

15.6 Using the NLS panel data on $N = 716$ young women, we consider only years 1987 and 1988. We are interested in the relationship between $\ln(WAGE)$ and experience, its square, and indicator variables for living in the south and union membership. Some estimation results are in Table 15.10.

TABLE 15.10

Estimation Results for Exercise 15.6

	(1) OLS 1987	(2) OLS 1988	(3) FE	(4) FE Robust	(5) RE
C	0.9348 (0.2010)	0.8993 (0.2407)	1.5468 (0.2522)	1.5468 (0.2688)	1.1497 (0.1597)
$EXPER$	0.1270 (0.0295)	0.1265 (0.0323)	0.0575 (0.0330)	0.0575 (0.0328)	0.0986 (0.0220)
$EXPER^2$	-0.0033 (0.0011)	-0.0031 (0.0011)	-0.0012 (0.0011)	-0.0012 (0.0011)	-0.0023 (0.0007)
$SOUTH$	-0.2128 (0.0338)	-0.2384 (0.0344)	-0.3261 (0.1258)	-0.3261 (0.2495)	-0.2326 (0.0317)
$UNION$	0.1445 (0.0382)	0.1102 (0.0387)	0.0822 (0.0312)	0.0822 (0.0367)	0.1027 (0.0245)
N	716	716	1432	1432	1432

(standard errors in parentheses)

- a.** The OLS estimates of the $\ln(WAGE)$ model for each of the years 1987 and 1988 are reported in columns (1) and (2). How do the results compare? For these individual year estimations, what are you assuming about the regression parameter values across individuals (heterogeneity)?

The OLS results for 1987 and 1988 are very similar in signs and magnitudes, especially for $EXPER$, $EXPER^2$, $SOUTH$ and $UNION$. This suggests stable relationships across years.

However, by running separate OLS each year, we assume that all individuals share the same parameter values within each year and ignore unobserved individual heterogeneity. This can lead to biased estimates if such heterogeneity is correlated with the regressors.

b. The $\ln(\text{WAGE})$ equation specified as a panel data regression model is

$$\ln(\text{WAGE}_{it}) = \beta_1 + \beta_2 \text{EXPER}_{it} + \beta_3 \text{EXPER}_{it}^2 + \beta_4 \text{SOUTH}_{it} + \beta_5 \text{UNION}_{it} + (u_i + e_{it}) \quad (\text{XR15.6})$$

Explain any differences in assumptions between this model and the models in part (a).

The panel model allows for individual-specific effects u_i , capturing unobserved heterogeneity.

OLS in part (a) ignores these effects, assuming all individuals are identical apart from observed variables. *

c. Column (3) contains the estimated fixed effects model specified in part (b). Compare these estimates with the OLS estimates. Which coefficients, apart from the intercepts, show the most difference?

Compared to the OLS estimates, the fixed effects estimates in column (3) show the biggest differences in the coefficients for SOUTH and EXPER .

① SOUTH drops from around -0.121 (OLS) to -0.33 (FE), indicating the OLS may have underestimated the region wage gap

② EXPER falls from ~ 0.127 (OLS) to 0.057 (FE), suggesting upward bias in OLS due to unobserved individual traits correlated with experience. *

d. The F -statistic for the null hypothesis that there are no individual differences, equation (15.20), is 11.68. What are the degrees of freedom of the F -distribution if the null hypothesis (15.19) is true? What is the 1% level of significance critical value for the test? What do you conclude about the null hypothesis.

$$\text{Numerator df} = N - 1 = 716 - 1 = 715$$

$$\text{Denominator df} = NT - N - K_5 = 1432 - 716 - 5 = 711$$

$$1\% \text{ critical value for } F(715, 711) \approx 1.98$$

Since $F = 11.68 > 1.98$, we reject the null

\Rightarrow There are significant individual effects \Rightarrow fixed effects model is preferred. *

- e. Column (4) contains the fixed effects estimates with cluster-robust standard errors. In the context of this sample, explain the different assumptions you are making when you estimate with and without cluster-robust standard errors. Compare the standard errors with those in column (3). Which ones are substantially different? Are the robust ones larger or smaller?

Cluster-robust SEs (column 4) allow for serial correlation within individuals, unlike regular SEs (column 3), which assume i.i.d. errors. Robust SEs are larger, especially for SOUTH ($0.1258 \rightarrow 0.2495$), meaning inference may change. *