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Why the Master? Human Capital Development for Practicing U.S. Cycling Coaches

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The center of focus in sport economics has traditionally involved U.S. professional team sports, European football, and, more recently, public finance of sport structures and mega-events such as the Olympic Games (Andreff & Szymanski, 2006; Rebeggiani & Tondani, 2008). The highly available and accurate data about many professional sports make them excellent economic laboratories for broader theoretical investigation. This is consistently highlighted by researchers dedicated to both sport economics (Fizel, 2006; Szymanski, 2003; Zimbalist, 2001) and general economic theory (Kahn, 2000; Seaman, 2003). However, one significant area that has received only limited attention is the sport of bicycle racing (Rebeggiani & Tondani, 2008). This is in spite of the evidence showing that more than 44 million Americans participate in bicycling (National Sporting Goods Association, 2008) and that TV viewership of the Tour de France spans 185 countries with over 3,200 broadcasting hours (Desbordes, 2008). While there have been some recent first attempts to investigate bicycle racing from production (Cherchye & Vermeulen, 2007; Prinz, 2005; Torgler, 2007) and industrial organizational (Desbordes, 2006; Morrow & Idle, 2008; Rebeggiani & Tondani, 2008) perspectives, the structure of the supporting service industry of cycling coaches has yet to be the subject of any published inquiry.

The context of the current discussion is the bicycling coaching profession. There have been diverse investigations of sport coaching, generally in terms of pedagogy (Cassidy, Jones, & Potrac, 2008; Light & Dixon, 2007), practice (Douge & Hastie, 1993; Hoigaard, Jones, & Peters, 2008; Hollembeak & Amorose, 2005), and human resources (Graham, Wedman, & Garvin-Kester, 1994; Rocha & Turner, 2008; Ryan & Sagas, 2009); however, no apparent work has focused on the industrial organization of individual sport coaching professions. This is likely due to the perception of coaches, in a majority of team sports, as employees. Sometimes they are known for their input in the production process of a sports product or, in individual sport contexts, they are viewed as simple independent contractors. While cycling coaches do seem to function in essentially the same way as coaches in other individual sports-- such as tennis, golf, or distance running, focusing primarily on individual advice, observation, counseling, and preparation--they clearly face an alternative industrial context due to the sport of cycling's interactive team strategy.

In the unique case of competitive cycling, we find that coaches, particularly in the U.S., might not be in employment arrangements typical of other team sport organizations, but they are, at least indirectly, subjected to team considerations. Therefore, simply taking the first steps to describe these coaches' firms, and exploring the relative performance differences among them, can potentially contribute to knowledge of other industrial contexts. Specifically, the way that cycling coaches conduct their industry-- that is, accumulation and mobilization of their human capital--is likely to have much more in common with the provision of similar services in the broader corporate world (e.g., executive coaching, life coaching, independent consulting) than with the conduct of team sport coaches.

The goals of the current study are to (a) describe the characteristics of practicing cycling coaches and (b) present an empirical model of the determinants of commercial success for an individual coach. To accomplish this, we broadly examined the determinants of the number of clients of a particular coach.

We also examined differences in these determinants across the three client groups: elite or professional athletes, other competitive racers or developmental athletes seeking to become professionals, and non-competitive recreational riders.

Background

Bicycling

Participation in cycling includes broad pursuits that range from leisurely transportation to professional competition. Although merely riding a bicycle is a somewhat simple function that most people learn quickly as a child, the acquisition of advanced skills, fitness, and competitive competencies can take a great deal of learning and practice. This type of education and development can often be accelerated by specific coaching and instruction. For example, understanding the importance of aerodynamic resistance to cycling performance is one of the key lessons for any practicing cyclist. Furthermore, the competitive side of cycling has its own uniqueness in that it is an individual sport practiced in teams.

At first glance, it might seem that there are analogous sports settings with these features (e.g., cross country, swimming, gymnastics), but, under closer inspection, cycling competitions stand alone due to the nature of their team production. In cycling competitions, the dominance of wind resistance, and the ability to draft behind other cyclists for energy savings creates unique interactions among all of the participants' performances. In an attempt to build an advantage over their competitors (in terms of energy savings), competitors can remain sheltered from the wind behind other cyclists until the most critical or culminating moments of a race. Fellow team cyclists offer this shelter and support, and this is essentially where the value of having a team arises.

While the team competitions in the mentioned comparative sports simply aggregate the individual results of team members, a cycling team's success is based wholly on the result of their one best finisher. Therefore, a supporting team member in cycling is not simply working to produce their best individual finishing position to add to a total (as in these other sports), but he/she is rather using his/her energies in a way that directly enhances the performance of their team leader at a strictly detrimental cost to their own finishing position. This analogy does not hold in cross country, swimming, or gymnastics as the individual performances are discrete and all team members work for their own best possible finish position.

Cycling can also be clearly set apart from other traditional team sports, such as football, basketball, or baseball. While in these team sports, athletes collaborate and aggregate their contributions to the team win, cycling still features only one individual winner, not a team victory. Additionally, while team members in these sports can clearly be judged on their position-specific individual performance statistics, team cyclists have no analogous statistics and their contributions are extremely difficult to observe. Essentially, they suffer an assured negative impact on their one measurable statistic (their own finish result) as a direct consequence of their team focused efforts. Researchers have only just begun to examine these trade-offs among the team members (Candelon & Dupuy, 2010).

These features--that is, individual accolade enhancements based on individual team member sacrifices--are not only unique in this sport's design, but they may also more closely mimic other industrial contexts, such as corporate and financial management teams. For example, an investment fund manager may receive all of the accolades and recognition for a fund's performance as a result of thousands of hours of analytical (grunt) work by the fund's team members. Likewise, a project manager is ultimately responsible and/or lauded for the results of a team effort that is impossible to achieve without individual member sacrifice. These are not uncommon scenarios. The uniqueness and strong analogs for cycling clearly motivate the study of the sport generally, and by extension, the coaching of its participants.

Cycling Coaches

As in other athletic endeavors, cycling participants often use, or fall under the tutelage of, some form of coach. The term coach--originating from the concept of a tutor conveying a student through an examination, as in a carriage (coach)--first appeared in the athletic sense in the 1860s and likewise referred to private tutoring and preparation for athletic participation (Liberman, 2005). This individual typically provides instruction, guidance, and objective feedback on activities in order for a client to improve their current performance or help them develop new skills.

In this paper, preliminary data are examined regarding a coach's accumulation of clients. Understanding the coaches' firms, and analyzing the relative performance differences among them, is a necessary extension of the current research of sport coaches and may contribute to the knowledge in other industrial contexts where large numbers of very small firms/individuals provide outside or independent support services through instruction, coaching, mentoring, and consulting. Specifically, the way that cycling coaches conduct their industry--that is, accumulate and mobilize their human capital--is likely to have much more in common with the provision of these types of services in the broader corporate world than with that of team sport coaches or managers.

In contrast to the employee model of compensation for professional team sports, cycling coaches are paid directly by the cyclists they coach. This independent relationship is most commonly based on an annual contract basis with payments made monthly. There has also been citation of some star coaches/trainers/doctors contracting with athletes to be paid on a percentage of their salary basis (Brewer, 2002), like some golf caddies. The role of a cycling coach is primarily centered on the physical and psychological preparation of his/her athletes. As such, a reflection of coach quality is his/her athletes' palmares, or competitive results, as well as the number of clients he/she provides services to successfully.

As with many other sport coaches, cycling coaches work with more than just one athlete. However, cycling coaches differ significantly from other team-sport coaches because they will also often work concurrently with athletes of many different skill levels. This would be akin to an NFL coach working with professional athletes as well as those of a high school and/or flag football team. The broad clientele that a cycling coach serves must be addressed when considering the industrial organization of their profession. Athletes that are just beginning in the sport competitively, but are racing at a lower level (development athletes), may perceive and desire different coach characteristics than an elite or professional athlete (ProAm athletes). For example, a ProAm client might prefer a coach with experience at the highest level of competition and a highly specialized education, while a development client might be more concerned simply with a coach's reputation of working with top ProAm athletes and/or personal referrals. Likewise, athletes who are cyclists but do not compete--what we will call recreational participants--may also use the services of a coach and have altogether different sets of concerns than competitors. We propose that the ability to continue to bring in new client revenue is dependent on these resume and referral systems.

While the unique industrial arrangements of cycling are evident from these introductory discussions, this paper aims to move beyond anecdotal recitation--at least to the level of stylized facts about the industry of cycling coaching in particular. With more accurate and valid characterizations of the coaching industry, further theoretical applications, and empirical testing can be explored. After fleshing out these descriptions and influencing factors, we suggest ways in which these stylized facts can inform further theoretical discussions relating to the industrial organization of team coaches. These subsequent studies could potentially be generalized to, or indirectly inform, further study of industrial practice in other analogous coaching/mentoring/consulting services contexts.

Data/Model

Data for the following analysis was drawn from an independent industry survey of U.S. cycling coaches (licensed and non-licensed) conducted in 2010. The motivation for an independent inquiry arose from

the limitations of available information about cycling coaches. Cycling coaches in the U.S. are typically members of USA Cycling (USAC), the national governing body for competitive cycling in the U.S., and virtually all competitive and formal participant bicycling activities in the U.S. are housed in this governing organization. USAC licensed competitors naturally look to USAC as the primary accreditation for cycling coaches, and in order to practice the profession with a USAC license, coaches are required to meet specified coaching education criteria and participate in continuing education activities in order to maintain their license. USAC had conducted an internal survey of current licensed coaches in 2009, but preliminary analysis of this secondary data revealed several important limitations for empirical study. Of primary concern, the internal instrument did not collect information about many important variables, particularly coaches' competitive experiences, personal characteristics, business practices, and the composition of their clientele. The focus on the original inquiry was essentially on future USAC coaching education opportunities, so its questionnaire concentrated on desired potential programs and the respondent's intent to participate. Additionally, due to the naive proprietary design of the questionnaire, several of the instrument's items were either qualitative in nature (open-ended) or the responses were structured in a way that rendered them essentially unusable for quantitative analysis.

The improved dataset for the present study resulted from a redesign of the initial USAC instrument and an expansion of the population sample. In addition to accessing licensed coaches, the researchers were also granted access to other formerly licensed coaches within the database of USAC. USAC executives and the coaching education manager agreed to allow the survey of both groups using their email database with no specific provisions or restrictions. The survey was again administered through an online questionnaire. All actively licensed USAC coaches, as well as all formerly USAC licensed coaches, were solicited to participate through an email message and the coaches were again asked to complete a short web-based questionnaire. Participation was voluntary and no incentives to participate were offered. Participant coaches were asked to complete a 40-item questionnaire. The questionnaire contained items related to demographic information (3), coaching specific education (2), current firm structure and activity (8), clientele characteristics (16), coaching experience (3), and competitive experience (8). The questionnaire design aimed to limit average completion time to less than 15 min in order to assure an adequate response rate and limit participant attrition (the respondents who completed the questionnaire in its entirety took between 7 and 8 min on average to do so). In all, 2,207 coaches were solicited for participation and 565 (25.6%) completed the questionnaire. Of these, only coaches who were active0-that is, "currently coaching at least one road cyclist"-0were included in the analysis (N= 386).

This instrument was designed to address many of the shortcomings associated with the original internal data collection. First and foremost, the dependent variable, CLIENT, was collected as a discrete count response in contrast to the coarse intervals used in the internal survey. Also, measures of competitive experience were added to understand how previous cycling experiences might affect commercial success. As mentioned previously, measures of a coach's previous competitive experiences are likely to be important to prospective clients. These can reveal, not only some sources of reputation effects, but offer insight to the experiential knowledge levels of these experts as well. Several variables were used to capture this construct: years of competition; years of competition at different levels (e.g., professional, national, top regional); number of Olympic participations; and numbers of National Championship, World Championship, and Olympic medals.

Also in this inquiry, the USAC coaching certification levels were examined, not only in terms of the value of increasing certification levels, but to indicate whether the coach was a currently licensed coach as well. The three certification levels were each included separately as dummy variables with the reference condition being non-licensed (i.e., USAC1, USAC2, and USAC3).

The questionnaire contained additional items that focused on the quality distribution of client for an individual coach as well. These items were added to clearly answer several important structural questions: How are the highest level athletes matched with their coaches? Do coaches limit their clientele to ProAm caliber clients, or in fact do coaches seek revenue in numbers by taking a wide

range of clients who will rarely meet in competition? Do successful professional coaches attract higher numbers of recreational clients? From the anecdotal background, we expected coaches to work with a variety of clients, but the distribution of their clientele was previously unknown.

Because of the improved survey design and new variables, the instrument yielded more detailed information about the industry and offered more analytical flexibility. Variables used in the regression model were:

AGE, reported age of coach measured in years

AGESQ, age of coach squared

COMP, coded 1 if the coach still competes in cycling events; 0 otherwise

COLL, coded 1 if coaches had at least AA undergraduate college education; 0 otherwise

FT, coded 1 if the coach practices the profession full time; 0 otherwise

GRAD, coded 1 for coaches with a graduate or professional degree; 0 otherwise

MALE, coded 1 for male coaches; 0 otherwise

USAC1, coded 1 if coach was a USAC licensed Level 1 coach; 0 otherwise

USAC2, coded 1 if coach was a USAC licensed Level 2 coach; 0 otherwise

USAC3, coded 1 if coach was a USAC licensed Level 3 coach; 0 otherwise

Yrs_Coach, a continuous variable for years of experience as a cycling coach

Yrs_CoachSQ, years of coaching experience squared

EXER_EDU, coded 1 if education is related to sports or exercise science; 0 otherwise

GRAD_EXER, coded 1 if graduate degree is related to sport/exercise science; 0 otherwise

Yrs_Racing, a continuous variable for all years of experience as a bicycle racer

Yrs_Cat1, a continuous variable for all years of experience as a national level competitor

Yrs_Pro, a continuous variable for all years of experience as a professional competitor

CHAMPS, a count variable for all national or international championships won

We used the following model to examine the explanatory power of these variables for overall clientele size (CLIENT). Population (POP) and income (INC) were also included in the model to guard against local variations--for example, a coach who is located closer to more potential clients or living in an area with higher per capita income might arguably have more business. Because of the count nature of the dependent variable used, both ordinary least squares OLS and negative binomial regression models were estimated with the following form:

(1) CLIENT = β_0 + β_1AGE + β_2AGESQ + β_3COLL + β_4CHAMPS + β_5COMP + β_6EXER_EDU + β_7FT + β_8GRAD + β_9GRAD_EXER + β_{10}MALE + β_{11}INC +

$[[\beta].sub.12]POP + [[\beta].sub.13]USAC1 + [[\beta].sub.14]USAC2 + [[\beta].sub.15]USAC3 + [[\beta].sub.16]Yrs\_Racing + [[\beta].sub.17]Yrs\_Cat1 + [[\beta].sub.18]Yrs\_Pro + [[\beta].sub.19]Yrs\_Coach + [[\beta].sub.20]Yrs\_CoachSQ$

With this data, we were also able to explore differences among the three previously discussed client groups: ProAm, development, and recreational. For the purposes of the coaching questionnaire, ProAm clients were defined as coach's clients who were Category 1 or higher (i.e., eligible for national and international ranking points). These would be professionally licensed by the international governing body for cycling (UCI) or USA Cycling Category 1 athletes (elite amateur without UCI contract). Alternatively, development clients were cyclists with a competitive license, USAC Categories 2-5, but no qualification for national or international competition. Finally, recreational clients were those with no USAC license. Without this license, these clients would not presumably have access to enter any cycling competitions (i.e., recreational by choice or some other constraint). The different clientele groups were therefore derived from these coach responses:

AthPROAM, a count variable for the number of ProAm athletes coached

AthDEVO, a count variable for the number of development athletes coached

AthREC, a count variable for the number of recreational athletes coached

Each of a coach's clients would fall into one of these three discrete categories, but each coach might have a more or less mixed overall clientele. So, in addition to analyzing the overall clientele size, the possible determinants of the size of the clientele for each respective group were modeled. Coaches reported how many of their clients fell in these specific categories. In three separate negative-binomial regressions with the number of recreational, development, and ProAm athletes as the dependent variables respectively, we compared their potential differences in coach selection. These separate models follow:

$(2)\ AthPROAM = [[\beta].sub.0] + [[\beta].sub.1]AGE + [[\beta].sub.2]AGESQ + [[\beta].sub.3]COLL + [[\beta].sub.4]CHAMPS + [[\beta].sub.5]COMP + [[\beta].sub.6]EXER\_EDU + [[\beta].sub.7]FT + [[\beta].sub.8]GRAD + [[\beta].sub.9]GRAD\_EXER + [[\beta].sub.10]MALE + [[\beta].sub.11]INC + [[\beta].sub.12]POP + [[\beta].sub.13]USAC1 + [[\beta].sub.14]USAC2 + [[\beta].sub.15]USAC3 + [[\beta].sub.16]Yrs\_Racing + [[\beta].sub.17]Yrs\_Cat1 + [[\beta].sub.18]Yrs\_Pro + [[\beta].sub.19]Yrs\_Coach + [[\beta].sub.20]Yrs\_CoachSQ$

$(3)\ AthDEVO = [[\beta].sub.0] + [[\beta].sub.1]AGE + [[\beta].sub.2]AGESQ + [[\beta].sub.3]COLL + [[\beta].sub.4]CHAMPS + [[\beta].sub.5]COMP + [[\beta].sub.6]EXER\_EDU + [[\beta].sub.7]FT + [[\beta].sub.8]GRAD + [[\beta].sub.9]GRAD\_EXER + [[\beta].sub.10]MALE + [[\beta].sub.11]INC + [[\beta].sub.12]POP + [[\beta].sub.13]USAC1 + [[\beta].sub.14]USAC2 + [[\beta].sub.15]USAC3 + [[\beta].sub.16]Yrs\_Racing + [[\beta].sub.17]Yrs\_Cat1 + [[\beta].sub.18]Yrs\_Pro + [[\beta].sub.19]Yrs\_Coach + [[\beta].sub.20]Yrs\_CoachSQ + [[\beta].sub.21]AthPROAM$

$(4)\ AthREC = [[\beta].sub.0] + [[\beta].sub.1]AGE + [[\beta].sub.2]AGESQ + [[\beta].sub.3]COLL + [[\beta].sub.4]CHAMPS + [[\beta].sub.5]COMP + [[\beta].sub.6]EXER\_EDU + [[\beta].sub.7]FT + [[\beta].sub.8]GRAD + [[\beta].sub.9]GRAD\_EXER + [[\beta].sub.10]MALE + [[\beta].sub.11]INC + [p.sub.12]POP + [[\beta].sub.13]USAC1 + [[\beta].sub.14]USAC2 + [[\beta].sub.15]USAC3 + [[\beta].sub.16]Yrs\_Racing + [[\beta].sub.17]Yrs\_Cat1 + [[\beta].sub.18]Yrs\_Pro + [[\beta].sub.19]Yrs\_Coach + [[\beta].sub.20]Yrs\_CoachSQ + [[\beta].sub.21]AthPROAM + [[\beta].sub.22]AthDEVO$

In the latter two models, the addition of other client groups as right hand side variables is intended to reflect the possibility of reputation effect from a coach working with top or higher level athletes. We assume this is a one-way relationship, so the other group variables are hierarchically removed up to the

ProAm model.

Results

Descriptive statistics are reported in Table 1. Of the respondents (N = 386), 309 were male (80%) with an average age of 44.6 years. On average, the respondents reported coaching just under 11 clients with a vast majority of these being development and recreational athletes (93%). (1) Respondents on average reported having 6.2 years of coaching experience and 12.0 years of experience as a competitor. Only 29.3% of the respondents reported having at least one ProAm athlete as a current client. Of these 113 professional coaches, the average number of ProAm clients was 2.34. Additionally, regarding industrial practice, the respondents also widely indicated their organizational affiliation was nearly always outside of professional teams (99.7%, see Table 4).

Regression Models

The data were analyzed using both a standard OLS regression and negative-binomial estimations. Negative-binomial was used because the distribution of the dependent variable was a count variable, highly non-normal, and displayed over-dispersion, which rules out using a basic Poisson estimation. Coefficient estimates for both models are presented in Table 2.

The OLS regression model fit for the data was statistically significant, and four of the individual exogenous variable coefficients emerged as statistically significant at the $[alpha] = 0.05$ level. These were: FT, whether the coach considered themselves full time; Yrs_Racing, how many years of past experience racing the coach reported having; Yrs_Coach, how many years of coaching experience the coach reported; and Yrs_CoachSQ, which reflects the diminishing importance of each additional year of coaching experience. The coefficient for whether or not the coach was male (MALE) was also significant at the $[alpha] = 0.1$ level. The remaining variable coefficients could not be statistically distinguished from zero.

The negative-binomial estimation procedure yielded parameter estimates that were fully consistent with those from the OLS regression in terms of sign and statistical significance. The direct interpretation of the coefficients is somewhat different from the OLS, but it is relatively straightforward. For example, the coefficient for Yrs_Racing ($[[beta].sub.14] = 0.0163$) implies that every additional year of racing experience results in a 0.016 difference in the log of the expected count of clients. The OLS coefficient estimate implies that each additional year of experiences reduces the number of clients by 0.263.

Client Type Regressions

The three separate negative-binomial regressions using the different client groups as the dependent variables all had a statistically significant goodness of fit ($[alpha] = 0.05$). The coefficients for all three models are presented in Table 3.

In the AthPROAM estimation, the coefficients for USAC1, Yrs_Cat1, Yrs_Coach, Yrs_CoachSQ (and INC) were statistically significant ($[alpha] = 0.05$). The remaining exogenous variables included in the estimation were not statistically different from zero.

In the estimation of the AthDEVO model, USAC2, Yrs_Coach, AthPROAM, and Yrs_CoachSQ were all statistically significant ($[alpha] = 0.05$).

The estimation of the AthREC model yielded five statistically significant coefficients: FT, Yrs_Racing, and Yrs_Cat1 at the $[alpha] = 0.05$ level, and Yrs_Coach and CHAMPS at the $[alpha] = 0.1$ level.

Discussion

The most important contribution of the analysis of this primary research data is that it helps to establish the broad characteristics of the cycling coaching industry. We are able to roughly account for how cycling coaches operate their firms, including the average number of clients, pricing, and the role of certification, education, and experience, which had not been verified previously. These stylized facts permit a jumping-off point for more robust investigations of economic theory discussed below.

Overall Clientele Model

The regression results present a mix of both expected and notable findings. While it is logical to expect a full time coach to gather more clients because of time dedicated to soliciting and working with clients (FT), perhaps more important to practitioners and the coaching education program developers of USAC, traditional educational attainment (COLL) and specialized certification efforts (USAC1, USAC2, USAC3) do not seem to add to a coach's ability to garner more total clients. This finding persists even when considering exercise and sport specific education variables (EXER_EDU, GRAD_EXER). Therefore, the data did not show any statistically significant relationships between any of these types of human capital investments and overall clientele size. Even when comparing the different clientele groups, only two variables of this class (i.e., education and training), showed any significant relationships: USAC1 with AthPROAM, and USAC2 with AthDEVO. It is worth noting the magnitude of these effects, however, in terms of the overall impact on the respective clientele groups. The OLS coefficients suggest that having the Level 1 certification garners 1.49 more ProAm clients for coaches; this is enormous compared to the average total ProAm clientele of 0.71. Also the Level 2 certification showed a similarly large effect of 7.46 more clients for the AthDEVO total (both from no certification reference condition). Nevertheless, these were the only two instances of the 38 estimated coefficients of this type that showed positive effects for formal human capital investment.

The overall model also revealed that the contribution "coaching experience" to clientele size is likely to increase at a decreasing rate. Using the continuous data, we were able to model this with the squared variable term and found that this relationship existed to some degree across all subgroups of the clientele; it appeared most clearly with ProAm clientele. This reiterates the importance of human capital development over time (experiential learning) in the initial stages of a coaching career.

It is also worth mentioning that POP and INC did not seem to matter for clientele size overall. Taking a closer look at how cycling coaches operate may offer an explanation. In particular, we see that many coaches operate their businesses directly through websites, phone, and email communications. Also, some preliminary data collected from the athletes' side of the equation (not reported here) reflects that more than half of the responding cyclists use remote coaching. These practices would surely blunt the impact of local context and offers yet another avenue for future study.

Competitive Experience and Client Groups

Competitive experience is intuitively an important source for human capital in this context, but the relationship that emerged from this data between the size of a coach's clientele and his/her competitive experience was counterintuitive. While one might expect Yrs_Racing to have a significant positive relationship with all client numbers, this data and regression estimation revealed a small but significant negative association with overall clientele size (CLIENT). This result did not necessarily persist across the subgroups of a coach's clientele, however, and the three separate regression models highlight several potentially important differences across the groups. A coach's competitive experience emerges as significant for both ProAm and AthREC cyclists but opposite in the direction (sign). The number of ProAm riders (AthPROAM) were significantly positively related to a coach's years of ProAm competition (Yrs_Cat1, years as a Category 1 or better), and the number of recreational (AthREC) clients were significantly negatively related only to the coaches' racing experience and accolades (Yrs_Racing, CHAMPS; p = 0.056). By sheer number, the AthREC clients may have just dominated the overall coach clientele and could have caused the unexpected result in the overall clientele regression. Explaining these negative relationships for recreational clients is a question of determining causality. It may be that

recreational cyclists are turned off by a coach that they viewed as too serious, or alternatively, coaches who were very high level competitors might have been less interested in clients with purely recreational endeavors. An additional explanation might be temporal in nature in that, in order to accumulate more clients, a coach with longer competitive career might have had less time to devote to coaching (i.e., each additional year of serious competition could be one less year devoted to coaching).

In addition to these interesting clientele relationships, the number of development clients (AthDEVO) was not related to the coaches' personal competitive experience variables. Instead, the number of ProAm athletes that a coach worked with (AthPROAM) was associated with the AtheDEVO clientele size. This suggested a potential signaling or reputation effect derived from the presence of ProAm athletes in a coach's clientele--this did not show up in the model of recreational clients, however. Interestingly, a coach's own top-level competitive credentials (Yrs_Pro) and accolades (CHAMPS, the number of national or international championships won) did not emerge as significant positive predictors of clientele size across any group.

It is also worth noting that the individual group models did not produce similar predictive contributions. While the ProAm model might explain a fair amount of the variation for that client group (13.3%), the development and recreation models only explained 3.4% and 3.7% respectively. The latter two may be subject to substantial omitted variable bias as most of the variables included were very performance- and competition-oriented. Incidentally, one categorical item in the questionnaire did reveal that "job-loss" and "too expensive" were the most common reasons listed for a coach's clients stopping coaching, but it did not disclose the distribution of the lost athletes according to our groups. Perhaps employment and personal income might have more effect on the development and recreational groups because coaching and sport participation generally are viewed as luxuries, compared to the relative necessity for full time athletes (ProAm). More research into the motivation, constraints, and pricing for recreational participants would be useful to help identify variables more salient to these cyclists.

Employment and Compensation

The results shown in Table 4 establish that U.S. cycling coaches are largely operating independently and do not typically work as employees of cycling teams. These stylized facts in and of themselves lead us further into the question of "why?" In the case of the competitive cycling, we have observed other evidence that coaches are often not employees of cycling teams (Brewer, 2002), despite evidence that, in nearly all other observed team sports, coaches are prominent and integral. Cycling coaches instead seem to more often be operating independently and providing coaching services to riders on an individual basis. Little is known about why these coaches' activities came to be housed outside the organization of cycling teams, or how athletes are matched with their coaches. These observations about this unique industrial feature warrant further exploration with regard to existing and potentially new economic theory. If cycling coaches are hired directly by individuals that are operating entirely in a team environment, why would these team members choose to individually invest in their production capabilities when the team leader is the primary beneficiary? And why does the team organization not invest in the development of its production team members to support its stars? For that matter, why have coaches not been in house for their team leaders? This is probably the most interesting research question going forward.

Limitations

Two other shortcomings warrant discussion: measurement of success and the presence of alternative markets. Clearly, the performance attainment of a coach's clients' (quality) might also reflect the success of his endeavors in addition to the size of his/her clientele (quantity). The CLIENT variable really just reflects the level of coaching activity the coach is undertaking. This data began to address these concerns by garnering information about clients' competitive levels. While included as right-hand side variables, it might be possible to formulate an index variable of success by combining athlete competition levels and clientele size in some way to express an alternative measure of success.

Additionally, a coach's success might also more accurately expressed by examining the relative improvements their clients achieve. This study is merely cross-sectional and cannot address this type of effectiveness, which would be better drawn from longitudinal or panel data.

As far as the presence of outside markets is concerned, the data do include at least some non-licensed coaches. While the predominance of the governing body in this context suggests there are limited outside options for initial coach training, the revealed unimportance of certification level--coupled with the clear relevance of competitive experience--might mean that former athletes might just as easily transition into unlicensed coaching without ever being certified by USAC. The effect and scale of this bias in the data should be considered, perhaps first by examining coaches from the athletes' perspective (i.e., determining how many athletes are using coaches that have never been licensed by USAC, and then any differences between these coaches and the current sample).

It should also be noted that the client group designations are theoretical/definitional and cannot necessarily be born out with statistical tests using this coach data. Because the data were collected with the individual coaches as the units of comparison, group mean comparisons were not possible because coaches may be coaching multiple types of clients. More data currently being collected from the individual athlete's perspective will allow for these theoretical designations to be confirmed or refuted in the future.

Future Research

With regard to further commercial applications, the relative lack of importance for price and traditional human capital investments suggests that other factors may contribute more strongly to a coach's recruiting success. Some of these factors we have seen are practical experience and competitive experience. We suggest that this is likely the case in similar industrial contexts and feel that these competitive reputation effects and referral mechanisms should be in line for further investigations in both cycling and executive coaching contexts.

Finally, the examination of the economic theory that might explain why cycling coaches and executive coaches are not integrated into professional cycling teams and businesses, respectively, is still to come. Some potential avenues for theoretical inquiry are transactions costs principles (e.g., Coase, 1937), resolution of principal-agent problems (e.g., Alchian & Demsetz, 1972), and organization hierarchies based on distribution of knowledge (e.g., Garicano, 2000; Hayek, 1945).

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Endnote

(1) This was consistent with preliminary internal data: 80% male, average age of 44.5 years (SD = 9.7), average of about 11 clients.

```
Table 1. Summary Statistics

Variables Minimum Maximum Mean SD N

AGE 19 80 44.57 10.15 386
ANY_COLL 0 1 0.92 0.27 386
Ath_REC 0 88 4.43 10.62 386
AthDEVO 0 53 5.56 7.00 386
AthPROAM 0 12 0.71 1.69 386
CHAMPS 0 29 0.30 1.89 386
CLIENT 1 100 * 10.66 13.18 386
COMP 0 1 0.72 0.45 386
EXER_EDU 0 1 0.29 0.46 386
FT 0 1 0.29 0.46 386
GRAD_Deg 0 1 0.41 0.49 386
GRAD_EXER 0 1 0.17 0.37 386
MALE 0 1 0.80 0.40 386
USAC1 0 1 0.14 0.34 386
USAC2 0 1 0.47 0.50 386
USAC3 0 1 0.83 0.38 386
Yrs_Cat1 0 20 1.42 3.51 386
Yrs_Coach 0 39 6.20 6.43 386
Yrs_Racing 0 45 12.04 9.27 386
```

```
* Maximum response: "100 or more athletes"
```

Table 2. Regression Results

Variable Ordinary least Negative-binomial
 squares

  [beta] SD [beta] SD

[[beta].sub.0] -14.212 9.288 0.061 0.854
 (Constant)
AGE 0.591 0.298 0.042 0.033
AGESQ -0.006 0.003 0.000 0.000
COLL 0.663 2.146 0.080 0.195
COMP -0.051 1.680 -0.013 0.117
FT 4.128 *** 1.553 0.373 *** 0.116
GRAD 0.493 1.649 0.019 0.123
MALE 3.101 * 1.588 0.319 ** 0.127
CHAMPS -0.048 0.212 -0.001 0.026
EXER_EDU -0.432 2.252 -0.163 0.162
GRAD_EXER 0.299 3.097 0.098 0.225
USAC1 2.767 2.444 0.242 0.157
USAC2 -1.306 1.713 -0.053 0.120
USAC3 0.925 2.095 0.054 0.155
Yrs_Cat1_Better 0.157 0.177 0.011 0.020
Yrs_Coach 1.306 *** 0.319 0.125 *** 0.024
Yrs_CoachSQ -0.033 *** 0.010 -0.003 *** 0.001
Yrs_Pro_Intl 0.009 0.302 0.021 0.032
Yrs_Racing -0.239 ** 0.118 -0.016 ** 0.007
INC 0.000 0.000 0.000 0.000
POP 0.000 0.000 0.000 0.000

Model Fit [R.sup.2] = 0.132 Pseudo [R.sup.2] = 0.0322
 F = 3.87, [X.sup.2](20,386) =
 p < 0.001 84.82, p < 0.001

Table 3. Coefficient estimates

Variables Dependent variable

  Model 1: ProAm Model 2: AthDEVO Model 3: Ath REC

  [beta] (SD) [beta] (SD) [beta] (SD)

(Constant) -3.959 ** 0.809 -2.111
 (1.868) (0.985) (1.848)
AGE -0.053 -0.005 0.114
 (0.066) (0.036) (0.070)
AGESQ 0.000 0.000 -0.001
 (0.001) (0.000) (0.001)
ANY_COLL 0.148 -0.050 0.289
 (0.464) (0.227) (0.421)
CHAMPS -0.110 0.015 -0.264
 (0.098) (0.029) (0.138)
COMP 0.200 0.182 -0.234
 (0.270) (0.140) (0.243)
EXER_EDU 0.536 -0.161 -0.250
 (0.334) (0.188) (0.360)
FT 0.136 0.117 0.689 ***
 (0.255) (0.136) (0.250)
GRAD_Deg 0.119 0.093 -0.108
 (0.306) (0.145) (0.264)
GRAD_EXER -0.475 -0.199 0.501
 (0.489) (0.263) (0.491)
MALE 0.472 0.209 0.161

```
 (0.306) (0.153) (0.269)
INC 0.000 *** 0.000 0.000
 (0.000) (0.000) (0.000)
POP 0.000 0.000 0.000
 (0.000) (0.000) (0.000)
USAC1 0.743 ** 0.205 0.506
 (0.339) (0.182) (0.339)
USAC2 0.119 0.294 ** -0.389
 (0.287) (0.144) (0.257)
USAC3 0.226 -0.207 0.045
 (0.369) (0.178) (0.342)
Yrs_Racing 0.007 0.007 -0.039 ***
 (0.017) (0.008) (0.015)
Yrs_Cat1 0.144 *** 0.008 -0.092 **
 (0.038) (0.023) (0.046)
Yrs_Pro 0.049 0.020 -0.010
 (0.055) (0.036) (0.065)
Yrs_Coach 0.231 *** 0.093 *** 0.106 *
 (0.068) (0.029) (0.059)
Yrs_CoachSQ -0.008 *** -0.003 *** -0.002
 (0.003) (0.001) (0.002)
AthPROAM 0.094 *** 0.049
 (0.036) (0.073)
AthDEVO -0.008
```

```
Model fit Pseudo Pseudo [R.sup.2] Pseudo [R.sup.2]
 [R.sup.2] = = 0.0341 = 0.0365
 0.1328
 [X.sup.2] [X.sup.2] [X.sup.2]
 (20,386) = (20,386) = (20,386) =
 107.47 73.72 62.89
```

(negative-binomial) *** p < 0.01; ** p < 0.05; * p < 0.10

Table 4. DS2 Practice_Mode

Which of the following best describes how you Frequency
practice your coaching?

I coach as an individual coach (independent) 271
I coach as an employee of someone else's coaching firm 42
I own a coaching firm with at least some employee coaches 27
I coach in a partnership (equal with no employees) 14
I coach as a volunteer or club coach 12
I coach for charity organizations/rides 8
I coach a college team 7
I coach as an employee of a government agency 4
I coach as an employee of a professional cycling team 1
Total 386

Which of the following best describes how you %
practice your coaching?

I coach as an individual coach (independent) 70.21
I coach as an employee of someone else's coaching firm 10.88
I own a coaching firm with at least some employee coaches 6.99
I coach in a partnership (equal with no employees) 3.63
I coach as a volunteer or club coach 3.11
I coach for charity organizations/rides 2.07
I coach a college team 1.81
I coach as an employee of a government agency 1.04
I coach as an employee of a professional cycling team 0.26
Total 100.00

Which of the following best describes how you Cum. %

```
practice your coaching?

I coach as an individual coach (independent) 70.21
I coach as an employee of someone else's coaching firm 81.09
I own a coaching firm with at least some employee coaches 88.08
I coach in a partnership (equal with no employees) 91.71
I coach as a volunteer or club coach 94.82
I coach for charity organizations/rides 96.89
I coach a college team 98.70
I coach as an employee of a government agency 99.74
I coach as an employee of a professional cycling team 100.00
Total
```