Problem Set 1

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Productivity Estimation

Question 1

Table 1: Summary Statistics for the Full Sample

	Mean	SD	Min	Perc. 25	Median	Perc. 75	Max	N
Log of Output	13.49	1.7	5.91	12.42	13.59	14.66	19.16	39,569
Log of Labor	5.00	1.0	0.62	4.33	5.01	5.68	8.86	39,569
Log of Investment	5.03	1.0	1.13	4.37	5.03	5.71	9.34	39,569
Log of Capital	8.99	1.9	2.09	7.99	9.29	10.29	14.57	39,569
Age of the firm	8.54	3.2	1.00	6.00	9.00	11.00	17.00	39,569

Table 2: Summary Statistics for the Balanced Sample

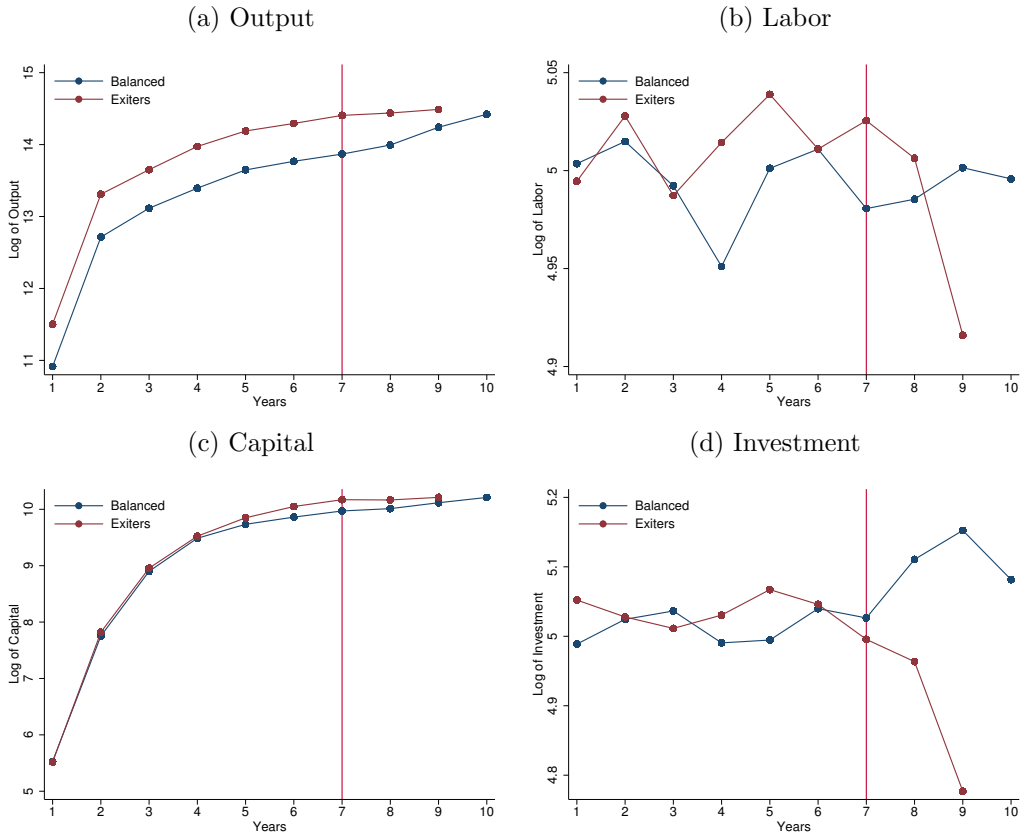
	Mean	SD	Min	Perc. 25	Median	Perc. 75	Max	N
Log of Output	13.41	1.7	5.91	12.36	13.52	14.57	18.87	21,800
Log of Labor	4.99	1.0	1.10	4.32	5.00	5.67	8.86	21,800
Log of Investment	5.04	1.0	1.13	4.37	5.04	5.73	9.34	21,800
Log of Capital	9.16	1.8	2.24	8.26	9.43	10.39	14.34	21,800
Age of the firm	7.32	3.2	1.00	5.00	7.00	10.00	16.00	21,800

Table 3: Summary Statistics for the Exiters Sample

	Mean	SD	Min	Perc. 25	Median	Perc. 75	Max	N
Log of Output	13.59	1.7	6.71	12.51	13.69	14.77	19.16	17,769
Log of Labor	5.01	1.0	0.62	4.34	5.01	5.69	8.60	17,769
Log of Investment	5.02	1.0	1.34	4.37	5.02	5.70	8.87	17,769
Log of Capital	8.78	1.9	2.09	7.66	9.11	10.15	14.57	17,769
Age of the firm	10.03	2.5	1.00	8.00	10.00	12.00	17.00	17,769

Firms that exit the market are, on average, 2.7 years older than the firms that stay in the market. As can be seen in Table 3, the differences in distribution suggests that firms that leave the market have less capital and investment, similar labor, and higher output.
The fact that exiting firms have higher output is puzzling. However, as can be seen in Figure 1, after

Figure 1: Time series by samples



Time series of average by year for both exiteres and firms that stay. Half of the exiters leave the market after year 7.

year three, exiter firms seem to have tried to compensate for a bad productivity draw by increasing labor and investment. However, this overspending drove them to leave the market.

Question 2

In order to estimate technology from a production function, we need the best possible estimates of the βs in the main regression because everything that we don't accurately account for in terms of labor, capital, and firm characteristics will go in the error which will ultimately be the estimate of technology. We expect the labor coefficient to be positively biased given the simultaneity between a flexible input and output. Regarding capital, we expect it to suffer from both attenuation bias and negative bias. First, because of capital measurement error. Second, because of selection, since we are focused solely on the firms that stay.

Suppose the errors in equation 1 can be rewritten as $\eta_{it} = \varepsilon_{it} + \eta_i$. If the unobserved time-invariant component η_i is not correlated with the regressors, estimates from the fixed-effects model are consistent but inefficient relative to estimates from the random-effects model. In this case, the results for the pooled, fixed, random, and between effects are shown in Table 4. As can be seen in column (1), it is the case that the coefficient of labor is larger than the standard 0.3 in the US literature. Likewise, capital seems less that then benchmark of 0.6.

In this case, the interpretation of sigma u in the coefficient table is the same for the fixed-effects and random-effects models. However, sigma u is a nuisance parameter when x is correlated with the

covariates.

Table 4: Total, Between, Within and Random Effects Estimators

	(1) Pooled	(2) Between	(3) Within	(4) Random Effects
Age of the firm	0.133***	0.128***	0.188***	0.133***
	(0.005)	(0.006)	(0.006)	(0.006)
Log of Capital	0.431***	0.555***	0.388***	0.421***
	(0.007)	(0.016)	(0.008)	(0.007)
Log of Labor	0.594***	0.613***	0.592***	0.594***
	(0.008)	(0.030)	(0.008)	(0.008)
Observations	21800	21800	21800	21800