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Value Added of Universities: Evidence From Georgia

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Abstract

In this paper we propose a quantitative measure of the value added of Georgian universities and their programs, and create a ranking based on that measure. We find that there is a large variation in the rankings of individual programs within universities. At the university level, a comparison with the only available comprehensive ranking reveals that a value added-based ranking can produce very different results from existing popular rankings.

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1. Introduction

For developing countries like Georgia, modernizing and improving the education system is of vital importance for long-term development. Fortunately, there are a number of university choices available to students when applying for undergraduate or graduate studies in Georgia. However, it is not always easy to find an objective measure that can be used to make thoughtful decisions about the relative performance of universities. Moreover, education policy makers in Georgia do not have universal, fair and objective sources upon which they can base decisions on how to distribute funding among public universities. Popular global university rankings often focus only on the top universities and completely neglect most of the universities in poor developing countries that never make it to the top. For example, only one Georgian university is listed in the prestigious Times Higher Education World University Rankings, Tbilisi State University, and it is ranked "1001+". Needless to say, Georgian universities are not represented in those reputable rankings that cover the top 100 or top 500 universities.

It has long been recognized that many ranking measures suffer from basic flaws. First, the measure of university performance should be implementable and fair for all universities and should not put some institutions in an advantageous position based on factors such as their size alone. Second, the measure of the performance of universities should be focused on *their value added* and should not simply compare student composition. For instance, ranking universities simply based on a comparison of the average entry scores of freshmen students would provide greater indication of how popular the universities are among the best freshmen, rather than of the extent to which those universities *actually improved* their students' knowledge or skills.

In this paper, we propose a quantitative measure of the value added of Georgian universities and create a ranking based on that measure. By comparing the entry exam scores at the MA level to similar entry scores at the BA level, we derive a value added measure of a particular university and its programs. We then compare our ranking to the only other comprehensive ranking available for Georgian universities: Webometrics (http://www.webometrics.info/en). The Webometrics Ranking is produced by the Cybermetrics Lab, a unit of the Spanish National Research Council (CSIC). It is a ranking system based on university web presence, visibility and web access. This ranking system measures how strongly a university is present in the web by its own web domain, sub-pages, rich files, scholarly articles etc. Note that the Webometrics ranks universities and not their programs, so the comparison of the two rankings is possible at the university level only.

We find that the Webometrics ranking favors larger universities, which are not placed at the top of our ranking. Second, we find that universities from outside the capital, Tbilisi, are ranked much higher in our ranking than in the Webometrics ranking. Finally, using a similar methodology we create a ranking of Georgian university undergraduate programs, which to the best of our knowledge is something that has not been done in the academic literature before. We find that there is a large variation in the value added of different programs within universities. This implies that the decisions of university applicants and policy makers should be based on the ranking at the university *program* level and not at the university level. This large variation in the level of value added across different programs provides further motivation to have this detailed ranking be made available.

Simply comparing the MA entry scores of students from different universities or programs in order to rank BA programs potentially suffers from the selection problem. It could be the case that "high-potential" students, those who would improve their skills in all subjects, are characterized by high BA entry scores, or by other observable characteristics such as being a graduate of a better high school. Their improved skills would then mistakenly be attributed to those universities' BA programs, even though they would have seen a similarly large increase in scores at other universities as well. To combat this problem, we propose a measure of value added that controls for all available observable student characteristics. In this approach, scores in the MA-level entry exam are explained by observable variables including scores in the BA-level entry exam, gender, high school size, location fixed effects, birth year fixed effects, BA admission year fixed effects as well as the duration between BA and MA admissions. The remaining variation in MA entry exam scores across universities (or programs) left unexplained by the other factors is then attributed to the quality of the corresponding universities, i.e. the value added.

The use of value added approaches in the context of evaluating school teachers' performance is popular in the academic literature. The pioneering work of Hanushek (1971) inspired many other researchers, more recently Rockoff (2004), Rivkin, Hanushek and Kain (2005), Aaronson, Barrow, and Sander (2007), and Chetty, Friedman and Rockof (2014). Although we use a similar approach in the broadest sense, our work differs from these papers as we focus on a developing country and evaluate the value added of universities and their programs. Moreover, while many other studies use experimental data, we use the data from the Georgian universal standardized tests for both undergraduate-level and master's-level entry exams.

2. Data

Our dataset comes from the Georgian National Assessment and Examination Center (NAEC) and covers the years 2011-2017. It includes information about students' BA and MA general aptitude entry test results ("entry exam scores"), the years the exams were taken, students' birth years, BA and MA admission and graduation years, high school location, the gender of the student as well as the size of the high school that the student graduated from.

One of the advantages of our dataset is that it covers the whole population of students taking the unified exams during 2011-2017. Moreover, since the exams are unified – and everyone takes the same exams – the comparison of scores across individuals controlling for student characteristics gives us a sensible measure of the value added. We also compare the general aptitude test results for the BA and MA entry exams, which are similar in nature, and this comparison thus measures the contribution of university undergraduate programs to the development of a student's general aptitude.

Table 1 summarizes the admissions, total number of universities and corresponding BA programs in Georgia during 2011-2017. As is clear from the table, the number of admissions, total number of universities and number of programs were all increasing over time, but the latter experienced the largest increase. This means that over time relatively more, smaller programs have been introduced. It is thus becoming increasingly important for decision makers to have a measure of university rankings at the program level.

Table 1: University Admissions

Year	2011	2012	2013	2014	2015	2016	2017
Admissions	23,639	26,050	28,861	26,456	28,061	27,785	28,176
Number of Universities	58	56	57	60	63	64	65
Number of Programs	656	802	1,153	1,249	1,559	1,639	1,785

In Table 2 we provide the summary statistics and the relationship between the BA score and MA scores for the applicants we have both scores available. The correlation between the two is about 0.7.

Table 2. Summary Statistics of BA and MA Scores

Variable	Number of Observations	Mean	Standard Deviation	Min	Max
General Aptitude Test Result for MA	11,396	7.9	3.9	0	17
General Aptitude Test Result for BA	11,396	1606.5	141.1	1305	1960

3. Empirical Specification

In order to control for the observed characteristics of students, we run the following regression:

$$MA_{ij} = \beta_0 + \beta_1 BA_{ik} + \beta_2 Gender_i + \beta_3 S_i + Loc_j + Dur_i + b_y + Ad_y + \varepsilon_{ij} \quad (1)$$

where MA_{ij} denotes the MA entry exam score of student i at university j, BA_{ik} denotes i's BA entry exam score at university k, $Gender_i$ denotes i's gender, Dur_i denotes the duration between student i's BA and MA admissions, b_y, Ad_y and Loc_j denote the Birth Year Fixed Effect, BA Admissions Fixed Effect and Location Fixed Effects, respectively.

The estimated MA entry exam scores, $\widehat{MA_{ij}}$ are then compared to the actual score values MA_{ij} and the differences, i.e. residuals, are taken for each student-university pair. Following the literature, to obtain the measure of university ranking, the average across its students is taken (Jakubowski, 2008; OECD, 2013):

$$VA_j = ave\left(MA_{ij} - \widehat{MA_{ij}}\right) = \frac{1}{N_j}\sum_{i=1}^{N_j} \varepsilon_{ij} \quad (2)$$

where N_j is the number of students in university j.

4. Empirical Results

Table 3 shows the regression results where the parameters are estimated using the whole sample of data covering the 2011-2017 entry exam scores at Georgian universities. As can be seen from the table, MA entry exam scores are positively correlated with BA entry exam scores. Moreover, the size of the high school the student graduated from is also positively correlated with their MA entry exam score. However, gender seems to have no significant effect on the exam scores.

Table 5 presents the rank of all Georgian universities with corresponding data: the number of student admissions and number of programs in 2017; the ranking of the best and worst programs of the university, and corresponding student admissions in 2013; and the corresponding Webometrics ranking.

Table 3: Regression Results

Covariates	Dependent Variable: General Aptitude Test Result for MA Admissions
BA General Aptitude Test Result	0.0183***
	(0.0002)
Gender	0.056
	(0.061)
School Size Graduated From	0.008***
	(0.003)
Birth Year Fixed Effect	Yes
BA Admissions Fixed Effect	Yes
Location Fixed Effect	Yes
Duration between BA and MA admissions	Yes
Observations	11,396
Adjusted R-squared	0.461

Standard errors in parentheses: *** p < 0.01, ** p < 0.05, * p < 0.1

Dramatic differences can be seen in the two rankings by comparing the first and last columns on Table 5. A couple of observations can be made. First, relative to our value added-based ranking, the Webometrics ranking favors larger universities and those located in the capital. For example, the top three universities in the Webometrics ranking are Tbilisi State University, Ilia State University, and Tbilisi State Medical University with 2017 admissions of 3,409, 3,662 and 1,009 students respectively. All three are based in Tbilisi. However, in our ranking they take 11th, 31st, and 19th places, correspondingly. In contrast, smaller universities (some of which are outside Tbilisi) fare much better in our ranking. For example, the Georgian National Institute Rvali, Zugdidi Teaching University and Sulkhan-Saba Orbeliani Humanities University are in 1st, 3rd and 6th places in our value added-based ranking, while in the Webometrics ranking these institutions do not even make the top 20. As can be seen from Table 3, admissions in 2017 to these universities were much smaller than the admissions to the three universities as ranked top by Webometrics, which tends to favor larger universities. In summary, Table 3 implies that there is almost no relationship between the ranking of Webometrics and our value added-based ranking.

Second, there is a large variation in the rankings of individual programs within universities. Take Gori University, for example. It is placed 16th overall in our ranking, with 227 students admitted

in 2017. However, it has 53 different programs and one of them – *Informatics, Mathematics & Biology* – is the best program (with 13 students admitted in 2013) out of all the different BA programs available in Georgian universities. On the other hand, Gori University's worst program (which admitted 36 students in 2013) is ranked one of the lowest of all Georgian university programs. Interestingly, the other programs which make the list include, for example, increasingly attractive programs in Georgia such as *Tourism*, *Business Administration*, *Management*, and *Agricultural Studies*.

Table 4: Program Ranking

Program Rank	University	Category
1	Gori University	Informatics, Mathematics & Biology
2	International Black Sea University	Tourism
3	Euroregional University	Psychology
4	David Guramishvili International Teaching University "iberia"	Business Administration
5	Shota Rustaveli Theater and Film University	Management
6	Ilia Chavchavadze Georgian National University	Journalism
7	Akaki Tsereteli State University Kutaisi	Design
8	Caucasus University	Cinematography
9	Georgian Technical University	Geodesy
10	University of Georgia	Health Administration
11	Telavi Iakob Gogebashvili State University	Agricultural Studies
12	David Aghmashenebeli University of Georgia	Health Care
13	Ilia State University	Sports
14	Grigol Robakidze University Tbilisi	Journalism
15	Akaki Tsereteli State University Kutaisi	Agricultural Studies
16	Zugdidi Teaching University (Zugdidi)	Business Administration
17	Georgian National Institute Rvali	Accounting
18	Ilia Chavchavadze Georgian National University	Journalism
19	Ilia State University	Law
20	Caucasus University	Humanitarian Studies

5. Conclusion

In this paper we examined entry exam scores at Georgian universities. Controlling for students' characteristics, we constructed a measure of value added of the universities and their programs.

We find that a value added-based ranking is very different from the only other ranking available for Georgian universities. We also find that the programs within universities are ranked very differently. Perhaps students should take this into account when making decisions about their education.

The recent papers on the related topics demonstrate the significance of the research on education attainments in the developing countries. For example, using the recent Skills Towards Employability and Productivity (STEP) surveys of urban labor force participants Shafiq et al. (2018) examine individuals' educational attainment, labor market participation, and earnings. Using logistic regressions, they find that individuals from disadvantaged origins are less likely to obtain a higher education degree. For future work, it is interesting to explore which universities or programs are better at improving the social mobility of students who do get the chance to obtain a higher education degree.

6. References

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7. The Main Table

Table 5: University and Program Ranking

Rank	University Name	University Admissions in 2017	Number of Programs in 2017	Rank of the Top Program	Admissions at the Top Program in 2013	Rank of the Worst Program	Admissions at the Worst Program in 2013	Webometrics Ranking	Point	CI
1	Georgian National Institute Rvali	14	7	18	30	775	63	41	1.650	(1.007, 2.293)
2	Tbilisi University	27	13	112	14	120	89	50	1.306	(0.717, 1.896)
3	Zugdidi Teaching University (Zugdidi)	36*	16*	16	6	751	11	28	1.091	(0.642, 1.539)
4	University Interpharm+	48*	2*	146	47	146	47	56	1.055	(-0.296, 2.405)
5	V. Saradjishvili Tbilisi State Conservatoire	77	19	155	3	155	3	17	1.014	(-1.318, 3.346)
6	Sulkhan-Saba Orbeliani Humanities University	186	23	86	57	241	91	33	0.911	(0.437, 1.386)
7	Tbilisi Teaching University "gorgasali"	27	11	25	16	697	47	N/A	0.851	(0.563, 1.139)
8	High School Georgia	7	3	124	15	349	69	N/A	0.704	(0.283, 1.125)
9	Akhalqalaqi High School-College (Akhalqalaqi)	16	3	157	16	352	3	N/A	0.695	(-0.045, 1.434)
10	Free University of Tbilisi	528	23	119	577	535	100	9	0.665	(0.633, 0.698)
11	Ivane Javakhishvili Tbilisi State University	3409	110	44	55	685	47	1	0.292	(0.291, 0.294)
12	Sukhishvili Teaching University (Gori)	35	16	78	3	784	3	N/A	0.290	(0.21, 0.37)
13	Saint Tbel Abuseridze University (Khulo)	37	11	107	94	687	3	N/A	0.153	(0.128, 0.178)
14	Caucasus International University	483	27	58	163	729	75	19	0.135	(0.107, 0.164)
15	David Guramishvili International Teaching University "iberia"	271*	11*	4	12	795	18	N/A	0.124	(-0.009, 0.258)
16	Gori University	227	53	1	13	797	36	25	0.106	(0.063, 0.148)
17	Tbilisi David Aghmashenebeli University	68	8	24	48	782	12	47	0.083	(-0.008, 0.174)
18	Georgia State Agriculture University	420	19	35	25	718	20	7	0.063	(0.029, 0.097)
19	Tbilisi State Medical University	1009	31	47	68	783	22	3	0.051	(0.032, 0.069)
20	University of Georgia	1108	86	10	36	762	9	6	0.028	(0.016, 0.04)
21	Sokhumi State University	643	38	67	98	660	30	16	0.013	(-0.009, 0.036)
22	Batumi Shota Rustaveli State University	1241	82	28	4	802	3	5	-0.006	(-0.014, 0.002)
23	David Aghmashenebeli University of Georgia	271	27	12	337	757	9	37	-0.024	(-0.059, 0.011)
24	Akaki Tsereteli State University Kutaisi	1611	91	7	2	778	20	11	-0.070	(-0.077, -0.062)
25	Guram Tavartkiladze Teaching University	99	16	173	112	727	76	35	-0.076	(-0.65, 0.497)
26	Caucasus Academic Center (CAC)	79*	7*	39	17	789	4	N/A	-0.081	(-0.461, 0.298)
27	Caucasus University	961	89	8	60	759	11	8	-0.117	(-0.146, -0.089)
28	International Black Sea University	531	76	2	18	764	44	4	-0.116	(-0.157, -0.09)
29	American University for Humanities	21*	2*	323	7	459	79	34	-0.123	(-0.542, 0.292)
30	Telavi Iakob Gogebashvili State University	270	41	11	7	801	4	20	-0.171	(-0.226, -0.115)
31	Ilia State University	3662	93	13	1	796	14	2	-0.183	(-0.184, -0.177)
32	Shota Rustaveli Theater and Film University	132	11	5	22	739	25	23	-0.196	(-0.281, -0.114)
33	University of Tsodna	140*	5*	445	83	449	37	43	-0.208	(-0.62, 0.191)
34	University Geomedi	162	13	126	105	786	6	38	-0.214	(-0.36, -0.079)
35	Georgian Technical University	4320	201	9	4	803	10	10	-0.226	(-0.23, -0.221)
36	Tbilisi Humanities University	38	9	141	29	624	72	36	-0.230	(-0.4, -0.069)
37	Batumi Arts Teaching University	330	26	42	100	792	7	30	-0.235	(-0.29, -0.181)
38	Kutaisi University	23	10	118	62	749	17	29	-0.290	(-0.429, -0.15)

39	Grigol Robakidze University Tbilisi	325	42	14	17	785	1	13	-0.371	(-0.412, -0.342)
40	Georgian American University	251	32	49	197	589	212	22	-0.380	(-0.422, -0.338)
41	Shota Meskhia Zugdidi State Teaching University	95	22	235	18	798	12	28	-0.432	(-0.483, -0.387)
42	Georgian University of Saint Andrew	287	34	22	7	790	8	14	-0.467	(-0.746, -0.189)
43	Zurab Zhvania Georgian Institute of Public Affairs	192	19	421	185	673	136	12	-0.486	(-0.649, -0.326)
44	Business Academy of Georgia	575	18	318	585	743	449	48	-0.503	(-0.644, -0.338)
45	Samtskhe Javakheti State University	305	33	143	4	777	12	46	-0.508	(-0.546, -0.465)
46	Ilia Chavchavadze Georgian National University	2057	58	6	9	678	459	32	-0.582	(-0.596, -0.56)
47	Rustavi College	37*	5*	452	35	708	2	59	-0.588	(-1.403, 0.217)
48	David Aghmashenebeli Defence Academy of Georgia	71	4	21	11	765	428	44	-0.601	(-0.724, -0.483)
49	Saint Queen Tamar Teaching University	16	9	135	26	735	1	N/A	-0.609	(-1.224, 0.006)
50	Tbilisi Open Teaching University	86	21	97	114	787	67	N/A	-0.645	(-0.713, -0.573)
51	Euroregional University	50*	4*	3	14	800	29	60	-0.844	(-1.371, -0.323)
52	Batumi State Maritime Academy	44	6	130	8	763	18	15	-0.854	(-1.407, -0.3)
53	Georgian Aviation University	172	30	440	208	793	44	27	-0.950	(-1.085, -0.793)
54	David Tvildiani Medical University (AIETI Medical School)	120	7	635	380	635	380	26	-0.990	(-4.508, 2.541)

Notes: *admission and programs information are not available for these universities in 2017, so the data for the most recent years are taken. Some of the universities are not ranked by Webometrics and their rankings are denoted by "N/A". The last two columns indicate the point estimates and 95% confidence intervals of these estimates.