables omitted from table.)

Table 6. Soccer players and 18 – 24 population per county

Variable	Men's Soccer Coefficient	t-Stat	Women's Soccer Coefficient	t-Stat
Gender Population 18-24 (Male, Female)	5.41E-05	5.86	1.89E-04	12.62
Median HHI	1.87E-05	4.31	7.32E-05	5.77
Median Home Value	-3.56E-07	-0.29	-3.47E-06	-1.19
Pct. HS Grad	-1.89E-02	-3.34	-3.90E-02	-2.53
Pct. Bach	2.41E-02	3.43	5.85E-02	3.46
Pop. Per Mile	-6.07E-05	-1.79	-3.79E-04	-4.69
Pct. Black	6.09E-01	2.64	1.12E+00	1.96
FBS Schools	8.26E-03	0.47	1.24E-02	0.28
Uruguay 1930	1.40E+00	2.16	1.67E+00	1.05
Constant	1.63E-01	0.44	-2.13E-01	-0.15

(OLS using county level data, 3140 observations. R-squared = 0.5504 for Men's, 0.6064 for Women's. State dummy variables omitted from table.)

4. Conclusion

We offer empirical evidence that income, population, and to some extent, culture and tradition have measurable impacts on an athlete's propensity to play college soccer in the United States. Despite the fact that soccer is arguably the easiest logistically (you can practice with varying numbers of players) and least expensive sport to play (all you really need is a ball and a field to play), the results suggest soccer athletes come from higher income areas. A lack of community support may partially drive this, but that may be the result of a lack of enthusiasm among student-athletes. They do not see soccer as a path to high status or prosperity in the United States. Baseball, basketball, and football players are highly paid, with the top players potentially earning tens or even hundreds of millions of dollars over the course of their careers, and enjoying celebrity status, while the top U.S. male soccer players are relatively unknown.

Therefore, while the sport of soccer has some scholarship opportunities, student-athletes likely do not perceive it as a lucrative career path in the United States. The economic logic suggests it is more of a leisure sport than an investment in future earnings, aside from potential college scholarships. Intuitively, NCAA soccer players are more likely to come from higher income, more highly educated areas, and the data is consistent with this.

We have also demonstrated the relevance of the market environment for soccer. It is a global sport, yet the competition for athletes necessary to deliver the product is a local phenomenon. While Kuper and Szymanski (2014) suggest that the United States should over time produce an elite-level men's soccer team, we suggest it may take longer than Kuper and Szymanski predict it will take to do so. Even a large, rich market must confront the competitive landscape and economic reality that other major sports offer the potential for greater returns for

the typical student-athlete, which dampens its appeal in the U.S., relative to most other countries.

Incentives matter. This is just a state of the world.

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