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Nepotism or Family Tradition? A Study of NASCAR Drivers

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ABSTRACT

Of the drivers who raced National Association for Stock Car Auto Racing (NASCAR) cup series in 2005, 23 out of 76 had family connections. Family career following is not unique to NASCAR, it is common in many careers such as law, politics, business, agriculture, medicine, and entertainment. Children enter the same career as their parents for reasons of physical-capital transfer, human-capital transfer, brand-name loyalty transfer, and nepotism. Using a panel data of NASCAR drivers from the last 30 years, the authors test to see which model best explains career following in racing. Their results suggest that nepotism is not present in the career length. Sons do not have longer careers than nonfamily-connected drivers, given the same level of performance. The authors do find that fathers end their careers earlier than performance indicates. Their results also show if nepotism exists, it occurs only with second brothers who follow their first brothers into racing.

National Association for Stock Car Auto Racing (NASCAR) has a long history of family-connected drivers. In 1949, the first NASCAR season, the Flock brothers both participated. The first father–son combination occurred 9 years later when Richard Petty raced with his father Lee Petty (Fielden, 2005). Of the drivers who raced NASCAR cup series in 2005, 23 out of 76 had family connections of either being a son, brother, or father of current or former drivers. Given the family connections, we ask the question: Does the N in NASCAR stand for nepotism? The tradition of career following, however, is not unique to NASCAR. We see this pattern in many careers such as law, business, politics, agriculture, medicine, and entertainment. There are many reasons why children enter the same career as their parents. These include physical-capital transfer, human-capital transfer, brandname-loyalty transfer, and nepotism.

Using a panel data of career statistics for drivers from the last 30 years, we test to see which model best explains career following in NASCAR racing. Unlike previous studies that look at only parent–child career following, we also focus on second brothers who follow their first brother into racing. To test the implications of each model, we focus on career length to see if it is family connection or performance on the track that determines career length.

SECTION 1: THEORY

In a series of articles, Laband and Lentz (1983a, 1983b, 1985, 1989, 1990a, 1990b, 1992, 1995) have tested different industries to study why children follow in the career paths of their parents. Their results differ by industry. For instance, farmers' children who also become farmers tend to stay on the same land their parents farmed (Laband & Lentz, 1984) suggesting both human- and physical-capital transfer. Nearly 50% of self-employed proprietors are second-generation business owners, suggesting brand loyalty, human-capital transfer, and/or physical-capital transfer. Baseball players who are sons of former players tend to play the same position as their fathers (Laband & Lentz, 1990b) also suggesting human-capital transfer.

Politicians' children are more likely to become politicians and tend to do better than their parents in terms of elections (Laband & Lentz, 1985), supporting both brand-name-loyalty and human-capital transfer. Children of lawyers who follow their parents into law tend to do better in the initial years of a law practice than nonlawyer children. This may be because of human-capital transfer and potentially nepotism (Laband & Lentz, 1992). Doctors' children are found to have an advantage in medical school admissions even if they have lower test scores or grades. This result points to nepotism in the admissions process (Laband & Lentz, 1989). We know of no articles that focus on sibling career following. In the NASCAR cup series, human-capital transfer, physical-capital transfer, nepotism, and brand name could all play a role in why a child follows their parent into a racing career.

Human-Capital Transfer

Formal education is one common way to acquire general human capital. Firmspecific human capital is acquired on the job and is usually a shared investment (Becker, 1962). Many occupational skills are learned informally on the job, such as farming and sole proprietor ownership. Skills for a sports career are industry specific, falling in between formal and informal education. Sports skills are usually obtained by participating in the sport at the amateur level through learning by doing. In baseball and hockey, minor league teams develop the talent of players. Basketball and football players usually develop their skill for the professional leagues through college athletics. In racing, there are short tracks, ARCA, Craftsman Truck, and Busch series where drivers develop their skills.

Children of drivers and younger brothers of drivers may grow up in the tradition of racing and acquire skills by being on the track with their families. For instance, Richard Petty was on his father Lee Petty's pit crew in his early teens (Poole & McLaurin, 2007). Laband and Lentz (1983a) suggest some occupation-specific human capital may be acquired as a by-product of growing up and some human capital is essentially free for career followers.1 If this type of human-capital spillover is present in NASCAR, we should see sons and second brothers entering cup series racing at a younger age with more success earlier in their careers than for nonfamily-connected drivers. In terms of career length, family-connected and nonfamily-connected drivers should have the same length, as the human-capital spillover advantage is only early in a driver's career.

Physical Capital and Nepotism

The performance of NASCAR drivers depends not only on their skills but also the quality of the car they drive and of their pit crew. Car quality depends on engineering, testing, and fabrication. In addition, each driver has many cars to race, depending on the track. Ultimately, the cost of racing for each team is a multimillion dollar enterprise (McGee, 2005). Many former drivers become car owners. Some turn to their sons to be drivers.2 Bellows (2003) states ''In auto racing, an equipment-intensive sport with a high financial barrier to entry, it pays to have family connections.'' It is possible that in this hiring, nepotism may be present.

Nepotism can be modeled as the opposite of Becker's employer prejudice-based discrimination (Becker, 1971). In Becker's model, firm owners get a disutility in hiring members of a particular group. Nepotism suggests that firm owners get a positive utility of hiring members of their own family. If this is the case, sons of drivers will be less productive on the track than nonfamily-connected drivers. Car owners are willing to accept lower-quality racers because of the utility they derive from employing family members. If nepotism is present, careers for family-connected drivers should be longer than for nonfamily-connected drivers and the productivity of family-connected drivers should be lower than nonfamily-connected drivers.

Brand Name Loyalty

In NASCAR, corporate sponsorship is used to fund car racing teams (Gage, 2006). Team owners attract sponsor dollars to provide the financial capital to run the team. Unlike other racing leagues, in NASCAR, drivers are not responsible for obtaining personal funds to pay for their ride. Corporations fund cars to provide advertisements for their products and exposure of their corporate names (Gage, 2006). Drivers in many ways become the spokesperson of the corporation that sponsors the team. Thus, the driver's last name becomes associated with a corporation and even a brand on its own. Laband and Lentz (1985) contend that occupational following may be an efficient mechanism for the transfer of rents across generations when the family name embodies goodwill. They argue that this occurs in politics with family members running on the family name. Recent examples include Kennedy, Clinton, and Bush. If a family name provides marketing ability, then owners may choose family-connected drivers of lower ability not for personal preferences but for fan preferences.

In some ways, brand name loyalty follows Becker's (1971) model of customer discrimination where owners hire less-productive drivers to please sponsors. It appeals to sponsors because fan loyalty to a family name leads to more sales even if the driver is not as productive as other drivers. If family name loyalty is present in NASCAR, we should find that only the most productive drivers should have sons and brothers follow them into racing as these fathers have developed the greatest rents from their name.

Overall, there are many reasons for career following that are not mutually exclusive. Human-capital transfer contends that family members have access to learning that makes drivers more productive and at a younger age. Yet careers should be no longer for family-related drivers than for nonfamily-connected drivers as human capital equalizes over the racing career. The theory of nepotism argues that drivers should be less productive and have longer careers than their productivity indicates. The theory of brand name loyalty states that fathers or first brothers can develop brand loyalty on which sons and second brothers can capitalize. If brand name loyalty is present, only the best drivers should have brothers or sons who follow them into racing. To test the implications of these models, we use a 30-year panel study of career duration.

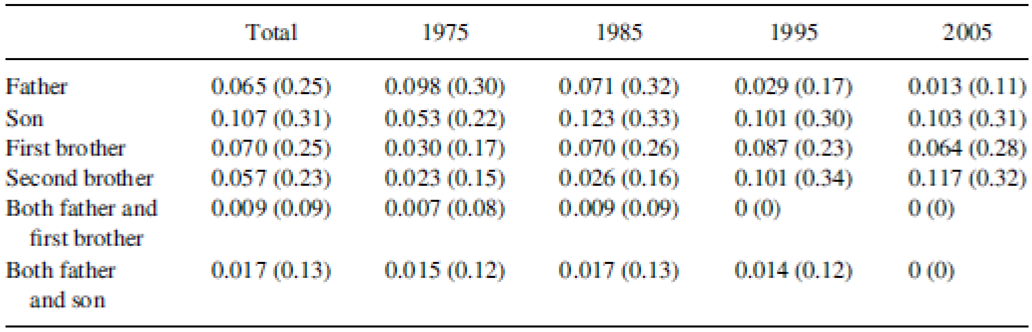
SECTION 2: THE DATA

Our data are a panel of all individuals who participated in the top NASCAR cup series from 1975 through 2005 gathered from the NASCAR Web site www.nascar.com and the book Day-by-Day in NASCAR History (Meinstereifel, 2004). Our panel is compiled from the 1973 to present time period that is considered the modern area of NASCAR. It has been named the modern era because of advent of corporate sponsorship in the early '70s by the R. J. Reynolds Tobacco Company when the series became known as the Winston Cup (Latford, 2000). This 30-year panel consists of 691 drivers and 2,848 observations. To capture the overall length of a driver's career, our data contain both stock and flow samples. A stock sample is composed of all ongoing careers at the start of the panel in 1975. These left-censored data are easily included because we know how many years each driver had driven in the NASCAR cup series before 1975. Our stock sample has 97 drivers who had an average tenure of 7 years as they entered the 1975 season. By including a stock sample, we capture information on drivers whose careers may be longer than the panel data set. For instance, one driver during this period had a career length of 35 years. Using only stock data would underrepresent short-career drivers, so we also include flow data.

A flow sample includes all careers that start between 1975 and 2005. This sample captures many short careers in NASCAR. For instance, during this period, 125 drivers had 1-year careers. If only flow data were used, it would allow for no careers longer than 30 years. As with most panels, our data are also right-censored where many careers were ongoing when our sample ended in 2005. Our right-censored data include only flow observations. To estimate a duration model of stock and flow data, we use a technique developed by Berger and Black (1998). This technique was also used by Groothuis and Hill (2004) to test for exit discrimination in the National Basketball Association and Groothuis and Hill (in press) to test exit discrimination in major league baseball.

In Table 1, we report the overall mean and the trend in family status over the length of our panel. Our data include drivers' family-relationship dummy variables on whether he is a father, son, first brother, or second brother in a racing family. The father dummy variable indicates whether a driver has a son who became a NASCAR driver. Its overall mean is 0.065 indicating that, on average, in any given year, 6.5% of racers who were racing have sons who follow them into racing. In 1975, 10% of the drivers eventually had sons who followed them into racing. By 2005, it had fallen to only 1%. This trend does not necessarily suggest that family connection is on the decline. On the contrary, the decline is caused by the inability to identify current drivers who might have children that follow them into racing. There are current drivers and some recently retired drivers who might have children who drive in NASCAR in the future, but there is no way to identify these drivers now.

Table 1
Trends in Family Status in NASCAR



	Total	1975	1985	1995	2005
Father	0.065 (0.25)	0.098 (0.30)	0.071 (0.32)	0.029 (0.17)	0.013 (0.11)
Son	0.107 (0.31)	0.053 (0.22)	0.123 (0.33)	0.101 (0.30)	0.103 (0.31)
First brother	0.070 (0.25)	0.030 (0.17)	0.070 (0.26)	0.087 (0.23)	0.064 (0.28)
Second brother	0.057 (0.23)	0.023 (0.15)	0.026 (0.16)	0.101 (0.34)	0.117 (0.32)
Both father and first brother	0.009 (0.09)	0.007 (0.08)	0.009 (0.09)	0 (0)	0 (0)
Both father and son	0.017 (0.13)	0.015 (0.12)	0.017 (0.13)	0.014 (0.12)	0 (0)

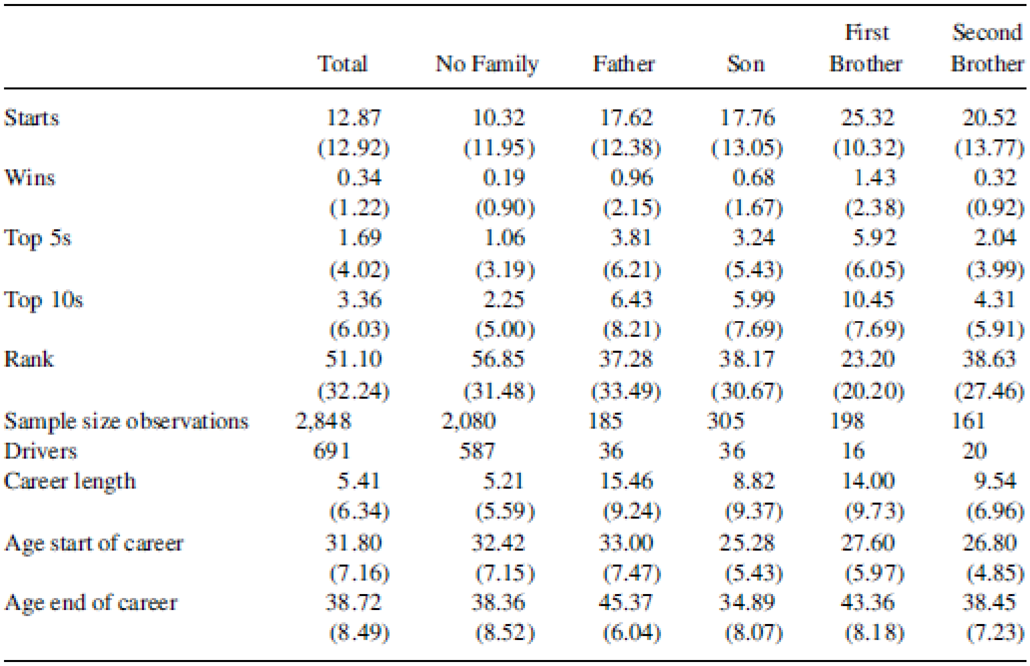
Note: Standard deviation in parentheses.

The son dummy variable indicates if the driver's father was a NASCAR driver. Its overall mean is 0.107 indicating that in any given year, averages 10.7% of racers who are sons of racers. The trend during 5-year increments was relatively steady at 10%. First brother is a dummy variable that indicates if the driver had a brother who followed him into racing. Its overall mean is 0.07. The second brother dummy variable is equal to one if the driver had a brother who had preceded him into NASCAR racing. Its overall mean is 0.05. The trend in first brother participation is relatively steady with a little decline, whereas the trend in second brother participation increased from about 3% in 1975 to about 11% in 2005.

Some drivers met more than one category, for instance, Bobby Allison is both a first brother and a father to other NASCAR drivers. To account for the multiple categories, we include two interaction dummies: first brother and father and both father and son. Their overall means are about 1% and 1.5%, respectively. The trend falls to zero for both categories for the same difficulties as above with no way of identify current drivers who have children who will follow them into NASCAR.

In column 1 of Table 2, we report the means of the full sample data. The data include age as well as performance data such as wins, top 5s, top 10s, and rank. The average number of starts per driver is about 13, an average of 0.34 wins per season, top 5 finishes per season of 1.7, and top 10 finishes per season of 3.36. The driver's rank is a seasonal variable that ranks the driver by finishes for all drivers who race in a given season. The variable ranges from 1 for the top racer in the season to last usually about 100 depending on how many drivers participated in the season.3 The last ranked racer most likely raced only in one race during the season. The average ranking is 51.1. The average age of a driver is about 37. The youngest driver to race in NASCAR was 18 and the oldest was 66.

Table 2
Means



	Total	No Family	Father	Son	First Brother	Second Brother
Starts	12.87	10.32	17.62	17.76	25.32	20.52
	(12.92)	(11.95)	(12.38)	(13.05)	(10.32)	(13.77)
Wins	0.34	0.19	0.96	0.68	1.43	0.32
	(1.22)	(0.90)	(2.15)	(1.67)	(2.38)	(0.92)
Top 5s	1.69	1.06	3.81	3.24	5.92	2.04
	(4.02)	(3.19)	(6.21)	(5.43)	(6.05)	(3.99)
Top 10s	3.36	2.25	6.43	5.99	10.45	4.31
	(6.03)	(5.00)	(8.21)	(7.69)	(7.69)	(5.91)
Rank	51.10	56.85	37.28	38.17	23.20	38.63
	(32.24)	(31.48)	(33.49)	(30.67)	(20.20)	(27.46)
Sample size observations	2,848	2,080	185	305	198	161
Drivers	691	587	36	36	16	20
Career length	5.41	5.21	15.46	8.82	14.00	9.54
	(6.34)	(5.59)	(9.24)	(9.37)	(9.73)	(6.96)
Age start of career	31.80	32.42	33.00	25.28	27.60	26.80
	(7.16)	(7.15)	(7.47)	(5.43)	(5.97)	(4.85)
Age end of career	38.72	38.36	45.37	34.89	43.36	38.45
	(8.49)	(8.52)	(6.04)	(8.07)	(8.18)	(7.23)

Source: NASCAR Web site www.nascar.com.
Note: Standard deviation in parentheses.

In Table 2, we also report the means by family status, comparing those with family connections to those with no family connections. We find that all family connections do better than a driver with no family connections in terms of performance variables. We also find that, on average, fathers tend to do better than sons, whereas second brothers do worse than first brothers. The average career length, as measured by all nonright-censored data, ranges from 5 years for no family connected drivers to 15.5 years for drivers who are fathers. We also find that son's careers tend to be shorter than father's careers and second brothers have shorter careers than do first brothers. Looking at the average age of the beginning of career, we find that sons and second brothers start their careers earlier than do fathers or first brothers. Fathers and first brothers are the oldest on average when ending their careers.

On the surface, the means seem to indicate nepotism, where sons and first brothers benefit from the reputations of family in the NASCAR series racing. To further explore the importance of family relations and determine if nepotism exists in NASCAR, we analyze the data using both nonparametric and semiparametric techniques.

SECTION 3: NONPARAMETRIC ESTIMATES OF CAREER DURATION

To help understand career duration in the NASCAR racing, we calculate yearly hazard functions as

(1)

$$h_t = d_t / n_t,$$

where d_t is the number of drivers who end their career in year t and nt is the number of drivers at risk of ending their career in year t. The hazard rate can be interpreted as the percentage of drivers who exited NASCAR, given they have acquired some level of tenure. We suspect that the majority of exit is involuntary particularly with drivers with short careers, although some may be voluntary retirements.

In Table 3, we report the total hazard rate and the hazard rate for both drivers with no family connections and with family connections. We find that for the first years in NASCAR, family-connected drivers are level less likely to exit than are nonfamily-connected drivers. This result is statistically significant at the 95% level.

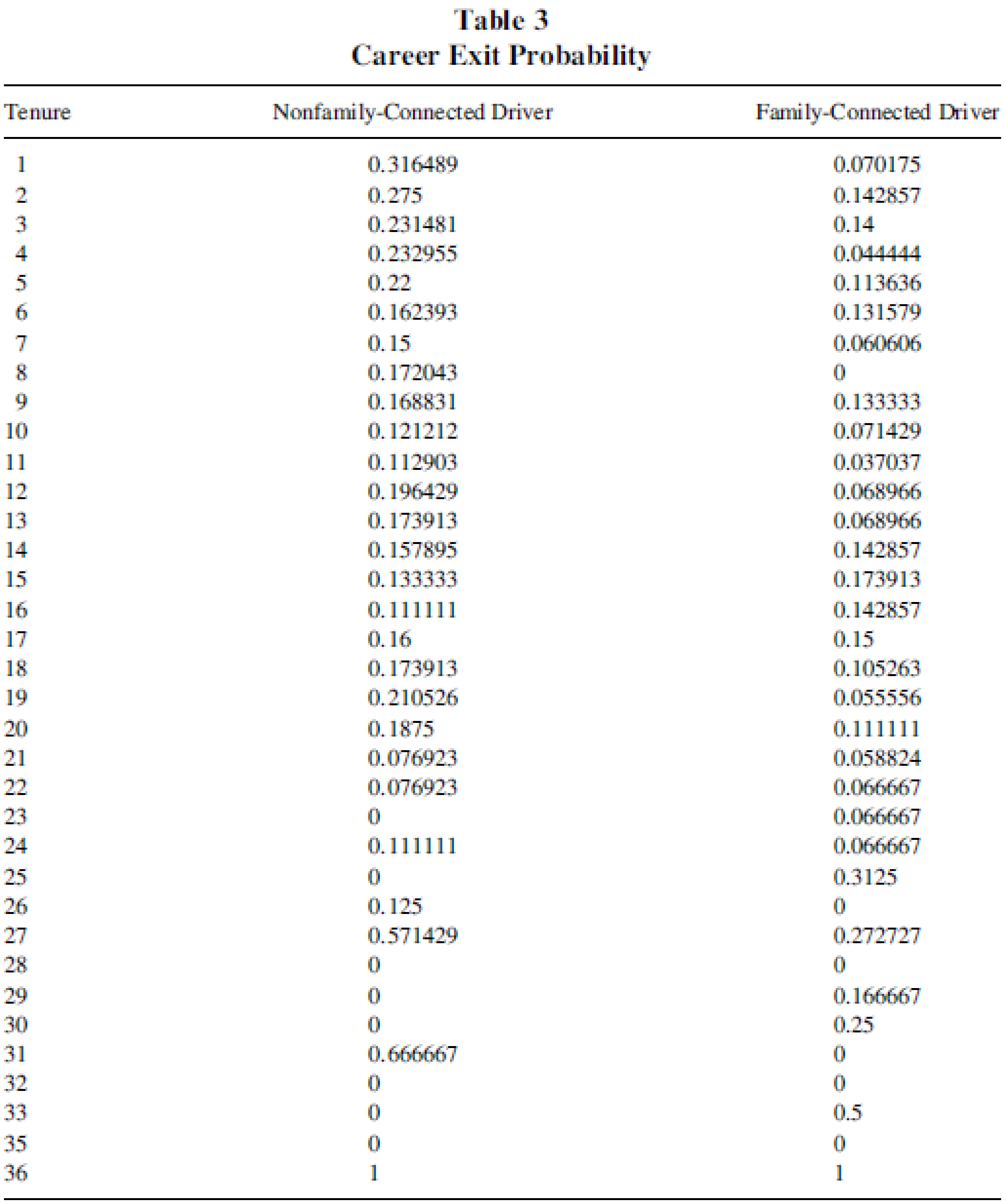
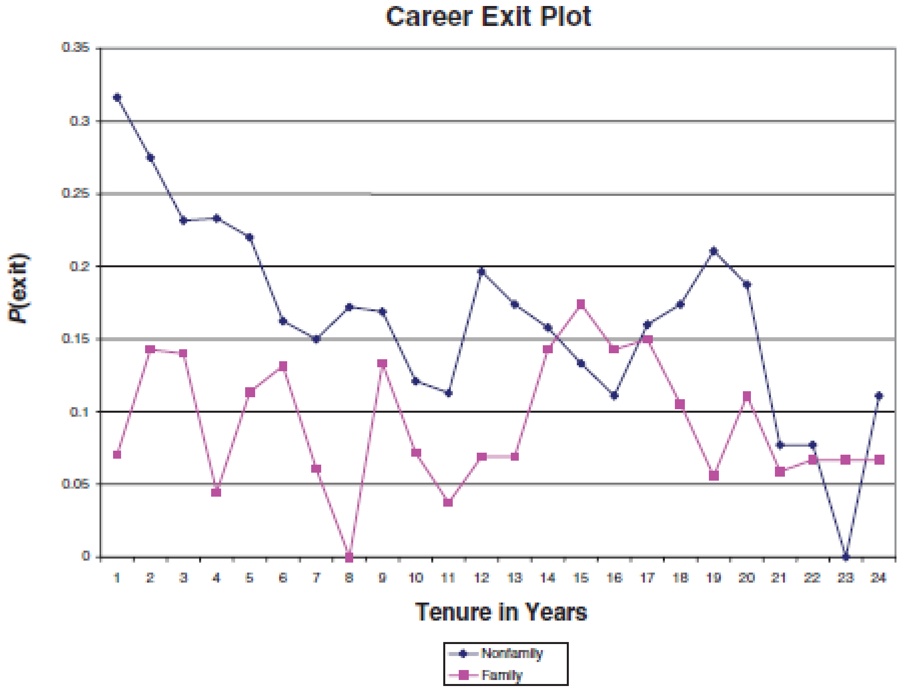


Table 3
Career Exit Probability

Tenure	Nonfamily-Connected Driver	Family-Connected Driver
1	0.316489	0.070175
2	0.275	0.142857
3	0.231481	0.14
4	0.232955	0.044444
5	0.22	0.113636
6	0.162393	0.131579
7	0.15	0.060606
8	0.172043	0
9	0.168831	0.133333
10	0.121212	0.071429
11	0.112903	0.037037
12	0.196429	0.068966
13	0.173913	0.068966
14	0.157895	0.142857
15	0.133333	0.173913
16	0.111111	0.142857
17	0.16	0.15
18	0.173913	0.105263
19	0.210526	0.055556
20	0.1875	0.111111
21	0.076923	0.058824
22	0.076923	0.066667
23	0	0.066667
24	0.111111	0.066667
25	0	0.3125
26	0.125	0
27	0.571429	0.272727
28	0	0
29	0	0.166667
30	0	0.25
31	0.666667	0
32	0	0
33	0	0.5
35	0	0
36	1	1

In Figure 1, we plot the hazard rate by family status. The nonfamily-connected plot shows that the hazard rate gradually declines for the first 8 years of tenure and then levels out at 15% until a racer has 20 years of experience. Family-connected drivers follow a relatively flat pattern with some jumps around 10%. We suggest that the pattern for nonfamily-connected drivers, with the initial downturn, occurs as individuals are sorted from NASCAR cup series racing. Comparing the two plots shows that family-connected drivers are somewhat less likely to exit NASCAR racing with their hazard plot lower than the nonfamily-connected hazard rate for the first 15 years of the plot. After 15 years, the family-connected plot and nonfamily plot cross many times. In the next section, we analyze career duration using semiparametric techniques to control for differences in productivity.

Figure 1
Career Exit Plot



SECTION 4: SEMIPARAMETRIC ESTIMATES OF CAREER DURATION

We estimate semiparametric hazard functions following Berger and Black (1998), Groothuis and Hill (2004, in press), and Berger, Black, and Scott (2005). Because our data are at the season level, we calculate our hazard model as a discrete random variable. As with Groothuis and Hill (2004), we model the durations of a single spell. We also assume a homogeneous environment so that the length of the spell is uncorrelated with the calendar time in which the spell begins, except for a time trend variable. This assumption lets us treat all the drivers' tenure as the same, regardless of when it occurred in the panel study. For instance, all 4th-year drivers are considered to have the same base line hazard, regardless of calendar time. This indicates that a 4th-year driver in 1978 has the same baseline hazard as a 4th-year driver in 1997, with the exception of a time trend.

To understand how stock data influence a likelihood function, we follow the notation of Berger et al. (2005). Suppose the probability mass function (*pmf*) of durations is defined as

$$f(t, x, \beta), \tag{2}$$

where t is the duration of the career, x is a vector of performance and personal characteristics, and β is a vector of parameters. Now denote $F(t, x, \beta)$ as the cumulative distribution function; then the probability that a career lasts at least t years is simply $1-F(t\ , x, \beta)$. If we define the hazard function as $h(t, x, \beta) \equiv f(t, x, \beta) \ / \ S(t, x, \beta)$, where $S(t, x, \beta) = \prod_{i=1}^{t-1} [1 - h(i, x, \beta)]$ and apply the definition of conditional probabilities, we may express the *pmf* as

$$f(t_i, x_i, \beta) = \prod_{j=0}^{t_i-1} [1 - h(j, x_i, \beta)] h(t_i, x_i, \beta). \tag{3}$$

If we have a sample of n observations, $\{t_1, t_2, \ldots, t_n\}$, the likelihood function of the sample is

$$L(\beta) = \prod_{i=1}^{n} f(t_i, x_i, \beta) = \prod_{i=1}^{n} \left(\prod_{j=0}^{t_i-1} [1 - h(j, x_i, \beta)] h(t_i, x_i, \beta) \right). \tag{4}$$

Often it is not possible to observe all careers until they end; hence, careers are often right censored. Let the Set A be the set of all observations where the driver's careers are completed and the Set B be the set of all observations where the careers are right censored. In this case, A and B are disjoint sets whose union is exactly the set of observations. For the set of right-censored observations, all we know is that the actual length of the career is greater than t_i, the observed length of the career up through the last year. We know that the actual length of the career is longer than we observe and the contribution of these observations to the likelihood function is just the survivor function, $S(t_i, x_i, \beta)$. Thus, we may write the likelihood function as

$$\begin{aligned} L(\beta) &= \prod_{i \in A} \left(\prod_{j=1}^{t_i-1} [1 - h(j, x_i, \beta)] h(t_i, x_i, \beta) \right) \times \prod_{i \in B} S(t_i, x_i, \beta) \\ &= \prod_{i \in A} \left(\prod_{j=1}^{t_i-1} [1 - h(j, x_i, \beta)] h(t_i, x_i, \beta) \right) \times \prod_{i \in B} \left(\prod_{j=1}^{t_i-1} [1 - h(j, x_i, \beta)] \right), \end{aligned} \tag{5}$$

where equation (5) exploits the property that $S(t, x, \beta) = \prod_{i=1}^{t-1} [1 - h(i, x, \beta)]$. Equation (5) is the likelihood function for any flow sample of discrete durations.

To introduce stock sampling, let the Set C be the set of careers that were in progress when data collection began. For these observations, we know that the career *i* has lasted for r years before the panel begins so that the probability that the total career length will be *t*, it is simply given by

(6)

$$\frac{f(t,x,\beta)}{S(r,x,\beta)} = \left(\prod_{i=r}^{t-1} [1 - h(i,x,\beta)] \right) h(t,x,\beta).$$

Because we are sampling careers that are already in progress, these observations enter the sample only if the career is at least of length r, and we adjust by the conditional probability of the career having length r. With the addition of these observations, we may write the likelihood function as

(7)

$$\begin{aligned} L(\beta) = & \prod_{i \in A} \left(\prod_{j=1}^{t_i - 1} [1 - h(j,x_i,\beta)] h(t_i,x_i,\beta) \right) \times \prod_{i \in B} \left(\prod_{j=1}^{t_i - 1} [1 - h(j,x_i,\beta)] \right) \\ & \times \prod_{i \in C} \left(\prod_{j=r_i}^{t_i - 1} [1 - h(j,x_i,\beta)] \right) h(t_i,x_i,\beta) \end{aligned}$$

The third term of the right-hand side of equation (7) reflects the adjustment necessary for the stock sample that ends during our panel. Because stock-sampled observations, by definition, must have survived until tenure r that they survived until time r provides no information; their survival is an artifact of the sampling strategy.

In our data, no stock-sampled observations are right-hand censored. Thus, we expressed the likelihood function as a function of the hazard functions (Berger & Black, 2001). All that remains is to specify the form of a hazard function and estimate by means of maximum likelihood estimation. The hazard function is the conditional probability of exiting NASCAR cup, given that the NASCAR cup career lasted until the previous season. The hazard function must have a range from zero to one. In principle, any mapping with a range from zero to one will work. Cox (1972) recommends

(8)

$$\frac{h(t,x,\beta)}{1 - h(t,x,\beta)} = \frac{h_t}{1 - h_t} e^{x\beta} = \exp(\gamma_t + x\beta).$$

which is simply the logit model with intercepts that differ by time periods. The term ht is a baseline hazard function that is common to all. The xβ term, determined by the driver’s personal and productivity characteristics, shifts the baseline hazard function, but it affects the baseline hazard function in exactly the same way each period. Berger and Black (1998) consider other hazard functions and find that the results are relatively robust across various specifications of the hazard function. As the logit model is available in many software packages, we follow Cox and use the logit model.

The intuition behind equation (8), when using the logit model for the hazard function, is relatively simple. For each year during the survey in which the driver races in NASCAR, the driver either comes back for another season or ends his career. If the career ends, the dependent variable takes on a value of one; otherwise, the dependent variable is zero. The driver remains in the panel until the driver exits racing or the panel ends. If the panel ends, we say the worker's spell is right-hand censored. Thus, a driver who begins his NASCAR career during the panel and races for 6 years will enter the data set 6 times. The value of his dependent variable will be zero for the first 5 years (tenure one through five) and be equal to one for the 6th year.

To illustrate a stock sample, consider another driver who enters the panel with 7 years of NASCAR cup racing tenure before 1975, the first year of the panel, then races for an additional 3 years to make a 10-year career. For this driver, we ignore his first 7 years of tenure because he is left-hand censored. As the equation of the likelihood function with stock data indicates, the duration of a NASCAR career before the beginning of the panel makes no contribution to the value of the likelihood function. Therefore, only years 8 through 10 will enter the data set with the dependent variable taking on the value zero for year 8 and 9. In the 10th year, it takes on a value of one with this driver appearing in the data set a total of 3 times. Note, for all drivers who are right-hand censored, we do not know when their career ends so their dependent variables are always coded as zero.

Because the drivers in the panel have varying degrees of job tenure before the beginning of the panel, we identify the hazard function for both long and short careers. The disadvantage to this approach is that the vector Y_t of equation (8) can be very large. In our study, it would require 35 dummy variables. We also run into problems with the Cox technique because we have too few drivers who have long careers. To simplify the computation of the likelihood function and keep the long careers, we approximate the Y_t vector with a fifth-order polynomial of driver's tenure. This reduces the number of parameters to be estimated from 35 to 5. The hazard function becomes

(9)

$$\frac{h(t,x,\beta)}{1-h(t,x,\beta)} = \Phi(t)e^{x\beta} = \exp(\phi(t)+x\beta).$$

where $\phi(t)$ is a fifth-order polynomial in the worker's tenure. Once again, we choose the Taylor series approximation technique over using tenure dummies, because of the small number of observations for high tenures. This method provides a very flexible specification of the baseline hazard but does impose more restrictions than Cox's model.[4]

THE RESULTS

In Table 4, we report the estimates for equation (9) for three specifications. In the first specification, we include only dummy variables for family connections. In the second specification, we use both family dummies and interaction familyconnected dummies. The interaction dummies control for racers who were both sons of racers and father of racers as well as for racers who were both first brother and fathers of other racers. In the third specification, we interact the family status dummy variables with age to test if career duration varies by family status over the length of the career. We find in all three specifications that the tenure polynomials are jointly significant. We also find that performance measures influence the likelihood of racing the next season. The more top 5s and the better the driver's ranking, the less the likelihood of ending a racing career. The coefficient on wins and top 10 finishes, however, is found to be insignificant in this specification because of the collinearity of the performance measures. The coefficient on age of the driver is also found to be positive and significant, suggesting that older drivers are more likely to exit racing. We also include year to control for the time period of the racer career. We find that current drivers are less likely to exit than drivers in the past.

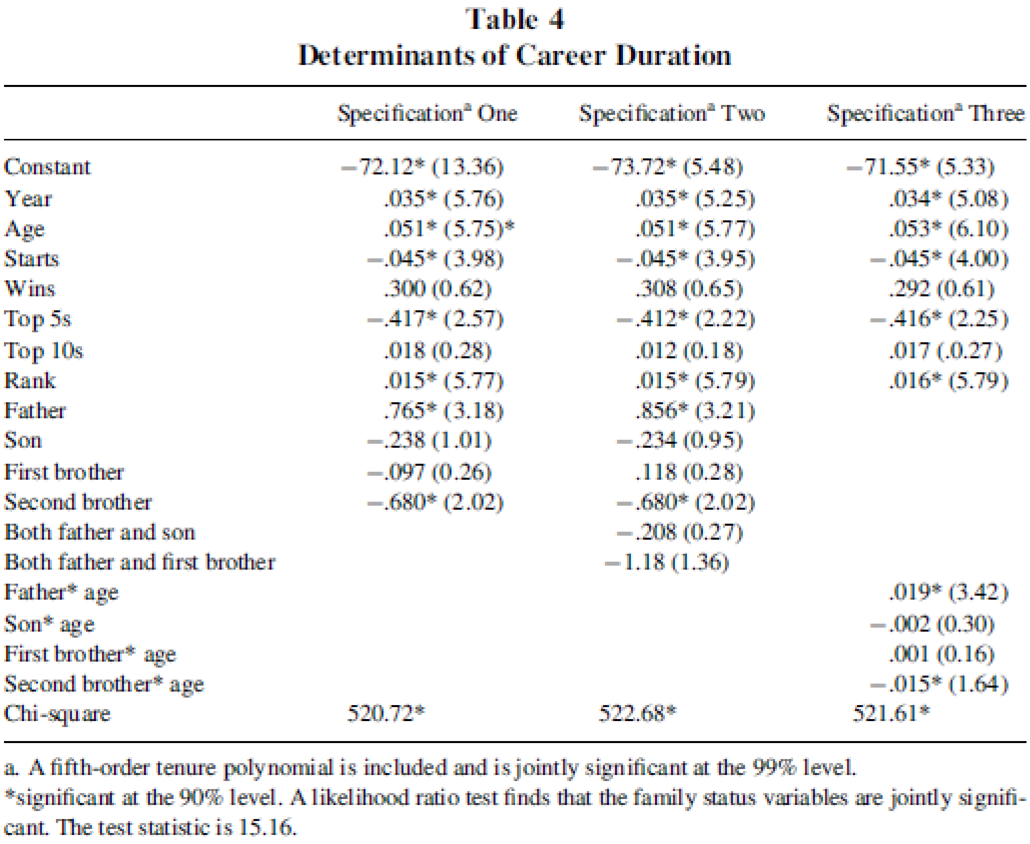


Table 4
Determinants of Career Duration

	Specification[a] One	Specification[a] Two	Specification[a] Three
Constant	−72.12* (13.36)	−73.72* (5.48)	−71.55* (5.33)
Year	.035* (5.76)	.035* (5.25)	.034* (5.08)
Age	.051* (5.75)*	.051* (5.77)	.053* (6.10)
Starts	−.045* (3.98)	−.045* (3.95)	−.045* (4.00)
Wins	.300 (0.62)	.308 (0.65)	.292 (0.61)
Top 5s	−.417* (2.57)	−.412* (2.22)	−.416* (2.25)
Top 10s	.018 (0.28)	.012 (0.18)	.017 (.0.27)
Rank	.015* (5.77)	.015* (5.79)	.016* (5.79)
Father	.765* (3.18)	.856* (3.21)	
Son	−.238 (1.01)	−.234 (0.95)	
First brother	−.097 (0.26)	.118 (0.28)	
Second brother	−.680* (2.02)	−.680* (2.02)	
Both father and son		−.208 (0.27)	
Both father and first brother		−1.18 (1.36)	
Father* age			.019* (3.42)
Son* age			−.002 (0.30)
First brother* age			.001 (0.16)
Second brother* age			−.015* (1.64)
Chi-square	520.72*	522.68*	521.61*

a. A fifth-order tenure polynomial is included and is jointly significant at the 99% level.
*significant at the 90% level. A likelihood ratio test finds that the family status variables are jointly significant. The test statistic is 15.16.

The coefficients on family relation provide some interesting results. To allow for ease of interpretation, we convert the coefficient into a percentage and focus on the magnitude of the effect by using 100[exp(b)−1]. This conversion gives us the percentage difference in hazard rates between the differing family status. First, we find that fathers are 114% more likely to exit in a given year, holding other factors constant, than drivers who do not have sons driving in the first specification and 135% more likely in the second specification. This seems counter to the results of the first section where fathers clearly are the oldest of the subgroups of racers when ending their career. The combination of these results shows that racers who have their sons follow them into racing tend to be the best racers. Yet fathers whose son follows them into racing exit sooner than their counterparts given the same level of performance. This is true in both specifications.

Second, sons are found to be about 10% less likely to exit their careers in a given year than their counterparts in both specifications. This result, however, is statistically insignificant. Although their father exits sooner than their performance indicates, a son's careers is no longer than that of other drivers. Our results show that being a father shortens a career, whereas being a son has no influence on career length, holding performance constant. This result lends supports to brand-nameloyalty model where a son may extend the racing name across generations.

Third, being a first brother is found to have no significant impact on career length in NASCAR. Second brothers, however, are 49% less likely to exit NASCAR and have longer careers than their performance indicates in both specifications. This result suggests that second brothers may free ride on the first brothers' reputation. This result also supports the brand name model with second brothers following first brothers into racing and being able to extend their careers longer, because of their family name. The interaction terms in the second specification are all statistically insignificant.

In the third specification with the interaction family status dummies with age, we find that the interaction of father and age is positive and statistically significant indicating that age is more important determinant of exit for fathers in NASCAR. The second brother dummy interaction is negative and statistically significant suggesting that age is less important as a determinant for exit for second brothers. All other family status interactions with age are statistically insignificant. The results of the third specification are consistent with the results of the first two specifications with fathers exiting sooner and second brothers exiting holding performance constant.

SECTION 5: CONCLUSIONS

Our results suggest that the N in NASCAR does not stand for nepotism. If nepotism existed, sons would have longer careers than their performance indicates. Sons, however, do not have longer careers than nonfamily-connected drivers, given the same level of performance. In addition, we find that drivers who have sons or brothers who follow them into racing are clearly some of the best drivers in NASCAR. This result is consistent with the brand-name-loyalty model where children can capture rents from established name recognition. We also find that fathers end their careers earlier than performance indicates when a son enters into cup competition. This could be because of a son's ability to extend a brand name across generations. The extension of a brand name also occurs with second brothers who benefit from the first brother's name and having longer careers than performance indicates. In addition, sons enter racing earlier, on average, than nonfamilyconnected drivers that is consistent with human-capital transfer. If nepotism exits, it occurs only with the second brothers career length.

Further research can be conducted to study the value of a family brand name. We speculate that current drivers such as Jeff Gordon or Tony Stewart may have developed brand names and have children follow them into racing. This line of research does not have to stop with the families of NASCAR. It could extend to the entertainment industry, politicians, lawyers, and family businesses. A first generation may establish the brand name, but following generations must maintain the level of performance to keep the value to the name.

NOTES

1. For a formal model of human-capital transfer between generations, see Laband and Lentz (1983a). In their model, they develop conditions when children acquire their education at home and when they acquire their education formally at school. Our hypothesis is that in NASCAR, many skills can be transferred informally from fathers to sons.

2. Currently, there are 20 team owners in NASCAR. The size of the team ranges from one to four cars. Of the 20 teams, 10 of the owners were former drivers in either NASCAR or Formula One. Over their history, 3 of the current teams have hired family members as drivers. Yet nepotism could also be present if owners hire children of friends whom they have raced with in the past.

3. Rank also serves as a proxy measure for DNFs (did not finish) because this measures captures finishing order.

4. When higher order polynomials of the sixth and seventh power are included, results do not change. This suggests that a fifth-order polynomial is flexible enough to capture the influence of the base line hazard.

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