TABLE 3.5 Subsample from Koop and Tobias Data

Person	Education	Wage	Experience	Ability	Mother's education	Father's education	Siblings
1	13	1.82	1	1.00	12	12	1
2	15	2.14	4	1.50	12	12	1
3	10	1.56	1	−0.36	12	12	1
4	12	1.85	1	0.26	12	10	4
5	15	2.41	2	0.30	12	12	1
6	15	1.83	2	0.44	12	16	2
7	15	1.78	3	0.91	12	12	1
8	13	2.12	4	0.51	12	15	2
9	13	1.95	2	0.86	12	12	2
10	11	2.19	5	0.26	12	12	2
11	12	2.44	1	1.82	16	17	2
12	13	2.41	4	−1.30	13	12	5
13	12	2.07	3	−0.63	12	12	4
14	12	2.20	6	−0.36	10	12	2
15	12	2.12	3	0.28	10	12	3

Let $\mathbf{X}_1$ equal a constant, education, experience, and ability (the individual's own characteristics). Let $\mathbf{X}_2$ contain the mother's education, the father's education, and the number of siblings (the household characteristics). Let $\mathbf{y}$ be the wage.

a. Compute the least squares regression coefficients in the regression of $\mathbf{y}$ on $\mathbf{X}_1$. Report the coefficients.

b. Compute the least squares regression coefficients in the regression of $\mathbf{y}$ on $\mathbf{X}_1$ and $\mathbf{X}_2$. Report the coefficients.

c. Regress each of the three variables in $\mathbf{X}_2$ on all of the variables in $\mathbf{X}_1$. These new variables are $\mathbf{X}_2^*$. What are the sample means of these three variables? Explain the finding.

d. Using (3-26), compute the R^2 for the regression of $\mathbf{y}$ on $\mathbf{X}_1$ and $\mathbf{X}_2$. Repeat the computation for the case in which the constant term is omitted from $\mathbf{X}_1$. What happens to R^2?

e. Compute the adjusted R^2 for the full regression including the constant term. Interpret your result.

f. Referring to the result in part c, regress $\mathbf{y}$ on $\mathbf{X}_1$ and $\mathbf{X}_2^*$. How do your results compare to the results of the regression of $\mathbf{y}$ on $\mathbf{X}_1$ and $\mathbf{X}_2$? The comparison you are making is between the least squares coefficients when $\mathbf{y}$ is regressed on $\mathbf{X}_1$ and $\mathbf{M}_1\mathbf{X}_2$ and when $\mathbf{y}$ is regressed on $\mathbf{X}_1$ and $\mathbf{X}_2$. Derive the result theoretically. (Your numerical results should match the theory, of course.)