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Private Philanthropy in Financing Public Universities: Fundraising Stochastic Frontier and Efficiency Evaluations

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Abstract

This study provides stochastic frontier analyses of private philanthropy in financing public universities in the United States. Panel data estimates of private giving –fundraising production frontiers and inefficiency effects are provided for an aggregate of 353 universities and separately for research intensive, doctoral granting, and master level institutions over the 2006-09 academic years. Inefficiency effects are modelled as set of university specific covariates, including medical schools, hospitals, executive employment and a time trend to capture potential effects of the global financial crisis on university fundraising efficiency. Efficiency scores are estimated across university levels and indicate that mean efficiencies range from 53% to 27% for research compared to master level universities. Medical school presence represents a fundraising advantage. Faculty productivity is positive among research and doctoral universities. University executives produce efficiency improvements but only in doctoral granting universities. Some evidence of crowding out exists and suggests government funding reduces private philanthropy. The findings suggest recession induced declines in private giving may have been lessened as a result of university wide fundraising efficiency improvements. Although data improvements are needed, the paper is believed to be the first to offer the rigor of frontier analysis in evaluating fundraising production and efficiencies and should be of interest to university and public policy decision-makers.

Keywords: Private Philanthropy, Fundraising, Universities, Private Giving, Stochastic Frontier, Efficiency, Higher Education Finance

1. Introduction

This paper estimates fund raising production frontiers and operating efficiencies for public universities in the United States. The fundraising pertains to the efforts of universities in generating financing through private philanthropy. Facing continuous declines in state appropriated tax dollars as a systematic funding source has forced public universities into an increased financial dependence on private giving. Although the share of annual university budgets provided by state appropriations has been on a slow decline for decades (e.g., Speck, 2010), the fiscal challenges induced by the global financial crisis has brought a new round of reductions in state support for nearly all of higher education. Reports indicate that even if states economies return to normal levels, increased interest in public management reforms and growing demands for other public goods production will likely put higher education at a continued state assisted disadvantage. Recent spending cuts among forty-one states have ranged from one to forty percent with a third of states cutting support by more than ten percent (Center for the Study of Higher Education, 2012). Moreover, with public universities operating under mandates to increase constituent access to higher education, governing boards and

legislative rulings have prevented universities from increasing tuition charges as full offsets to state funding reductions. However, not all public universities are equal in the private philanthropy market; private fundraising abilities and efficiencies differ across universities. As increased tax appropriated support remains problematic, most universities will have to seek ways of improving their fundraising efficiencies. At the same time, state appropriated funding decisions should be based, in part, on fundraising differences, especially if those differences are due to university characteristics legislated according to university founding charters and continuing legislative constraints. Among other things, state universities are not free to create medical schools, graduate programs, and research institutes, all of which can affect a university's production and efficiency of fundraising.

It is the purpose of this paper to estimate how those private fundraising production and efficiencies might differ across universities. Stochastic production frontiers are estimated for a balanced panel of 353 public universities operating over three academic years, 2006-09. After investigating frontier estimation for the complete sample, the focus turns to separate estimates for three classifications of universities: research intensive, doctoral granting, and master level universities. An advantage offered by the stochastic frontier analysis rests with the composed error. Part of the error captures changes in private fundraising due to luck and events beyond the control of the university and part represents the university's fundraising inefficiency. Moreover, inefficiencies are modeled as a function of university specific factors. University executive employment enters both the production and inefficiency specifications. Since the academic years cover the financial crisis, a time trend is used to examine the recessionary effects on both private giving and university inefficiencies. The frontier estimates are used to provide efficiency scores across university levels. A literature survey indicates that the paper is the first of its kind to provide the rigor of private fundraising efficiency evaluations offered by stochastic frontier analysis and, therefore, is believed to be of interest to university and public policy decision-makers alike.

The next section of the paper provides a review of the applied body of related literature. That is followed by a section devoted to the research methodology, including the stochastic frontier analysis, the data, and the empirical model specification and a section presenting the empirical estimates for the production frontier, inefficiency effects, and efficiency scores. The paper ends with a brief summary and some concluding remarks.

2. Previous Applied Research

There are two strands of literature relevant to the current inquiry. The first pertains to nonprofit institutional fundraising with a specific focus on higher education. The second involves the use of stochastic frontier analysis in the evaluation of higher education operating efficiencies.

Much of the nonprofit fundraising literature has focused on how charitable organizations spend contributions on management and administration. The Center On Nonprofits and Philanthropy (2004) suggests an efficiency measure that is based on a comparison of fundraising expenditures to fundraising contributions. The notion is that organizations should spend in the range of 25 to 50 percent of contributions on fund raising. Based on a comparison across different sectors of the economy, the Center's study indicates that the education sector spends an average $0.24 of contributions on fundraising and is the least efficient sector relative to human services, the arts, and the health sectors of the economy. However, Hager et al. (2001) offer caution in attempting to apply uniform efficiency standards to all types of nonprofit organizations and report that larger nonprofits and younger nonprofit organizations tend to be more efficient relative to smaller and older organizations. Evaluations of fundraising efficiencies have been conducted using nonparametric methods, including data envelopment analysis. Medina-Borja and Triantis (2011) examine fundraising efficiencies for 960 United States social service nonprofits and report an overall mean financial efficiency of 41%.

Studies have also examined fundraising and private giving in higher education. Harrison et al. (1995) find a positive relationship between development expenditures and private donations for eighteen public and private universities. They find that public vs. private university ownership, i.e.,

control, does not matter and that athletic programs have no significant impact on alumni giving. Athletics and private giving have also been studied by others. For example, Turner, et al. (2001) use micro data from fifteen selective private colleges and universities and find that football winning percentages do not influence private giving at prestigious, high-profile institutions but a modest positive effect exists at lower level colleges or universities. Ehrenberg and Smith (2003) also study selective private universities and colleges but focus on research classified institutions. They find that endowments are critical and that richer universities by that measure spend larger proportions of annual giving on building yet larger endowments. While these studies concentrate exclusively on external giving, Agypt et al. (2012) study university employee giving. Their study centers on a single public university and suggests that length of employee service is a weak predictor of giving. In addition, they find that among faculty, the combination of promotion and tenure reduce giving, but promotion while tenured increases employee giving.

Research has also raised the paradoxical question of crowding out and investigated the extent to which private fundraising can result in reduced government funding and financial support. As applied to higher education, Peltzman's (1973) was first to begin this line of inquiry in positing a "political substitution" effect that causes legislators to negatively react to increased private donations by reducing government appropriated support. His state level data for 1967 suggests that a private dollar of educational support reduces government funding by 45 cents. Evidence of this "free riding" was also presented by Becker and Lindsay (1994). Using institutional level instead of state level data, they find that a dollar of private university fundraising reduces government funding by the same dollar, i.e., 100% crowding out. Counter to this, Payne's (2001) sample of research universities indicates some crowding-in so that private donors add 65 cents per dollar of federal research support. More recent evidence indicates a diminished rate of crowding out. Using 2006 institutional level data, Sav (2012 a) finds that the average rate of crowding out among public universities is on the order of 43%.

None of the above studies offer evidence as to the performance of universities from the perspective of their fundraising efficiency. The evaluations of the type provided by the Center On Nonprofits and Philanthropy (2004) are useful in relying on accounting data but apply to the aggregate education sector of the economy. The institutional level studies noted, on the other hand, offer insights into the determinants of successful fundraising efforts but fail to advance an understanding of university fundraising efficiency and the factors that lead to institutional differences in those efficiencies. None of the studies utilize stochastic frontier analysis even though it has been widely accepted as a standard methodology for evaluating university efficiencies from both a production and cost perspective.

And although stochastic frontier analysis has only recently emerged in applications to higher education, it has been successfully applied in a fairly large international context. Izadi, et al. (2002) estimate stochastic frontier based operating efficiencies using a 1994 sample of 99 British universities. Stevens (2005) does so using 1995-99 data for 80 English and Welsh universities, while Johnes and Johnes (2009) use frontier analysis in their 2000-03 efficiency study of 121 English universities. McMillian and Chan (2006) apply stochastic frontier analysis to evaluate the 1992 academic year efficiency performance of 45 Canadian universities. Abbott and Doucouliagos (2009) evaluate both New Zealand and Australian universities using data from 1995-2002 and 1997-2003, respectively. Sav (2012 b and c) estimates frontier efficiencies for U.S. research universities (2012 b) and religious colleges and universities (2012 c) in employing academic years 2005-09. The mean estimated operating efficiencies vary widely across these studies and range from approximately 15% to 99.9%. In part, efficiency differences can arise from the fact that all of these studies use different stochastic frontier specifications, underlying inefficiency distributional assumptions, and university cost and production variables that vary from four in one study to fifty in another study. That makes comparisons across studies beyond the scope of the present paper. Moreover, those efficiencies are based on two or more production outputs in estimating multiproduct frontiers. Not one of the studies, however, examines university fundraising as either an input or output. In contrast, the present paper will concentrate the frontier estimation and production efficiencies on university fundraising as the

separable university output. The approach, therefore, will provide the ability to derive university efficiency estimates from the stochastic frontier methodology while also using the private giving literature to examine the determinants of successful university fundraising. The next section of the paper sets forth the details of the research method.

3. Research Method

In what follows, the methodology of the stochastic frontier analysis as employed in this research paper is presented. That is followed by a description of the research data and then the empirical specification of the model.

3.1. Stochastic Frontier Analysis

The methodology for the university efficiency evaluations has its roots in the stochastic frontier work of Aigner, et al. (1977) and Meeusen and van den Broech (1977). Interest in employing panel data has brought forth many widely accepted extensions to those seminal works. In particular, the efficiency models developed by Battese and Coelli (1992) and Battese and Coelli (1995) have proved to be most useful in evaluating efficiencies arising from managerial decision-making, environmental variables and institutional and input characteristics. Using standard notation (e.g., Kumbhakar and Lovell, 2000), a panel data frontier for the production of *y* by institution *i* in year t can be considered as follows:

$$y_{it} = f(x_{it};\alpha) + v_{it} - u_{it} \tag{1}$$

where *x* is a 1x*k* input vector, α is a *k*x1 parameter vector, *i*=1,…,*N* and *t*=1,…,*T*. The *v*'s represent the effects on production due to random events, such as tsunamis, terrorism, etc. and are assumed to be independently and identically distributed as $N(0,\sigma_v^2)$. The *u*'s are nonnegative technical inefficiencies for institution *i* in time *t* and, therefore, represent possible reductions in output below the frontier potential.

While a number of distributional assumptions exist for the inefficiency term, the more general specification embedded in the Battese and Coelli (1995) model posits that the *u*'s depend upon a set of *z* covariates (1x*m* vector) such that

$$u_{it} = z_{it}\delta + \varepsilon_{it} \tag{2}$$

where δ is a *m*x1 vector of parameters to be estimated and ε represents a random variable that is a truncation at $z_{it}\delta$ of the normal distribution with mean of zero and variance σ_u^2. In the model estimation, the variance parameters are defined as $\sigma_v^2 + \sigma_u^2 = \sigma^2$. In addition, $\sigma_u^2 / \sigma^2 = \delta$ is computed and used to test the significance of the stochastic specification. The resulting efficiency measure is determined by

$$Efficiency_{it} = E(y_{it} \mid u_{it}, x_{it}) / E(y_{it} \mid u_{it} = 0, x_{it}) \tag{3}$$

Given *u*, the efficiency for institution *i* at time *t* is $0 \le \exp(-u_{it}) \le 1$ or $0 \le \exp(-z_{it}\delta - \varepsilon_{it}) \le 1$. Thus, negative coefficients in the inefficiency specification (2) represent efficiency improving effects whereas positive coefficients are indicative of reductions in efficiency.

3.2. Data Sources

In applying the frontier analysis to the efficiency evaluation of public university fundraising, data are obtained from the National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS). Several IPEDS survey instruments are used, including the institutional characteristics survey, finance survey, faculty survey, and human resources staffing and employees surveys. Given off-year survey data availability, data release lags, and changes in variable definitions over time, it was possible to create a panel data set of universities for three academic years, 2006-09. Individual public universities included Carnegie classifications that were merged to create (1) research intensive universities, (2) doctoral universities, and (3) master level colleges and universities. In some cases it was necessary to omit institutions that had missing survey data. In other cases, missing observations for specific variables were replaced with neighboring nonmissing values usual cascade

replacement. The result was a balanced panel of 353 universities over three academic years for a total of 1,059 total observations. For the three levels of institutions, the panels included 87 research universities, 55 doctoral universities, and 142 master level universities.

3.3. Empirical Specification

Empirical implementations of the model commonly proceed with the Cobb-Douglas or translog specification. While the translog is a more flexible form, its non-linear nature precludes any direct economic interpretation of the estimated coefficients. More importantly, however, in the present inquiry the translog did not behave in producing convergence in some of the empirical estimations and, therefore, had to be abandoned. Thus, to maintain consistency across model estimations, the Cobb-Douglas was chosen. It, of course, offers the advantage that the estimated coefficients are elasticities, but that interpretation is only of secondary interest in the current applications. Full specification of the model is, as usual, dictated, in part, by the availability and nature of the data. As described above, IPEDS is the data source for the current inquiry. It provides a fairly rich source of institutional level data.

For the efficiency evaluation of university fund raising from private sources, the output of interest is the annual revenue that the university derives from private gifts, PrivateGifts. Employing a Cobb-Douglas production function, the empirical specification is

$$\ln \text{PrivateGifts}_{it} = \alpha_0 + \sum\nolimits_j \alpha_j \ln x_{j,it} + \alpha_T T + v_{it} - u_{it} \tag{4}$$

where the independent variables are defined as

UnGradSize=undergraduate university size, number of undergraduate students enrolled;
GradSize=graduate university size, number of graduate students enrolled;
Faculty=number of full-time faculty employed;
Research=dollar value of research grants awarded;
ArtCollect=dollar value of art collection and equipment;
ProfStaff=number of professional staff employed;
Executive=number of executives employed;
GovtFunding=percentage of total funding from state and local governments;
Endowment=dollar value of endowment fund;
T=time trend.

The inefficiency term is of the log linear form and includes a number of dummy variables believed to alter the efficiency with which universities can capture and produce private donations. Those variables, along with the university's executive team, define the inefficiency as follows:

$$u_{it} = \delta_0 + \sum\nolimits_r \delta_r D_r + \delta_E \ln \textit{Executive}_{it} + \delta_T T + \varepsilon_{it} \tag{5}$$

where

MedSch=1 if the university houses a medical school; 0 otherwise;
Hospital=1 if the university houses a hospital; 0 otherwise;
MedHospital=1 if the university houses both a MedSch and Hospital; 0 otherwise;
InstLevel=1 if the university level is Carnegie classified as research-doctoral; 0 otherwise;
Executive=number of executives employed;
T=time trend.

Following Battese and Coelli (1995), the time trend in the production function is included to measure possible Hicksian technological changes whereas in the inefficiency term it measures possible linear changes in university efficiency over time.

In the empirical analysis, four models are presented. Three of the models pertain to the three different university classification levels: research, doctoral, and master. In addition, an initial model includes all universities but with the InstLevel dummy variable present so as to investigate the marginal effect of the two higher level research and doctoral universities relative to the master level institutions. The structural differences generated from this latter result provide the impetus for conducting separate university level efficiency evaluations.

Table 1 presents a summary of the variables along with their descriptive statistics. University size at the undergraduate and graduate levels, faculty employment, institutional research, art collection, staffing, and executive employment increase as the level of the university increases from master to doctoral to research. That is as expected. The single exception to that relationship is the university dependence on government appropriated funding from state and local governments as measured by GovtFunding. That tends to move in the opposite direction with the lower level master universities averaging approximately 34% of total funding from government appropriations compared to approximately 25% for research universities. However, there is much greater GovtFunding variance and, therefore, tie to government funding among master relative to higher level universities.

Table 1: Variables and Descriptive Statistics Across University Levels

Variable	**Research**		**Doctoral**		**Master**	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Gifts	5.19E+07	5.25E+07	1.11E+07	1.18E+07	3.01E+06	5.17E+06
UnGradSize	20967	7874	12003	6676	7726	4230
GradSize	6407	3098	3271	2064	1387	1107
Faculty	1201	521	576	238	341	177
Research	4.71E+08	3.07E+08	1.36E+08	8.03E+07	6.02E+07	3.43E+07
ArtCollect	3.79E+08	2.93E+08	9.38E+07	5.52E+07	3.30E+07	2.35E+07
ProfStaff	2030	1585	562	477	217	135
Executive	343	354	136	108	73	51
GovtFunding	25.41	9.25	29.81	8.26	3.35E+01	7.25E+00
Endowment	5.97E+08	9.49E+08	8.84E+07	1.12E+08	2.28E+07	2.52E+07
MedSch	0.57	0.50	0.16	0.37	0.01	0.10
Hospital	0.18	0.39	0.02	0.13	0.00	0.04
InstLevel	1.00	0.00	1.00	0.00	0.00	0.00
N	261		165		633	

4. Empirical Results for Private Fund Raising

The full model is estimated simultaneously by maximum likelihood. However, as Greene (2012) advises, in stochastic frontier analysis, the model parameters are not the central focus. Rather, it is the inefficiency effects that are of critical interest. Thus, in presenting the empirical results, the following separates the production frontier estimates from the estimated inefficiency effects. That is followed by a comprehensive efficiency evaluation across university levels and academic years.

4.1. Production Frontier Estimates

Production estimates are presented in Table 2. The four estimations presented are for all universities combined and for universities separated by level according to research, doctoral, and master classifications. The log likelihoods and likelihood ratios, of course, refer to the full model estimation and are included in Table 2 for reporting convenience. The ratios are significant at the 1% level of statistical significance and are in support of the stochastic specification across all four model estimations. Moreover, the estimated gammas indicate that a significant portion of the total variance arises from inefficiency. Again, that result is significant at the 1% level across all estimates presented in Table 2. In the frontier estimate that includes all universities, six out of nine university specific variables are statistically significant at the 10% and better level. Examining the separate university level estimates, however, there is a somewhat better statistical performance for the research level universities relative to either the doctoral or master level universities. The single common ground among all estimations is the finding that larger university endowments at the outset of the academic year have positive and statistically significant impacts on private fund raising during the academic year. To the extent that beginning endowments measure past private fund raising productivity, it

comes as little surprise that past productivity affects current fund raising productivity. It is also interesting that the endowment effect follows directly with the university level. That is, the estimated endowment coefficient is largest for the research universities and followed in descending order for doctoral then master level universities. For research universities, a 1% increase in past endowments leads to nearly the same 1% increase in current gifts. Among master level institutions, that same 1% endowment increase leads to less than a 0.05% increase in current giving.

Table 2: Stochastic Production Frontier Estimates for University Private Gift Fund Raising

	All	**Research**	**Doctoral**	**Master**
Constant	*9.204	*10.382	**8.443	*14.20
	(0.996)	(2.246)	(3.942)	(2.929)
UnGradSize	***-0.317	**-0.698	-0.517	0.076
	(0.163)	(0.311)	(0.330)	(0.399)
GradSize	-0.121	-0.231	-0.030	-0.036
	(0.083)	(0.180)	(0.193)	(0.104)
Faculty	*0.657	*0.992	*1.068	0.196
	(0.228)	(0.328)	(0.382)	(0.374)
Research	*0.329	-0.032	0.292	0.137
	(0.113)	(0.159)	(0.310)	(0.224)
ArtCollect	-0.071	*0.361	0.110	*-0.483
	(0.079)	(0.124)	(0.166)	(0.133)
ProfStaff	*0.379	***0.309	0.116	*0.615
	(0.098)	(0.163)	(0.256)	(0.201)
Executive	0.085	-0.051	-0.055	*0.771
	(0.061)	(0.087)	(0.145)	(0.142)
GovtFunding	*-0.418	-0.168	**-0.751	-0.339
	(0.127)	(0.131)	(0.383)	(0.332)
Endowment	*0.079	*0.098	*0.083	***0.046
	(0.014)	(0.026)	(0.021)	(0.024)
TimeTrend	-0.016	-0.059	-0.085	0.047
	(0.043)	(0.059)	(0.096)	(0.075)
Sigma Squared	*108.019	*27.823	*40.220	*268.179
	(7.135)	(3.420)	(6.794)	(11.382)
Gamma	*0.998	*0.995	*0.996	*0.999
	(0.0002)	(0.002)	(0.001)	(0.0002)
Log Likelihood	-2114.744	-334.411	-249.970	-1457.869
Likelihood Ratio	*1540.408	*368.690	*213.770	*715.836
Note: Significant at 1% denoted *; 5% denoted **; 10% denoted ***.				

Similar to the endowment effect, the GovtFunding effect is consistent across all estimates. Unlike the endowment effect, however, it has a negative impact on private gifts and is only statistically significant in the estimation for all universities combined and for doctoral universities separately. But even those results suggest that increased government funding could lead to less private giving or private fund raising. In general, crowding out of that type would be supportive of the past crowding out evidence provided by Peltzman (1973) and Sav (2012 a). Yet, with the data presently available, it is not possible to investigate whether the increases in government funding of universities tends to affect private donors giving willingness or acts upon university administrators as a disincentive to engage more intensively in private fund raising ventures. That issue requires more detailed data and will have to remain as a possible inquiry for future research agendas.

The inclusion of university executive employment in the production function produces mixed results. Its negative effect among research and doctoral universities suggests some excess executive employment therein, but it is not significant at a reasonable level of statistical significance. The marginal negative effect is, however, conceivable given that the mean executive employment among research type universities is nearly four times greater than the mean employment among the master level universities. And among the latter universities, the executive employment effect is positive and significant, thereby suggesting a positive executive fund raising productivity up to some level of employment. In contrast, the findings show a positive private funding effect arising from faculty employment. The effect is positive across all estimates and statistically significant among research and doctoral universities. That is understandable in that those universities house the most prestigious faculty and the individual and corporate private giving that follows such prestige.

Somewhat surprisingly, negative effects on private funding exist with respect to the university size measures in terms of both undergraduate (UnGradSize) and graduate (GradSize) enrollments. Both can be thought of as producing pools of potential alumni donors. As proxy to that, however, our data require that we rely on current enrollments rather that the true alumni base. That data problem is likely to contribute to the statistical insignificance found for the majority of the enrollment (size) coefficients. And despite the presence of the global financially induced recession during the academic years included in the analysis, the results indicate that the negative impact on university private giving as captured in the time trend is statistically insignificant. However, as we now turn to the inefficiency effects, it will be seen that the insignificant effect of the time trend in production might be attributed to an offsetting improvement in private fund raising efficiency.

4.2. Inefficiency Effects

Estimated inefficiency effects appear in Table 3 and are presented for all universities combined and separately for research, doctoral, and master level universities

Table 3: Inefficiency Estimates for University Private Gift Fund Raising

	All	**Research**	**Doctoral**	**Master**
Constant	*-38.437	*-21.552	*11.626	*-197.133
	(3.764)	(4.536)	(3.302)	(10.942)
MedSch	*-14.630	*-24.777	*-17.921	
	(5.245)	(5.276)	(4.610)	
Hospital	-1.812	*5.821		
	(1.771)	(1.258)		
MedHospital	-1.462	*5.821		
	(1.286)	(1.258)		
InstLevel	*-44.409			
	(5.579)			
Executive	*3.503	**1.371	*-7.430	*28.545
	(0.614)	(0.644)	(1.002)	(1.414)
TimeTrend	-1.036	-1.073	-1.336	-0.077
	(0.716)	(0.699)	(2.611)	(2.028)
Note: Significant at 1% denoted *; 5% denoted **; 10% denoted ***.				

In the inefficiency estimates for all universities combined, the negative coefficients associated with each of the dummy variables indicate that the presence of medical schools and hospitals, in addition to being a research intensive or doctoral granting institution, improve the efficiency with which public universities are able to raise funding from the private sector. The negative time trend coefficient suggests that universities have improved the efficiency of their fund raising efforts over the three academic years. However, of all these effects, only the MedSch and InstLevel coefficients are

statistically significant. The only contributor to increased inefficiency occurs with respect executive employment. That, however, is not consistent across university levels.

Among doctoral universities, university executives increase fund raising efficiency. The opposite occurs in the research and master university sectors. But for research universities, the inefficiency effect associated with the executive employment is relatively small based on the size of the coefficient; that relative weakness is likely due to the overpowering fund raising efficiency created by the presence of medical schools at research universities. In contrast, the absence of medical schools at master level universities can be responsible for the comparatively larger inefficiency effect associated with university executives. The evidence supports the notion that medical schools ease the difficult task of university fund raising. Oddly, the hospital effect is counter to that and appears as a significant inefficiency addition. Yet, our data do not allow a separation of private donations by function and, therefore, an identification of funds designated for hospitals vs. medical schools or other university production activities.

4.3. Efficiency Evaluations

Efficiency measures obtained from the model estimations provide useful evaluations across universities and time. Table 4 contains the fund raising efficiency scores for the three university levels. Given the structural differences across university levels, scores for all universities combined are omitted but could easily be envisioned as a weighted average of those presented in Table 4.

Table 4: Efficiency Score Dynamics by University Level

Research Uni.	2006-07	2007-08	2008-09	2006-09
Mean	0.531	0.535	0.537	0.534
Median	0.561	0.583	0.564	0.589
Minimum	0.000	0.000	0.000	0.000
Maximum	0.908	0.889	0.885	0.875
Standard Deviation	0.211	0.229	0.230	0.205
Skewness	-0.414	-0.553	-0.528	-0.476
Doctoral Uni.	2006-07	2007-08	2008-09	2006-09
Mean	0.420	0.476	0.486	0.460
Median	0.382	0.508	0.515	0.489
Minimum	0.000	0.000	0.000	0.000
Maximum	0.871	0.886	0.815	0.784
Standard Deviation	0.246	0.248	0.225	0.208
Mean	0.420	0.476	0.486	0.460
Master Uni.	2006-07	2007-08	2008-09	2006-09
Mean	0.270	0.276	0.277	0.274
Median	0.217	0.238	0.223	0.251
Minimum	0.000	0.000	0.000	0.000
Maximum	0.854	0.822	0.816	0.768
Standard Deviation	0.238	0.223	0.234	0.202
Skewness	0.684	0.393	0.627	0.390

As indicated by the mean efficiency scores presented in Table 4, research universities are the most efficient private giving fundraisers: following that are the doctoral and then master classified universities. The mean research university efficiency is approximately 53% and is nearly twice that of 27% efficiency at master level universities. The median 58.9% vs. 25.1% efficiency differential between the two universities levels is more than double. As expected, the efficiency gap between research and doctoral universities is much narrower. At the mean efficiency, there is only a 7% point difference (53% vs. 46%) existing between research and doctoral universities; a t-test indicates that the

difference is statistically significant at the 5% and better level (t-value=2.08). To the credit of universities, in all cases, universities improved the efficiency with which they raise private funding. From the 2006-07 to the 2008-09 academic year, doctoral universities achieved the largest mean efficiency gain of 15.7%. The gain among master universities was 2.6%, while research universities increased efficiency by 1.1%.

Although doctoral universities are on average substantially more efficient than master universities, the maximum efficiencies indicate that the most efficient university in each group performs about equally well with regard to fund raising efforts. The minimum efficiency performance is very low and approaches zero (rounded in Table 4) in each of the university levels. However, the standard deviations are approximately equal across all university levels. That is not true with regard to the skewness of the distributions. Both research and doctoral university efficiencies are negatively skewed, but the master level efficiency distribution tails off in the opposite direction. A clearer picture of the differences in the efficiency distributions is presented in the Table 5 frequency distributions.

Table 5: Efficiency Score Distributions

Efficiency	**Research Uni.**		**Doctoral Uni.**		**Master Uni.**	
Score	No.	%	No.	%	No.	%
0-.1	2	2.3%	3	5.5%	51	24.2%
.1-.2	5	5.7%	4	7.3%	32	15.2%
.2-.3	5	5.7%	8	14.5%	41	19.4%
.3-.4	10	11.5%	4	7.3%	26	12.3%
.4-.5	14	16.1%	11	20.0%	24	11.4%
.5-.6	10	11.5%	8	14.5%	21	10.0%
.6-.7	20	23.0%	11	20.0%	13	6.2%
.7-.8	14	16.1%	6	10.9%	3	1.4%
.8-.9	7	8.0%	0	0.0%	0	0.0%
.9-1.0	0	0.0%	0	0.0%	0	0.0%
Total	87		55		211	

The Table 5 distributions show that nearly 60% of the research universities are at least 50% efficient, while approximately 46% of doctoral universities and only 18% of master universities reach that halfway mark. The percentages rapidly thin out at higher levels of efficiency; nearly 25% of the research universities are estimated to operate at or above a 70% level of efficiency performance, whereas the percentages of doctoral and master universities drop to about 10.9% and 1.4%. Using 30% efficiency as the upper bound, the skewness difference is equally apparent. Almost 60% of master universities are estimated to have efficiency scores at or below 0.3. In addition, almost 1/3 of doctoral universities fall at or below the 30% level of efficiency.

5. Summary and Concluding Remarks

Private giving is becoming an increasingly important component of funding for public universities. Its potential role as a larger funding source and as a substitute to government support has strengthened as a result of the call for public management reforms and budgetary cuts induced by the global financial crisis. To what extent private philanthropy can partially substitute for government appropriated funding is a question being put on the table before both university administrators and legislators alike. However, as universities begin enhancing fundraising efforts, decision makers should understand the factors that make for successful fundraising and be aware of fundraising efficiency differences across different levels of public universities. This paper employed stochastic frontier analysis in an attempt to help bring clarity to those issues as they relate to the production and efficiency of university fundraising performance. The analysis was focused on U.S. public universities operating during the 2006-09 academic years. University fundraising production frontiers and fundraising efficiencies were

estimated for a combined 353 institutions and separately for research, doctoral, and master level universities.

The findings indicate that larger endowments at the outset of the academic year have positive impacts on university fundraising during the year. That result was found to be consistent across university levels and is generally supportive of previous research (e.g., Ehrenberg and Smith, 2003). Here, however, endowment elasticities are estimated and found to be approximately unity at research universities but only on the order of 0.05 at master level universities.

Evidence was also presented to suggest that the crowding out paradox facing university fundraising efforts is still functioning. The finding that increased government funding tends to reduce private giving is in keeping with the very early work of Peltzman (1973) and the more recent evidence presented by Sav (2012 a). Yet, much greater data refinements would be needed in order to sort out the full effects and determine if increased government funding reduces private donor incentives to give or university administrative incentives to fundraise. University faculty were found to have significant positive impacts on private giving at both research and doctoral universities. Fundraising productivity of university executives, on the other hand, was significantly positive only in master level universities.

A major contribution of the paper rests with the inefficiency effects of fundraising production being modeled from a set of university specific characteristics. The empirical results clearly indicate a strong private donor effect tied to the presence of a university medical school. That gave research and doctoral granting universities a clear fundraising advantage over master level institutions. University executive employment was also included in the inefficiency term. The estimates revealed that university executives carry a small inefficiency effect in research universities and a fairly large inefficiency among master universities, but improve the efficiency of fundraising in doctoral universities.

Efficiency performance varied substantially across university levels. The mean fundraising efficiency at research universities was 53% compared to 27% at master level schools. Doctoral universities averaged 46% performance efficiency. Approximately one fourth of research universities achieved fundraising efficiencies at or above 70%, whereas fewer than 2% of master universities achieved that efficiency mark. Estimates placed the majority of master universities and about one third of doctoral universities below 30% efficiency. The mean fundraising efficiencies are relatively low in comparison to other U.S. based university efficiency estimates. For example, overall mean efficiencies at research and doctoral universities are reported to be above 70% (Sav, 2012 b). However, those previously published estimates are based on multi output production that exclude any aspects of fundraising, while the efficiencies obtained herein are fundraising specific.

When examining the dynamics of fundraising, the time trend results support the expectation that private donations declined over the three academic years. But the decline was estimated to be statistically weak and insignificant. In part, that was attributed to the finding that universities have managed to create efficiency improvements over the equally short period of time. It is reasonably plausible that the results pointing to better managed fundraising efforts succeeded in warding off otherwise deeper reductions in private giving.

The paper is believed to be the first to provide frontier estimates of university fundraising efficiencies and, as such, it must offer caution in interpreting the results. The caution primarily rests upon the nature of the data. First and foremost, the private giving data obtained from IPEDS are annual data but do not necessarily match with university fundraising campaigns. While universities are usually always on the hunt for private donations, many universities launch extensive fundraising campaigns in a carefully timed manner. Thus, major fundraising drives tend to be very lumpy and can escape the private giving data provided on an annual basis. On the employee front, the data did not permit an assignment of employees to the management or support of university fundraising production. The data only allowed the distinction among executives, professional staff, and faculty. Thus, university executives were used as the ultimately responsible fundraising decision-makers and included in both the production and inefficiency specifications. And finally, while medical school and hospitals were visible observations to include as potentially affecting private donor support, it was not possible

to tie private giving to specific university functions, including capital projects, scientific research, or support for other non-medical professional schools or programs. Although it is not likely such data issues will be available at national level anytime soon, a fruitful future research agenda might focus on a continuing study of university fundraising efficiencies using a small manageable sample of universities for which there is available quality data of this type.

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