Graduation Rates and Accountability: Regressions Versus Production Frontiers

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The table of results in Appendix 2 that appeared in the original online and print versions of this paper contains an error. The final four columns of Appendix 2 report the input slacks. Our frontier model was output-oriented and both the technical efficiency scores and input slacks were calculated in that framework. Yet the slacks that we put in the table came from an input-oriented calculation. This was simply a clerical error on our part in the production of the final table. When we referred to the slacks in the paper, we were using the correct numbers that appear in this erratum. Thus the error in the printed table has no effect on our conclusions or our methodology.

A casual perusal of the two sets of slacks shows that they are not the same, and in a small numbers of cases the differences are substantial. An output-oriented efficiency measure reports how much output could be increased without altering input quantities used by projecting an inefficient firm to the frontier. An input-oriented efficiency measure reports how much inputs could be proportionately reduced without affecting output. Using Fig. 2, output-oriented DEA projects up from inefficient firms 4, 5, 6, and 7 vertically to the frontier. Thus there is a significant amount of input slack for firm 7. On the other hand, input-oriented DEA would project horizontally leftward back to the frontier. In this case there is no input slack for any of the four inefficient examples. This accounts for why slack measures can differ and reinforces why context is important in interpreting the input slack.

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Appendix

Appendix 2 Table of results

Rank		School	Resid.	TE	Input slacks			
DEA	RES				SAT	Top10	Full	Cost
1	8	Auburn Univ.	0.555	1	0	0	0	0
1	13	Bowling Green State Univ.	0.485	1	0	0	0	0
1	5	Brown Univ.	0.830	1	0	0	0	0
1	51	Florida State Univ.	0.195	1	0	0	0	0
1	4	Fordham Univ.	0.840	1	0	0	0	0
1	1	Harvard Univ.	1.374	1	0	0	0	0
1	10	Howard Univ.	0.500	1	0	0	0	0
1	34	Illinois State Univ.	0.268	1	0	0	0	0
1	84	Indiana State Univ.	0.049	1	0	0	0	0
1	20	Indiana Univ.—Bloomington	0.390	1	0	0	0	0
1	68	Johns Hopkins Univ.	0.109	1	0	0	0	0
1	107	Louisiana State Univ.—Baton Rouge	−0.053	1	0	0	0	0
1	56	Louisiana Tech Univ.	0.170	1	0	0	0	0
1	72	Mississippi State Univ.	0.090	1	0	0	0	0
1	73	New School Univ.	0.086	1	0	0	0	0
1	121	Oklahoma State Univ.	−0.133	1	0	0	0	0
1	15	Pace Univ.	0.433	1	0	0	0	0
1	19	Pennsylvania State Univ.	0.396	1	0	0	0	0
1	2	St. John's Univ.	0.879	1	0	0	0	0
1	33	SUNY—Albany	0.274	1	0	0	0	0
1	16	Syracuse Univ.	0.431	1	0	0	0	0
1	118	Texas A&M Univ.—Commerce	−0.112	1	0	0	0	0
1	76	Univ. of Akron	0.074	1	0	0	0	0
1	35	Univ. of California—Davis	0.266	1	0	0	0	0
1	54	Univ. of California—Irvine	0.181	1	0	0	0	0
1	57	Univ. of Colorado—Denver	0.167	1	0	0	0	0
1	113	Univ. of Georgia	−0.083	1	0	0	0	0
1	40	Univ. of Illinois—Urbana-Champagne	0.243	1	0	0	0	0
1	131	Univ. of Louisville	−0.165	1	0	0	0	0
1	95	Univ. of Missouri—St. Louis	−0.013	1	0	0	0	0
1	14	Univ. of New Hampshire	0.433	1	0	0	0	0
1	6	Univ. of Notre Dame	0.825	1	0	0	0	0
1	55	Univ. of Vermont	0.172	1	0	0	0	0
1	3	Univ. of Virginia	0.843	1	0	0	0	0
1	101	Univ. of Wisconsin—Milwaukee	−0.032	1	0	0	0	0
36	27	Clemson Univ.	0.330	0.999	11	0	0	0
36	58	Univ. of California—Riverside	0.148	0.999	0	0.459	0.066	0
36	87	Univ. of Northern Colorado	0.029	0.999	0	0	0.104	0
39	24	Univ. of Wisconsin—Madison	0.366	0.995	0	0	0.040	0

Appendix 2 continued

Rank	School		Resid.	TE	Input slacks			
					SAT	Top10	Full	Cost
DEA	RES							
39	53	Miami Univ.—Oxford	0.182	0.995	41	0	0.136	0
41	39	Tufts Univ.	0.243	0.994	24	0	0.061	0
42	9	Georgetown Univ.	0.520	0.992	0	0	0.021	0
42	52	Ohio Univ.	0.186	0.992	10	0	0.032	0
44	32	Lehigh Univ.	0.282	0.991	0	0	0	1194
45	11	College of William and Mary	0.494	0.989	6	0	0.043	0
46	21	Yale Univ.	0.387	0.987	0	0.057	0.074	17515
47	12	Northwestern Univ.	0.489	0.985	0	0.026	0	2945
48	17	Pepperdine Univ.	0.412	0.984	0	0.183	0	4730
49	31	Univ. of Michigan—Ann Arbor	0.291	0.981	0	0	0.086	0
50	25	Seton Hall Univ.	0.356	0.980	0	0	0	2687
50	46	Virginia Tech	0.222	0.980	0	0	0.045	0
52	41	Dartmouth Univ.	0.239	0.979	0	0	0.078	14571
53	7	Univ. of Missouri—Kansas City	0.578	0.976	0	0.008	0	710
53	30	Univ. of Delaware	0.313	0.976	0	0	0.079	2130
55	23	Stanford Univ.	0.371	0.975	0	0.009	0	2113
56	22	Michigan State Univ.	0.376	0.973	0	0	0	0
56	43	DePaul Univ.	0.227	0.973	17	0	0	0
58	29	Duquesne Univ.	0.319	0.972	0	0.123	0	0
59	82	Colorado State Univ.	0.057	0.970	66	0	0	0
60	28	Columbia Univ.	0.320	0.969	0	0.027	0.003	0
61	143	Wake Forest Univ.	−0.237	0.968	0	0	0.057	15509
62	70	Univ. of California—Los Angeles	0.098	0.967	0	0.131	0.013	0
63	59	Univ. of Pennsylvania	0.134	0.964	0	0.048	0	7321
64	26	Univ. of Connecticut	0.342	0.963	0	0	0.021	0
65	36	Marquette Univ.	0.257	0.961	5	0	0.123	0
65	65	Duke Univ.	0.121	0.961	0	0.034	0.048	0
67	127	Univ. of Houston	−0.152	0.960	0	0.042	0	0
68	71	Univ. of North Carolina—Chapel Hill	0.097	0.958	0	0	0.016	0
68	96	Univ. of California—Santa Barbara	−0.016	0.958	0	0.234	0.034	0
70	120	Washington Univ. in St. Louis	−0.130	0.954	0	0	0	16540
71	18	Univ. of Denver	0.410	0.952	0	0.004	0	0
71	135	Univ. of Chicago	−0.170	0.952	0	0	0.022	4288
73	145	Massachusetts Inst. of Technology	−0.245	0.948	30	0.067	0.099	0
74	60	SUNY—Binghamton	0.134	0.945	0	0	0.106	0
75	112	Univ. of California—San Diego	−0.081	0.944	0	0.117	0.018	0
76	42	West Virginia Univ.	0.232	0.942	0	0.031	0.012	0
76	115	Rensselaer Polytechnic Institute	−0.098	0.942	6	0	0.059	0
78	45	Univ. of South Carolina—Columbia	0.223	0.940	0	0.065	0	0
78	119	Univ. of Central Florida	−0.113	0.940	61	0	0	0
80	63	Univ. of the Pacific	0.127	0.935	0	0	0.086	0
80	77	Texas A&M Univ.—College Station	0.069	0.935	0	0	0.104	0

Appendix 2 continued

Rank		School	Resid.	TE	Input slacks			
DEA	RES				SAT	Top10	Full	Cost
82	141	Rice Univ.	−0.232	0.934	0	0.006	0.025	0
82	147	Brandeis Univ.	−0.265	0.934	0	0	0.067	0
82	153	Vanderbilt Univ.	−0.284	0.934	32	0	0.070	0
85	90	Univ. of Southern California	0.018	0.933	0	0	0.034	0
86	105	North Dakota State Univ.	−0.047	0.931	0	0	0.103	0
87	74	Univ. of Massachusetts—Amherst	0.083	0.929	0	0	0.005	0
88	75	Univ. of San Francisco	0.083	0.925	3	0	0	0
89	104	Univ. of New Mexico	−0.041	0.924	0	0.004	0	0
90	149	Emory Univ.	−0.271	0.923	0	0.032	0	5466
91	50	Univ. of South Dakota	0.198	0.917	0	0	0	0
92	47	Purdue Univ.—West Lafayette	0.205	0.916	0	0	0.094	0
93	126	Univ. of California—Berkeley	−0.148	0.915	0	0.144	0.035	0
94	81	Univ. of Iowa	0.059	0.914	11	0	0	0
94	99	Univ. of Florida	−0.030	0.914	0	0	0.068	0
96	78	Univ. of Washington	0.062	0.913	0	0	0.142	0
97	80	George Washington Univ.	0.059	0.909	16	0	0	0
98	151	Worcester Polytechnic Institute	−0.282	0.908	9	0	0.024	0
98	186	California Institute of Technology	−0.905	0.908	20	0.100	0.114	17759
100	83	Univ. of Oregon	0.054	0.905	0	0	0.032	0
101	44	Western Michigan Univ.	0.223	0.902	0	0	0	0
101	86	Iowa State Univ.	0.039	0.902	0	0	0.032	0
103	69	Northern Illinois Univ.	0.105	0.899	0	0	0	0
103	88	American Univ.	0.025	0.899	30	0	0.109	1369
105	116	Univ. of Texas—Austin	−0.108	0.898	0	0	0	0
106	48	Univ. of Alabama	0.203	0.896	0	0	0.010	0
107	166	New York Univ.	−0.388	0.893	17	0	0	0
108	64	Loyola Univ. Chicago	0.121	0.889	0	0	0.023	6154
108	109	Kent State Univ.	−0.062	0.889	0	0	0.007	0
110	181	Univ. of Rochester	−0.568	0.888	1	0	0.045	2652
111	38	St. Louis Univ.	0.245	0.887	3	0	0	0
112	117	Univ. of San Diego	−0.109	0.886	0	0	0.105	0
113	183	Carnegie Mellon Univ.	−0.654	0.884	0	0	0.056	0
114	124	Baylor Univ.	−0.144	0.882	0	0	0.191	0
115	100	Clark Univ.	−0.031	0.881	0	0	0.116	2492
115	144	Univ. of Montana	−0.238	0.881	0	0	0.129	0
117	138	Univ. of Texas—Dallas	−0.203	0.880	39	0	0	0
118	123	Univ. of Maryland—College Park	−0.144	0.878	0	0	0.020	0
119	62	Univ. of Maine—Orono	0.127	0.876	0	0	0	0
119	171	Tulane Univ.	−0.428	0.876	43	0	0.021	0
121	125	Hofstra Univ.	−0.144	0.873	0	0	0	3328
122	66	Univ. of Toledo	0.112	0.872	0	0	0	0
123	91	Univ. of Nebraska—Lincoln	0.016	0.871	22	0	0	0

Appendix 2 continued

Rank		School	Resid.	TE	Input slacks			
DEA	RES				SAT	Top10	Full	Cost
124	140	Univ. of Southern Mississippi	−0.227	0.870	0	0.161	0.003	0
124	173	Case Western Reserve Univ.	−0.454	0.870	47	0	0	0
126	98	Univ. of Pittsburgh	−0.024	0.865	0	0	0.052	0
127	178	Boston Univ.	−0.493	0.865	0	0	0.009	495
128	177	Clarkson Univ.	−0.490	0.864	20	0	0.085	4274
129	103	Catholic Univ. of America	−0.037	0.861	0	0	0.055	1374
130	165	Brigham-Young Univ.—Provo	−0.371	0.859	0	0	0.029	0
131	61	Univ. of North Carolina—Greensboro	0.131	0.858	0	0	0	0
132	97	Washington State Univ.	−0.019	0.856	0	0	0.028	0
133	146	Univ. of Maryland—Baltimore County	−0.257	0.855	36	0	0.001	0
134	85	Oregon State Univ.	0.043	0.854	0	0	0.027	0
135	94	Northeastern Univ.	−0.013	0.848	0	0	0	1016
136	160	Univ. of Miami	−0.322	0.846	0	0	0.144	1578
137	155	Stevens Institute of Technology	−0.296	0.844	41	0.166	0	0
138	67	Univ. of Rhode Island	0.112	0.842	0	0	0	0
139	169	Univ. of Missouri—Columbia	−0.401	0.841	51	0	0.167	0
140	110	Ohio State Univ.—Columbus	−0.067	0.837	0	0	0.134	0
140	176	Illinois Institute of Technology	−0.487	0.837	109	0.260	0	0
142	158	Texas Christian Univ.	−0.305	0.836	0	0	0.150	3590
143	37	Andrews Univ.	0.253	0.828	0	0	0.038	3624
144	106	Univ. of Tennessee—Knoxville	−0.047	0.825	0	0	0.029	0
145	79	Univ. of Idaho	0.062	0.819	0	0	0	0
145	179	Univ. of California—Santa Cruz	−0.535	0.819	0	0.080	0.022	0
147	130	Wichita State Univ.	−0.162	0.818	0	0	0	77
147	133	North Carolina State Univ.—Raleigh	−0.167	0.818	0	0	0	0
149	92	Univ. of Wyoming	−0.006	0.816	0	0	0.021	0
150	49	Temple Univ.	0.200	0.809	0	0	0	1093
150	93	Northern Arizona Univ.	−0.012	0.809	0	0.010	0	0
152	111	Univ. of Kansas	−0.079	0.807	0	0	0.024	0
153	134	Univ. of Mississippi	−0.169	0.804	0	0.014	0.018	0
154	142	Univ. of Kentucky	−0.235	0.801	0	0	0.089	0
155	89	Univ. of Utah	0.025	0.799	0	0	0	0
156	136	Univ. of Oklahoma	−0.181	0.794	0	0	0	0
157	154	SUNY—Buffalo	−0.291	0.792	0	0	0	2105
158	162	Univ. of Alabama—Huntsville	−0.326	0.791	0	0.062	0	0
159	108	Old Dominion Univ.	−0.059	0.790	0	0.032	0	0
160	150	Drexel Univ.	−0.277	0.789	0	0	0	1423
161	161	Montana State Univ.	−0.325	0.788	0	0	0.094	0
162	122	Nova Southeastern Univ.	−0.133	0.779	0	0.007	0	0
163	129	Texas Tech Univ.	−0.161	0.774	0	0	0.041	0
164	132	Florida Institute of Technology	−0.167	0.765	0	0	0	0
165	182	Michigan Technological Univ.	−0.577	0.762	6	0	0.172	0

Appendix 2 continued

Rank		School	Resid.	TE	Input slacks			
DEA	RES				SAT	Top10	Full	Cost
166	114	Ball State Univ.	−0.085	0.759	0	0	0.071	1648
166	159	SUNY—Stony Brook	−0.307	0.759	0	0	0.070	1452
168	102	Virginia Commonwealth Univ.	−0.037	0.758	0	0	0	0
169	152	Univ. of Arizona	−0.284	0.755	0	0	0.019	0
170	139	Middle Tennessee State Univ.	−0.217	0.744	0	0	0	0
171	137	Univ. of South Florida	−0.184	0.736	0	0.065	0	0
171	148	Univ. of North Texas	−0.269	0.736	0	0.027	0	0
173	163	Univ. of Hawaii—Manoa	−0.366	0.726	0	0	0.073	0
174	157	Arizona State Univ.	−0.303	0.719	0	0.012	0	0
175	156	Southern Illinois Univ.—Carbondale	−0.302	0.712	0	0	0.012	29
176	164	Univ. of North Dakota	−0.371	0.706	0	0	0.111	442
177	187	Univ. of Missouri—Rolla	−1.126	0.702	40	0	0.025	0
178	175	Univ. of Arkansas—Fayetteville	−0.475	0.701	0	0.005	0	0
179	172	Univ. of Minnesota—Twin Cities	−0.441	0.700	0	0	0.062	1671
180	170	Indiana Univ. of Pennsylvania	−0.412	0.693	0	0	0.122	0
181	128	Wright State Univ.	−0.157	0.681	0	0	0.009	0
182	185	Univ. of Tulsa	−0.860	0.679	0	0	0.123	510
183	184	Polytechnic Univ.	−0.675	0.676	0	0.023	0	5463
184	168	New Jersey Institute of Technology	−0.398	0.667	0	0	0	0
185	167	Univ. of Texas—Arlington	−0.392	0.660	0	0.030	0	0
186	180	Univ. of Illinois—Chicago	−0.545	0.647	0	0	0.087	0
187	174	Univ. of Alabama—Birmingham	−0.469	0.564	0	0	0.007	0