Data and Regressions Results for Building Efficiency Rates

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1. The Data

The data set comprises information on 66 tall buildings constructed from approximately 1955 to the present. The variables include data on gross floor area (square feet), number of floors, the city, the year completed and the efficiency rate (100*Net Floor Area/Gross Building Area). Note the buildings from the Los Angeles in the 1950s were given a year of 1955 because specific years were not given in the source.

There are the sources for the data:

- Ayşin, S.E.V. and Özgen, A., 2009. Space efficiency in high-rise office buildings. *Metu Jfa*, *2*.
- A PhD dissertation circa 1975 on the economics of tall buildings in Los Angeles. I had photocopied it and have it somewhere in my house, but I can't find it now—it's lost among my stacks of papers. If you really want to see it, email me and I'll try to dig it up.
- Kim, H.I., 2004. *Space efficiency in mixed-use high-rise building* (Doctoral dissertation, Illinois Institute of Technology).
- An extra data point was taken from Watts, S., Kalita, N. and Maclean, M., 2007. The economics of super-tall towers. *The structural Design of tall and special buildings*, *16*(4), pp.457-470.

2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Efficiency Rate	67	74.8831	6.860928	60	86.41879
Floors	67	39.08955	34.76097	8	143
Year	67	1972.896	20.98747	1954.5	2008
GFA (m. sq ft)	67	1.065619	1.190937	.018	5.274311
Office	66	.8484848	.3612978	0	1
Mixed Use	66	.1515152	.3612978	0	1
Asia	67	.1641791	.3732338	0	1
Europe	67	.1641791	.3732338	0	1
U.S.	67	.6716418	.4731602	0	1

3. Regression Results

	(1)	(2)	(3)	(4)	(5)
floors_10	0.130	-0.150	-1.961	-2.266	-0.938
	(0.45)	(-0.24)	(-3.72)*	(-3.06)*	(-1.73)
Year	-0.183	-0.184	-0.129	0.104	0.0570
	(-9.15)**	(-6.88)**	(-3.96)*	(5.39)**	(1.40)
GFA_mill		0.884	3.783	4.081	
		(0.52)	(3.14)*	(4.45)**	
office			-11.11	-6.576	-3.932
			(-3.34)*	(-2.23)	(-3.03)*
Asia				-8.186	-8.658
				(-2.60)	(-4.45)**
Europe				-11.04	-10.39
				(-8.55)**	(-4.90)**
lnGFA					1.091
					(1.51)
_cons	435.5	437.0	343.4	-117.5	-41.66
	(11.08)***	(8.31)**	(5.43)**	(-3.03)*	(-0.48)
N	67	67	66	66	66
R-sq	0.263	0.267	0.431	0.490	0.445
adj. R-sq	0.240	0.232	0.394	0.439	0.388
AIC	430.7	430.4	405.6	398.3	404.0
BIC	435.1	434.8	410.0	402.7	408.4

Dep. Var. Efficiency Rate (%). Robust t statistics in parentheses—clustered by continent. * p<.1, ** p<.05, *** p<.01.

Equation (1) regresses building efficiency on floors and year of construction. Equation (2) adds the gross square footage (in millions of square feet). Equation (3) adds an office dummy (mixed use is the omitted building type). Equation (4) adds regional dummies (the U.S. is the omitted group). Finally, Equation (5) is the same as (4) but include the log of gross floor area rather than in levels. In short, specification (4) appears to be the best one. Equations (1) – (3) seem to suffer from omitted variable bias. And Equation (5) has a higher AIC and BIC and lnGFA is not statistically significant. Equation (4) shows that for every 10 floors taller, holding GFA constant, reduces efficiency by 2.27 percentage points, on average. But the year coefficient estimate suggests an annual average increase in efficiency of 0.1 percentage point. As expected, wider buildings, holding floor count constant, increase efficiency. Offices as well appear less efficient then their mixed-use counterparts. Asian and European buildings appear less efficient than their U.S. counterparts. Why this might be is left for future research.