Cross-Sectional Aggregation of Non-linear Models*

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Abstract

Tables.

Table 1(a): Estimates of Industrial Production Functions, (1956-1995)

Sectors	$\hat{\mu}_i$	$\hat{\alpha}_i$	$(1-\hat{\alpha}_i)$
Agriculture	0.0266 (2.34)	0.4276 (2.05)	0.5724 (–)
Mining	0.0185 (0.59)	0.5951 (2.48)	0.4049 (–)
Manufactures	0.0166 (2.70)	0.4948 (3.97)	0.5052 (–)
Energy	0.0309 (1.82)	0.1092 (0.36)	0.8908 (–)
Construction	0.0143 (1.82)	0.7454 (6.53)	0.2546 (–)
Transport	0.0263 (5.95)	0.5950 (3.65)	0.4050 (–)
Communications	0.0331 (4.44)	0.6327 (3.91)	0.3673 (–)
Other Services	0.0056 (0.56)	0.6451 (3.52)	0.3549 (–)
Average (Mean group estimate)	0.0215	0.5306	0.4694

Notes
Results relate to regression equations of the form

$$\Delta y_{it} = \mu_i + \alpha_i \Delta l_{it} + (1-\alpha_i)\Delta k_{it} + \varepsilon_{it},$$

for $i = 1, ..., 8$, and where t-statistics are provided in parentheses.

Table 1(b): Diagnostic Statistics for The Estimated Production Functions in Table 1(a)

Sectors	R^2	$\hat{\sigma}_i$	LLF_i	RR_i	q_i	SC_i	FF_i	RN_i	H_i
Agriculture	0.0999	0.0576	58.4266	5.2807	1	1.8571	5.5886	1.7777	1.6680
Mining	0.1390	0.1228	28.1578	1.8637	1	3.8204	0.2232	162.2353	0.1561
Manufactures	0.5435	0.0213	98.2887	0.1719	1	0.4427	0.0876	0.6902	0.4918
Energy	0.0034	0.0600	56.7965	0.1100	1	3.9271	0.1586	45.0702	0.8085
Construction	0.5284	0.0394	73.6196	0.5331	1	2.2092	1.5060	3.9545	0.3440
Transport	0.2598	0.0297	84.9039	2.2021	1	1.6748	3.2959	0.2750	0.0292
Communications	0.2865	0.0276	87.8917	6.5421	1	1.9919	4.9257	2.1829	5.8440
Other Services	0.2463	0.0240	93.4500	1.4193	1	5.0344	2.1355	1.6287	2.8302

Notes

Diagnostic statistics relate to the equations presented in Table 1(a). R^2 denotes the proportion of the variation in the growth in the output-capital ratio around its mean that is explained by the model; $\hat{\sigma}_i$ is the estimated standard error of the regression; LLF_i is the value of the log-likelihood; RR_i is the test of the q_i restriction(s) imposed on the regression (cf. $F(1,38)$); SC_i is the LM test of first-order serial correlation in the residuals (cf. $\chi^2(1)$); FF_i tests the functional form of the regression (cf. $\chi^2(1)$); RN_i tests the normality of the residuals (cf. $\chi^2(2)$); and H_i tests the presence of heteroskedasticity in the residuals (cf. $\chi^2(1)$).

Table 2(a): Estimates of Industrial Production Functions (Including Productivity Dummies, 1956-1995)

Sectors	$\hat{\mu}_i$	$\hat{\alpha}_i$	$(1-\hat{\alpha}_i)$	$\hat{\beta}^E_{1i}$	$\hat{\beta}^E_{2i}$	$\hat{\beta}^E_{3i}$	$\hat{\beta}^W_{1i}$	$\hat{\beta}^W_{2i}$	$\hat{\beta}^W_{3i}$	$\hat{\beta}^O_{1i}$	$\hat{\beta}^O_{2i}$
Agriculture	0.0275 (3.20)	0.4572 (2.89)	0.5428 (–)	–	–	–	−0.0812 (−2.29)	−0.1386 (−3.89)	0.1241 (4.01)	–	–
Mining	0.0033 (0.29)	0.4470 (5.07)	0.5530 (–)	−0.1257 (−3.97)	−0.1126 (−3.58)	−0.4758 (−15.14)	–	–	–	–	–
Manufactures	0.0165 (2.81)	0.4929 (4.13)	0.5071 (–)	–	–	−0.0304 (−2.11)	–	–	–	–	–
Energy	0.0285 (2.67)	0.0576 (0.30)	0.9424 (–)	–	–	−0.2052 (−7.68)	–	–	–	–	–
Construction	0.0171 (2.57)	0.6937 (7.15)	0.3063 (–)	–	–	–	–	–	–	−0.1294 (−3.83)	−0.0703 (−2.11)
Transport	0.0275 (5.67)	0.5682 (3.62)	0.4318 (–)	–	–	–	–	–	–	–	−0.0601 (−2.08)
Communications	0.0331 (4.44)	0.6327 (3.91)	0.3673 (–)	–	–	–	–	–	–	–	–
Other Services	0.0083 (0.87)	0.6737 (3.86)	0.3263 (–)	–	–	–	–	–	–	–	−0.0515 (−2.22)
Average (Mean group estimtes)	0.0202	0.5029	0.4971	−0.0157	−0.0141	−0.0889	−0.0102	−0.0173	0.0155	−0.0162	−0.0227

Notes
Results relate to equations of the form

$$\Delta y_{it} = \mu_i + \alpha_i \Delta l_{it} + (1-\alpha_i)\Delta k_{it} + \sum_{j=1}^{3} \beta^E_{ji} \Delta d^E_{jt} + \sum_{j=1}^{3} \beta^W_{ji} \Delta d^W_{jt} + \sum_{j=1}^{2} \beta^O_{ji} \Delta d^O_{jt} + \varepsilon_{it},$$

$i = 1, ..., 8$, where the dummy variables, d^J_{jt}, are defined in (5.6) in the text. t-statistics are provided in parentheses.

Table 2(b): Diagnostic Statistics for the Estimated Industrial Production Functions in Table 2(a)

Sectors	R_i^2	$\hat{\sigma}_i$	LLF_i	RR_i	q_i	SC_i	FF_i	RN_i	H_i	$\tilde{R}_i^2$
Agriculture	0.5268	0.0435	71.2867	14.6441	5	0.3584	0.5629	1.6335	0.3588	0.9427
Mining	0.8964	0.0444	70.5111	6.2127	5	0.0073	1.7591	56.4326	0.0230	0.8448
Manufactures	0.3692	0.0204	100.5560	6.7138	7	2.9984	0.0965	0.5495	0.7003	0.9503
Energy	0.6156	0.0378	75.8493	4.4246	7	0.5674	0.3999	3.0886	0.3557	0.9633
Construction	0.6911	0.0328	82.0869	2.0863	6	0.0053	4.5784	0.6423	0.0612	0.8805
Transport	0.3370	0.0285	87.1056	9.5831	7	2.6287	4.2973	0.2077	0.1357	0.9550
Communications	0.2865	0.0276	87.8917	14.2207	8	1.9919	4.9257	2.1829	5.8440	0.8769
Other Services	0.3349	0.0229	95.9498	9.3691	7	6.3481	2.1926	1.8472	3.1937	0.9714

Notes
Diagnostic statistics relate to the equations presented in Table 2(a). See also notes to Table 1(b).

Table 3(a): Estimates of Aggregate Production Functions (with and without productivity dummies, 1956-1995)

	$\hat{\mu}$	$\hat{\alpha}$	$(1-\hat{\alpha})$	$\hat{\beta}_1^E$	$\hat{\beta}_2^E$	$\hat{\beta}_3^E$	$\hat{\beta}_1^W$	$\hat{\beta}_2^W$	$\hat{\beta}_1^O$	$\hat{\beta}_2^O$	$\hat{\gamma}$
Model 1	0.0206	0.6654	0.3346	–	–	–	–	–	–	–	–
	(3.58)	(4.56)	(–)								
Model 2	0.0217	0.6094	0.3906	−0.0102	0.0405	0.0166	0.0144	−0.0190	−0.0824	−0.0382	–
	(4.00)	(4.38)	(–)	(−0.83)	(−1.32)	(0.67)	(0.84)	(−1.58)	(−2.30)	(−2.22)	
Model 3	0.0184	0.4588	0.5412	–	–	–	–	–	–	–	−3.0997
	(2.51)	(1.01)	(–)								(−0.48)
Model 4	0.0169	0.1570	0.8430	−0.0134	0.0441	0.0207	0.0157	−0.0163	−0.0883	−0.0411	−6.6348
	(2.42)	(0.35)	(–)	(−1.06)	(1.43)	(0.83)	(0.90)	(1.33)	(−2.48)	(−2.37)	(−1.07)
Model 5	0.0216	0.6375	0.3625	–	–	–	–	–	−0.0405	−0.0370	–
	(4.11)	(4.78)	(–)						(−2.33)	(−2.14)	

Notes
Results relate to equations of the form

$$\Delta y_t = \mu + \alpha \Delta l_t + (1-\alpha)\Delta k_t + \sum_{j=1}^{3} \beta_j^E \Delta d_{jt}^E + \sum_{j=1}^{2} \beta_j^W \Delta d_{jt}^W + \sum_{j=1}^{2} \beta_j^O \Delta d_{jt}^O + \gamma(\Delta l_t - \Delta k_t)^2 + v_t,$$

where the dummy variables, d_{jt}^E, $j = 1, 2, 3$ and d_{jt}^W, $j = 1, 2$ are defined in (5.6) in the text. t-statistics are provided in parentheses.

Table 3(b): Diagnostic Statistics for the Aggregate Production Functions in Table 3(b)

	R^2	$\hat{\sigma}$	LLF	RR	q	SC	FF	N	H
Model 1	0.3534	0.0188	103.3086	14.5264	9	5.4976	0.9408	0.9638	0.5399
Model 2	0.5713	0.0169	111.5268	1.5810	2	9.2436	0.0547	0.0691	0.3925
Model 3	0.3574	0.0190	103.4334	14.3670	8	5.2719	1.7190	0.8338	0.8230
Model 4	0.5871	0.0169	112.2761	0.1143	1	10.6671	0.2234	0.0816	0.5568
Model 5	0.4912	0.0171	108.0995	7.6320	7	5.4794	0.1469	0.8702	0.0021

Notes
See also notes to Table 2(b).