Comments on

John Kane and Lawrence M. Spizman
"An Update of the Educational Attainment Model for a Minor Child"

by

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Kane and Spizman (hereinafter SK) have provided an update on an interesting and important topic of direct relevance for anyone estimating the lost earnings capacity of an injured child, and in some states like Pennsylvania, the lost earning capacity of a fatally injured child. I enjoyed reading the SK paper and offer some comments and a couple of earnings loss calculations using the updated SK estimates and those based on the paper it updates by Gill and Foley (1996).

I. Implementation Issues

1. In computing the educational attainment probabilities specified in SK Table 1, how does one deal with coefficients on variables that fit the child or the child's family but that are not statistically significant in the probit estimation? Should these coefficients simply be ignored as if they did not apply to the child or the child's family, or should they be used in computing the educational attainment probabilities?

Table 1 attached shows the coefficient estimates in the SK paper and those for Model III in the GF paper. For ease of comparison, the estimates for males from each study are put side by side, as are the estimates for females. In each equation, some of the variables are statistically insignificant at the typically chosen confidence levels of 1%, 5% and 10%. Tables 3 and 6 show the effect on the value of Z of, alternatively, including and excluding these variables. Tables 4 and 7 show the implications for lifetime earnings capacity for an 8-year-old female child, and male child, respectively. Using the SK equation, the difference between the estimates that use the insignificant variables and those that do not is about $185,000 for the female and $200,000 for the male. This sizable dollar difference in estimates illustrates the need to provide some guidance about whether statistically insignificant coefficients should be used or not. How can their use be defended? From the standpoint of the econometrics, Dr. Kane pointed out the using all the relevant variables, whether individually significant or not, provides the best overall assessment of the probability. Perhaps the "more likely than not" legal definition of "a reasonable degree

of statistical certainty" would suggest it is permissible to use a statistical significance level of not the standard 5% but just under 50%! But such a standard would not pass muster under the Daubert standard which asks whether the theory or technique is generally accepted in the scientific community.

2. How does one deal with the lack of an exact match between the education categories in the SK and GF papers and the education categories in Table 9 of *Money Income in the United States* (2000). SK and GF have six education categories, whereas Table 9 of *Money Income* has nine. My solution to this matter in Tables 4 and 7 was to:

(a) Ignore the *Money Income* educational attainment category "Less than 9th grade." An ever decreasing percentage of persons fail to complete the 9th grade, so the effect of ignoring this category is relatively meager. An alternative approach would be to use the procedure specified in (b) and (c) below.

(b) Split the "1-3 years of college" probability in SK and GF into two parts with weights equal to the proportion of persons in the "some college, no degree" category and the "Associate degree" category, relative to the sum in both categories combined.

(c) Split the "Ph.D. Degree (or equivalent)" probability in SK and GF into two components using the same procedure as in (b). An alternative is to ignore the Ph.D. Degree category and increase the probability of a master's degree by the tiny probability of obtaining a Ph.D. degree or equivalent.

3. For some of the variables, such as whether the child was living with both parents, the variable in the data is measured when the child was 14 years of age. How is this variable to be used for a child who is not 14 years of age? For example, the child in Tables 4 and 7 is assumed to be 8 years of age. Does the forensic economist assume that a child living with both parents at age 8 will be living with both parents at age 14? That is what I have implicitly done in the computations in Table 4 and 7. But, of course, this assumption is only true with a probability less than one. Should the probability of divorce be estimated and then "1 minus the divorce probability" be multiplied by the value of the "living with parents" coefficient? Such an estimate is presumably beyond the expertise of the forensic economist for a specific couple, though resort could be had to average statistics to compute an average divorce probability. Would this refinement be an example of what Justice Stevens termed "delusive exactness"?

4. Empirical work by some eminent researchers (Cameron and Heckman) has found that a GED is not equivalent to a high school diploma. Rather, the earnings of dropouts are better predictors of earnings for persons with a GED. Unfortunately, GED recipients and diploma recipients are lumped together in the *Money Income* data. I don't have a suggestion about how to remedy this problem, but forensic economists should be aware of the

Cameron and Heckman findings.

5. SK put emphasis on the differences between the descriptive statistics in their sample and the one used by GF. There are some large differences, e.g., the SK sample has triple the percentage of blacks as the GF sample, and the proportion of the SK sample with a high school diploma is about 17% points higher than in the GF sample. (GF sample proportions are closer to population totals than those in the SK sample.) These and other differences are so large that I think SK should contact GF and try to determine why their samples are so very different. I know that Jack Foley is alive and well because I had recent email correspondence with him and sent him an electronic copy of the new SK paper. I advise SK to contact him and try to reconcile the puzzling differences in their samples. These large differences lead me to suspect that an error may have been made somewhere in the process of extracting either the GF sample or the SK sample. Considerable effort should be devoted to uncovering the reason for the sample differences, as an extraction error or coding error would invalidate all the estimates using the flawed sample.

6. Finally, I am a bit puzzled by the last two sentences in the SK paper, which read: “The current study shows that the reliance on a data set that does not contain completed educational attainment data for a substantial proportion of the population also has potentially serious implications for such an estimation process. This calls into question the validity of forecasts based upon the original estimates provided by Gill and Foley.”

The last two sentences seem strange to a reader of SK’s 1998 LED article, which makes the case that the educational probability model is likely to survive a Daubert challenge because the results of the SK 1992 paper were again found in the GF 1996 paper, indicating the “robustness” of the results. I am not convinced that this conclusion is overturned by the SK update, especially in view of the following:

(1) As Table 1 reveals, a number of variables (parental education, adults being in a professional occupation, living with both parents at 14 and magazines) were found to be statistically significant in both the GF study and the SK update. The only major difference in the results is for the religion variables. For males, GF found all these variables statistically significant, whereas the SK update does not (with the exception of being Jewish, which was significant in SK for males). Overall, the addition of more complete data on educational attainment data did not cause the basic results to change.

(2) The large discrepancy between the sample statistics for the two studies needs to be reconciled. Until it is, there is the possibility that one of the studies has errors in the way the samples were drawn, or errors made in the process of compiling and using the data.

(3) When all relevant coefficients are used, whether statistically significant or not, the SK

estimate for the expected earnings capacity of white female child is 3.2% above the GF estimate ($1,135,724 vs. $1,100,357). For males the difference is 6.6% ($1,613,405 vs. $1,512,996). The estimates using only the significant variables differ by about 10% for the female and 6.8% for the male. While I have not computed differences for a wide number of other scenarios, the one I did compute does not seem so large as to call the validity of the GF paper into question.

(4) SK are able to show a total of 540 changes (reported among about 8,400 to 9,000 persons) in educational attainment between 1993 and 1998 for persons between 33 and 40 years old. It would be interesting to see how these changes were distributed across the various education categories. Were 300 of the 540 changes due to persons obtaining a GED? Is 540 changes in educational attainment enough of a change to account for the difference between the equation estimates of SK and GF? What would the equation estimates look like if they were estimated for the same sample of persons but using the sample records as of 1992? My suspicion is that the main differences between the GF and SK estimates are not due to the 540 changes in educational attainment but rather to some other basic differences in the persons contained in the two samples or the way the sample data were manipulated.

References

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U.S. Census Bureau, Current Population Reports, P60-209, *Money Income in the United States: 1999*, U.S. Govt. Printing Office, Washington, D.C., 2000.

Comment on John Kane and Lawrence M. Spizman, "An Update on the Educational Attainment Model for a Minor Child," by James D. Rodgers. Eastern Economics Association, New York City, Feb. 24, 2001.

Table 1

Ordered Probit Estimates Explaining Educational Attainment

Variable	Males-GF	S	Males-SK	S	Females-GF	S	Females-SK	S
Constant	-0.660	***	0.078		0.142		0.254	
Hispanic	-0.220		0.028		0.136		0.087	
Black	0.000		0.114	**	0.330	***	0.157	***
Urban 14	0.101	***	-0.045		-0.062		-0.162	***
Mother's Education								
High School	0.207	***	0.310	***	0.415	***	0.359	***
Some College	0.354	***	0.570	***	0.531	***	0.520	***
College	0.713	***	0.843	***	0.855	***	0.752	***
Father's Education								
High School	0.278	***	0.193	***	0.188	***	0.211	***
Some College	0.533	***	0.411	***	0.279	***	0.383	***
College	0.768	***	0.781	***	0.571	***	0.633	***
Adults' Occupation								
Professional	0.204	***	0.130	***	0.358	***	0.335	***
Sales or Clerical	0.094	***	0.076		0.057		0.087	*
Religion Raised								
Baptist	0.560	***	0.279		-0.151		0.320	
Protestant	0.586	***	0.386		0.014		0.511	
Catholic	0.558	***	0.349		0.012		0.448	
Jewish	1.039	***	0.754	**	0.422	***	1.105	
Other	0.698	***	0.405		0.005		0.337	
Only Child	0.045		0.204	*	0.301	***	0.202	*
Living with Both Parents at age 14	0.243	***	0.187	***	0.188	***	0.182	***
Newspapers in home at age 14	0.017	***	0.092	**	0.157	***	0.067	
Magazines in home at age 14	0.257	***	0.277	***	0.218	***	0.195	***
Library card at age 14	0.205	***	0.235	***	0.059		0.223	***
μ_1	1.429	***	2.102	***	1.411	***	2.043	***
μ_2	2.078	***	2.402	***	2.166	***	2.481	***
μ_3	3.159	***	3.384	**	3.365	***	3.477	***
μ_4	3.702	***	4.074	***	4.181	***	4.396	***
Chi-Squared	829.690	***	1029.584	***	988.160		1008.287	***

S = Significance Level

*significant at the 0.1 level

**significant at the 0.05 level

***significant at the 0.01 level

TABLE 2
RELEVANT DATES AND EXPECTANCIES
IN THE CASE INVOLVING
FEMALE CHILD

	DATE	YEAR AND FRACTIONAL EQUIVALENT	NUMBER OF YEARS	AGE	50% OF GROUP WILL HAVE EXPECTANCY BETWEEN APPROXIMATELY AGE (LOW)	AGE (HIGH)
1. Date of Birth	1-Jul-1991	1991.50	--	--	--	--
2. Date of Injury	1-Jul-1999	1999.50	8.00	8.00		
3. Date of This Report	24-Feb-2001	2001.15	1.65	9.65	--	--
4. Statistical Life Expectancy (a)	Dec-2071	2072.00	72.50	80.50	74.16	89.98

(1) LEVEL OF EDUCATIONAL ATTAINMENT	(2) LABOR MARKET ENTRY DATE	(3) ENTRY AGE	(4) STATISTICAL WORKLIFE EXPECT-ANCY (b)	(5) PROBABILITY OF LIVING FROM AGE AT DEATH TO ENTRY AGE (a)	(6) ADJUSTED STATISTICAL WORKLIFE EXPECT-ANCY (4) x (5)
As a high school dropout	2008.50	17.00	35.50	0.99820	35.44
With a high school diploma	2009.50	18.00	39.20	0.99775	39.11
With some college, no degree	2011.50	20.00	37.90	0.99687	37.78
With an associate degree	2011.50	20.00	38.80	0.99687	38.68
With a bachelor's degree	2013.50	22.00	38.60	0.99604	38.45
With advanced degree	2015.50	24.00	37.80	0.99524	37.62

(a) Computed from the female child's age as of the date of her injury using Robert N. Anderson, "United States Life Tables, 1998," National Vital Statistics Reports, Vol. 48, No. 18, February 7, 2001, U.S. Dept. of Health and Human Services, Table 6.

(b) Computed from the age at which it is assumed that the female child would have entered the labor force after completing the indicated level of education using Tamorah Hunt, Joyce Pickersgill and Herbert Rutemiller, "Median Years to Retirement and Worklife Expectancy for the U.S. Civilian Population," Journal of Forensic Economics, Spring/Summer 1997, Vol. X, No. 2, Appendix A -Table 7.

Comment on John Kane and Lawrence M. Spizman, "An Update on the Educational Attainment Model for a Minor Child," by James D. Rodgers. Eastern Economics Association, New York City, Feb. 24, 2001.

Table 3

White female child, parents both completed high school, father and mother both in sales or clerical, protestant religion, not an only child, living with both parents, newspapers and magazines in the home, no library card.

	SK's Z All Variables	SK's Z – Only Sign. Variables	GF's Z All Variables	GF's Z Sign. Variables
White female	0.254		0.142	
Mother-HS Graduate	0.359	0.359	0.415	0.415
Father-HS Graduate	0.211	0.211	0.188	0.188
Adults' Occupation Sales or Clerical	0.087	0.087	0.057	
Raised Protestant	0.511		0.014	
Living with both parents	0.182	0.182	0.188	0.188
Newspaper	0.067		0.157	0.157
Magazines	0.195	0.195	0.218	0.218
Total, Giving the value of Z	1.866	1.034	1.379	1.166
μ_1	2.043		1.411	
μ_2	2.481		2.166	
μ_3	3.477		3.365	
μ_4	4.396		4.181	

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Table 4

Expected Earnings Capacity of a White 8-Year-Old Female Child, Parents Completed High School and with Other Family Characteristics Specified in Table 3

Spizman and Kane Update

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Educational Attainment Level	Female FTYR Earnings	Lifetime Earnings	Assigned Probability from updated SK Model	Expected Value	Assigned Probability from updated SK Model Sign. Var. Only	Expected Value
9 to 12 years of education, no diploma	$19,419	$688,132	3.10%	$21,346	15.06%	$103,611
High school graduate (includes GED)	$23,498	$919,053	53.92%	$495,577	69.29%	$636,853
Some college, no degree	$28,661	$1,082,850	10.92%	$118,243	5.62%	$60,816
Associate degree	$31,285	$1,210,057	5.13%	$62,053	2.64%	$31,916
Bachelor's degree	$40,263	$1,548,001	21.57%	$333,885	6.67%	$103,198
Master's degree	$49,635	$1,867,267	4.79%	$89,417	0.69%	$12,877
Professional degree	$72,171	$2,715,070	0.33%	$8,919	0.02%	$605
Doctorate degree	$69,085	$2,598,975	0.24%	$6,285	0.02%	$426
			100.00%	$1,135,724	100.00%	$950,302

Gill and Foley

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Educational Attainment Level	Female FTYR Earnings	Lifetime Earnings	Assigned Probability GF Model	Expected Value	Assigned Probability GF Model Sign. Var. Only	Expected Value
9 to 12 years of education, no diploma	$19,419	$688,132	8.39%	$57,767	12.18%	$83,819
High school graduate (includes GED)	$23,498	$919,053	42.88%	$394,105	47.50%	$436,518
Some college, no degree	$28,661	$1,082,850	18.48%	$200,117	16.64%	$180,206
Associate degree	$31,285	$1,210,057	8.68%	$105,020	7.82%	$94,571
Bachelor's degree	$40,263	$1,548,001	19.21%	$297,409	14.47%	$224,021
Master's degree	$49,635	$1,867,267	2.10%	$39,170	1.27%	$23,629
Professional degree	$72,171	$2,715,070	0.15%	$3,971	0.07%	$2,009
Doctorate degree	$69,085	$2,598,975	0.11%	$2,798	0.05%	$1,416
			100.00%	$1,100,357	100.00%	$1,046,190

TABLE 5
RELEVANT DATES AND EXPECTANCIES
IN THE CASE INVOLVING
MALE CHILD

	DATE	YEAR AND FRACTIONAL EQUIVALENT	NUMBER OF YEARS	AGE	50% OF GROUP WILL HAVE EXPECTANCY BETWEEN APPROXIMATELY AGE (LOW)	AGE (HIGH)
1. Date of Birth	1-Jul-1991	1991.50	--	--	--	--
2. Date of Injury	1-Jul-1999	1999.50	8.00	8.00		
3. Date of This Report	24-Feb-2001	2001.15	1.65	9.65	--	--
4. Statistical Life Expectancy (a)	Aug-2066	2066.60	67.10	75.10	67.85	85.71

(1) LEVEL OF EDUCATIONAL ATTAINMENT	(2) LABOR MARKET ENTRY DATE	(3) ENTRY AGE	(4) STATISTICAL WORKLIFE EXPECT-ANCY (b)	(5) PROBABILITY OF LIVING FROM AGE AT DEATH TO ENTRY AGE (a)	(6) ADJUSTED STATISTICAL WORKLIFE EXPECT-ANCY (4) x (5)
As a high school dropout	2008.50	17.00	35.50	0.99699	35.39
With a high school diploma	2009.50	18.00	39.20	0.99606	39.05
With some college, no degree	2011.50	20.00	37.90	0.99392	37.67
With an associate degree	2011.50	20.00	38.80	0.99392	38.56
With a bachelor's degree	2013.50	22.00	38.60	0.99150	38.27
With advanced degree	2015.50	24.00	37.80	0.98891	37.38

(a) Computed from the female child's age as of the date of her injury using Robert N. Anderson, "United States Life Tables, 1998," National Vital Statistics Reports, Vol. 48, No. 18, February 7, 2001, U.S. Dept. of Health and Human Services, Table 5.

(b) Computed from the age at which it is assumed that the female child would have entered the labor force after completing the indicated level of education using Tamorah Hunt, Joyce Pickersgill and Herbert Rutemiller, "Median Years to Retirement and Worklife Expectancy for the U.S. Civilian Population," Journal of Forensic Economics, Spring/Summer 1997, Vol. X, No. 2, Appendix A -Table 7.

Comment on John Kane and Lawrence M. Spizman, "An Update on the Educational Attainment Model for a Minor Child," by James D. Rodgers. Eastern Economics Association, New York City, Feb. 24, 2001.

Table 6

White male child, parents both completed high school, father and mother both in sales or clerical, protestant religion, not an only child, living with both parents, newspapers and magazines in the home, no library card.

	SK's Z All Variables	SK's Z – Only Sign. Variables	GF's Z All Variables	GF's Z Sign. Variables
White male	0.078		-0.660	-0.660
Mother-HS Graduate	0.310	0.310	0.207	0.207
Father-HS Graduate	0.193	0.193	0.278	0.278
Adults' Occupation Sales or Clerical	0.076		0.094	0.094
Raised Protestant	0.386		0.586	0.586
Living with both parents	0.187	0.187	0.243	0.243
Newspaper	0.092	0.092	0.017	0.017
Magazines	0.277	0.277	0.257	0.257
Total, Giving the value of Z	1.599	1.059	1.022	1.022
μ_1	2.102		1.429	
μ_2	2.402		2.078	
μ_3	3.384		3.159	
μ_4	4.074		3.702	

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Table 7

Expected Earnings Capacity of a White 8-Year-Old Male Child, Parents Completed High School and with Other Family Characteristics Specified in Table 6

Spizman and Kane Update

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Educational Attainment Level	Male FTYR Earnings	Lifetime Earnings	Assigned Probability from updated SK Model	Expected Value	Assigned Probability from updated SK Model Sign. Var. Only	Expected Value
9 to 12 years of education, no diploma	$25,558	$904,582	5.49%	$49,671	14.48%	$130,983
High school graduate (includes GED)	$35,121	$1,371,315	63.76%	$874,361	70.67%	$969,144
Some college, no degree	$42,193	$1,589,391	6.76%	$107,399	4.00%	$63,633
Associate degree	$44,706	$1,724,045	2.89%	$49,863	1.88%	$32,416
Bachelor's degree	$62,543	$2,393,637	17.39%	$416,150	7.96%	$190,534
Master's degree	$75,441	$2,820,038	3.05%	$85,923	0.88%	$24,678
Professional degree	$130,711	$4,886,069	0.37%	$18,096	0.07%	$3,616
Doctorate degree	$107,988	$4,036,667	0.30%	$11,941	0.05%	$2,199
			100.00%	$1,613,405	100.00%	$1,417,203

Gill and Foley

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Educational Attainment Level	Male FTYR Earnings	Lifetime Earnings	Assigned Probability GF Model	Expected Value	Assigned Probability GF Model Sign. Var. Only	Expected Value
9 to 12 years of education, no diploma	$25,558	$904,582	15.34%	$138,754	15.34%	$138,754
High school graduate (includes GED)	$35,121	$1,371,315	50.46%	$691,973	50.46%	$691,973
Some college, no degree	$42,193	$1,589,391	13.37%	$212,535	13.37%	$212,535
Associate degree	$44,706	$1,724,045	6.28%	$108,268	6.28%	$108,268
Bachelor's degree	$62,543	$2,393,637	12.92%	$309,222	12.92%	$309,222
Master's degree	$75,441	$2,820,038	1.26%	$35,583	1.26%	$35,583
Professional degree	$130,711	$4,886,069	0.21%	$10,360	0.21%	$10,360
Doctorate degree	$107,988	$4,036,667	0.16%	$6,301	0.16%	$6,301
			100.00%	$1,512,996	100.00%	$1,512,996