

Copyright

by

Toni Templeton

April 2018

AN EXAMINATION OF EFFICIENCY IN
HISTORICALLY BLACK COLLEGES AND UNIVERSITIES

A Dissertation Presented to the
Faculty of the College of Education
University of Houston

In Partial Fulfillment
of the Requirements for the Degree

Doctor of Philosophy

by

Toni Templeton

April 2012

AN EXAMINATION OF EFFICIENCY IN
HISTORICALLY BLACK COLLEGES AND UNIVERSITIES

A Dissertation for the Degree

Doctor of Philosophy

by

Toni Templeton

Approved by Dissertation Committee:

Dr. Cathy Horn, Chairperson

Dr. Samira Ali, Committee Member

Dr. Tiffany Davis, Committee Member

Dr. Anthony Rolle, Committee Member

Dr. Robert H. McPherson, Ph.D.,
Dean College of Education

April 2018

Acknowledgment

To the love of my life.

With you, anything is possible.

AN EXAMINATION OF EFFICIENCY IN
HISTORICALLY BLACK COLLEGES AND UNIVERSITIES

An Abstract
of a Dissertation Presented to the
Faculty of the College of Education
University of Houston

In Partial Fulfillment
of the Requirements for the Degree

Doctor of Philosophy

by

Toni Templeton

April 2012

Abstract

The purpose of this series of studies was to understand a natural occurrence of efficiency in higher education: Historically Black Colleges and Universities (HBCUs). HBCUs are institutions founded prior to 1964 with missions to provide educational options to Black students (Allen, 1992). Despite never receiving funding equal to that of their peers, the high production of educational outcomes with few resources exemplifies the definition of technical efficiency (Farrell, 1957). This series of studies sought to aid in improving efficient production by understanding the higher education funding policy providing resources to HBCUs, the degree of efficient operations of HBCUs, and the relationships between expenditures and student outcomes at HBCUs.

Qualitative analysis of the higher education policy providing resources to public institutions of higher education in states operating HBCUs yielded two common policy themes: 1) states set expectations of higher education with workforce development goals, and 2) HBCU-specific language is largely absent from state higher education funding policy. Data envelopment analysis determined that relative efficiency scores skewed toward efficiency and efficiency was found among HBCUs of all sizes. Ordinary least squares regression models were developed to understand the relationships between resource allocation and student outcomes. A model for graduation rates found the percentage of Pell grant recipients and Public Service expenditures to be positively and significantly related to graduation rates, suggesting high levels of support for students and their families.

This series of studies found HBCUs to be a promising area of future research to improve the efficient outcomes of higher education. Further, previous assertions of discriminatory funding policies were confirmed and should be rectified in order for HBCUs to reach the full potential of their contribution to higher education. The future of efficiency in higher education can be led by Historically Black Colleges and Universities.

Table of Contents

Chapter	Page
I. Introduction.....	1
II. A Review of Current Higher Education Finance Policy: An HBCU Perspective.....	16
References.....	57
Appendix A: Higher Education Funding Policy Analyzed.....	62
III. Accessible, Affordable, and Achieving: An Examination of Technical Efficiency in HBCUs.....	63
References.....	99
Appendix A: IPEDS Expenditure Variable Descriptions.....	106
Appendix B: IPEDS Institutional Variable Description.....	109
Appendix C: Student Population Descriptive Statistics.....	114
Appendix D: Institutional Revenue.....	115
Appendix E: Institutional Expenditures per FTE.....	116
Appendix F: Environmental and Output Variable Correlation Table	117
IV. Expenditure and Success in HBCUs.....	118
References.....	144
Appendix A: IPEDS Expenditure Variable Descriptions.....	149
Appendix B: IPEDS Institutional Variable Description.....	152
Appendix C: Scatterplots of Dependent and Independent Variables.....	157
Appendix D: Best Curve Fits	159
V. Conclusion.....	161

List of Tables

Table	Page
1. Direct Content Analysis Frequency Coding	41
2. Input Variable Correlations	77
3. Output Variable Correlations.....	78
4. Environmental and Output Correlations.....	80
5. Total Student Enrollment.....	83
6. HBCU Total Revenue per FTE.....	85
7. Mean Expenditures per FTE	86
8. Mean Data Envelopment Efficiency Scores.....	87
9. Mean Student Demographics Most Efficient HBCUs.....	90
10. Mean Revenue per FTE Most Efficient HBCUs.....	91
11. Mean Expenditure per FTE Most Efficient HBCUs.....	91
12. Mean Demographics Least Efficient HBCUs.....	92
13. Mean Revenue per FTE Least Efficient HBCU	93
14. Mean Expenditure per FTE Least Efficient HBCU	94
15. Environmental and Output Variable Correlations.....	128
16. Independent Variable Correlations	129
17. Total Student Enrollment.....	134
18. HBCU Expenditure per FTE.....	136
19. Total Cohort Graduation Rate Regression.....	137

List of Figures

Figure	Page
1. HBCU-based Framework for Black Student Success.....	31
2. Map of Public 4-year HBCUs.....	36
3. Data Envelopment Analysis.....	72
4. HBCU-based Framework for Black Student Success.....	74
5. DEA Models.....	81
6. HBCU Enrollment.....	83
7. Efficiency Score Histogram.....	88
8. Efficiency and Enrollment.....	88
9. HBCU-based Framework for Black Student Success.....	121
10. Total HBCU Enrollment.....	134

Chapter I

Introduction

Today, two out of every three jobs require some form of higher education, a proportion that will only escalate with time (Carnevale, Jayasundera, & Gulish, 2016). Over the course of a lifetime, those earning at least a Bachelor's degree will earn close to \$400,000 more than those with only a high school diploma (Humphreys, 2017; Ma, Pender, & Welch, 2016). The increasingly significant impact of higher education on lifetime earnings and societal contribution is clear. Public policy, well aware of the contributions of higher education to prosperity and success, has high expectations of higher education preparing students to meet the high demands and global competitiveness of the workforce, but also to do so without increasing the financial burden on the student and student's family (Immerwahr, 2004; Immerwahr & Johnson, 2010).

Institutions of higher education must prepare tomorrow's workforce in a less than ideal fiscal environment. Not only is the expectation that higher education not increase financial burdens on students, but also the current higher education fiscal landscape is troubled by decreasing state and federal allocation (Sigritz, 2015). Since 1990, state allocation for higher education has decreased by 20% nation-wide (Sigritz, 2015) and the current administration has proposed cuts in excess of \$4 billion to federal student aid programs (Office of Management and Budget, 2017). As revenue decreases and raising tuition is not an ideal option to replace lost funds, institutions of higher education are forced to find the most efficient means of producing student outcomes, or producing the greatest possible student outcomes with the least possible resources (Farrell, 1957).

Institutions of higher education could find guidance for efficient resource allocation policy and practice where funding has always been constrained and outcomes have always been high. One specific instance of efficient educational production might exist in Historically Black Colleges and Universities (HBCUs). HBCUs, institutions formed prior to 1964 with missions of educating Black Americans, have historically been funded at lower levels than peer institutions, yet have provided so many opportunities for Black American success, they are credited with essentially created the Black middle class (Allen, Jewell, Griffin, & Wolf, 2007; Gasman, 2013). This instance of efficient educational outcomes could provide future direction as the larger higher education community becomes more resource-constrained.

The purpose of this series of three proposed research studies was to investigate the funding policy, efficiency, and resource allocations that produced the impressive student outcomes of resource-constrained HBCUs. The efficient decision making of HBCUs provides an alternative approach to achievement of all students in times of resource constraint in higher education. The first study sought to understand the current landscape of higher education finance policy and the theoretical alignment of that policy to the educational approach of HBCUs, the second investigated the extent to which HBCUs are efficient producers of higher education outcomes, and the third explored relationships that might exist between different categories of expenditures and student outcomes at HBCUs. The information gleaned from this research informs the greater higher education community in creating efficient models of higher education resource allocation that optimize student outcomes. The following sections of this introductory chapter detail the

significance of HBCUs and the importance of efficiency in the determination of possible solutions to achieving optimal student outcomes.

Historically Black Colleges and Universities

HBCUs exemplify both the historical and future intersections of race and higher education (Minor, 2008). Founded in order to provide the only educational option for Black people following the Civil War¹, HBCUs are defined by their official recognition in the Higher Education Act of 1965 as institutions formed prior to 1964 with a mission to serve Black students (Gasman, 2010). Throughout the nation's marred history of slavery, discrimination, oppression, and racism, HBCUs have served as an incubator for unapologetically Black ideas—a protected space for the cultivation of Black leaders and thinkers to challenge the white-washed narrative of the country and demand the rights of Black people. HBCUs have provided an opportunity to for Black students to engage and connect with one another in an accepting, nurturing environment (Allen, 1992).

A unique student population. HBCUs have maintained a mission of affordability and access by serving Black students regardless of income or preparation (Arroyo & Gasman, 2014; Harper, Patton, & Wooden, 2009; Hodge-Clark & Daniels, 2014). Though there are selective, private institutions like Spelman College, Morehouse College, Xavier University and Howard University, on average, HBCUs serve a low-income student population less prepared for college than predominantly white institutions (PWIs) (Hodge-Clark & Daniels, 2014). Unlike predominantly white institutions (PWIs), all 101 operating HBCUs serve a student population composed of at least 40% Pell Grant

¹ Some HBCUs existed before the end of the Civil War. See Allen & Jewel, 1992 and Harper, Patton, & Wooden 2009 for more detailed history.

recipients (Nichols & Evans-Bell, 2017). An estimated 70% of all HBCU students are eligible for Pell Grants, many are first-generation college students, and many attend part-time in order to take care of other responsibilities (Arroyo & Gasman, 2014). When compared to other institutions with similar populations of Pell Grant recipients, the significant differences among student population become clear. In the Education Trust's recent analysis of IPEDS data, the average SAT score of freshmen classes admitted to HBCUs is 860, while that of similar Non-HBCUs is 988 (Nichols & Evans-Bell, 2017). HBCU student success takes an array of forms.

HBCU student success. Prior to the 1990s, HBCUs were the only institutions where Black students were not one of the lowest performing subgroups (Perna, 2001; Perna, Milem, Gerald, Baum, Rowan, & Hutchens, 2006). During that time, the impacts of HBCUs on the higher education attainment and wage earnings of Black students was clear: Black students benefitted more by attending HBCUs than PWIs (Allen, 1992; Kim, 2002; Perna, 2001; Perna et al., 2006; Willie & Cunnigen, 1981). It should be noted that de facto segregation and discrimination still existed into the 1990s and limited Black students' access to institutions of higher education other than HBCUs (Harper, Patton & Wooden, 2009; Perna, 2001; Perna et al., 2006).

Following the 1992 *United States v. Fordice* decision and several state settlements to mitigate racial segregation still in existence in higher education, HBCUs began to experience a declining enrollment as more Black students were accepted into PWIs (Brown & Burnett, 2014; Gasman, 2013; Minor, 2008). After Black student enrollment began to increase at PWIs, studies comparing the success of Black students at HBCUs and PWIs surfaced. Research examining data from the 1990s into the early 2000s found

that Black students were no more likely to earn a bachelor's degree at HBCUs than PWIs (Kim & Conrad, 2006) and there was no difference in wage earnings between Black students attending HBCUs and PWIs (Kim, 2011), and HBCU attendance could negatively affect student outcomes (Fryer & Greenstone, 2007).

Concomitantly, studies documenting student outcomes other than wage earnings and appropriately controlling for the unique student population served by HBCUs have documented the higher completion rates, lower dropout rates, improved confidence, increased campus activity involvement, and more frequent, positive faculty interactions of African American students attending HBCUs (Palmer, Davis, & Hilton, 2009; Palmer, Davis, & Maramba, 2010; Palmer & Gasman, 2008). Additionally, the average Black student graduation rate at HBCUs (37.8%) is greater than the graduation rate at non-HBCUs serving similar populations of Pell Grant recipients (32.0%) (Ma, Pender, & Welch, 2016). In short, HBCUs have had a large and positive impact on the higher education attainment of Black students.

More recently, examining African American professionals in the workforce, the Thurgood Marshall College Fund (2015) found that 40% of Black members of Congress, 12.5% of Black CEOs, 40% of Black engineers, 50% of Black professors at non-HBCUs, 50% of Black lawyers, and 80% of Black judges were all graduates of HBCUs. These realities are especially noteworthy, given that HBCUs make up only 3% of the higher education institutions in the nation (Gasman, 2013). The significance of their impact is undoubtedly driven by a particular HBCU-brand of student supports.

HBCU student support. HBCUs achieve great success by providing environmental supports to Black students uncommon to other institutions. Palmer and Davis, for

example, have published extensively on the particular experiences that make African Americans successful at HBCUs, including the incorporation of family, African American mentors, and financial support (Palmer, Davis, & Hilton, 2009; Palmer, Davis, & Maramba, 2010; Palmer, Davis & Thompson, 2010; Museus, Palmer, Davis & Maramba, 2011). Jett (2013) cites the spiritual and ethical leadership provided by African American mentors in HBCUs as a major factor in the success of Black students. The Black student success yielded by these distinctive HBCU student supports is so impactful that HBCUs are often solely credited for the creation of the Black middle class (Allen, Jewell, Griffin, & Wolf, 2007; Davis, 1998; Gasman, 2013).

HBCU Funding. Perhaps the most noteworthy accomplishment of HBCUs is the creation of such success with only a fraction of the funding received by PWIs (Brady, Eatman, & Parker, 2000; Brown & Burnette, 2014; Gasman, 2010; Lee & Keys, 2013; Sav, 1997, 2010). Gaps in funding between HBCUs and PWIs are partially attributable to both federal and state allocations. The mission of HBCUs to first provide instruction to meet the needs of students has taken from their focus on attaining federal research funding. Further, discriminatory practices within federal research and development programming has also contributed to underrepresentation of HBCUs in federal research (Gasman, 2010; Harper, Patton, & Wooden, 2009). With regard to state allocations, discriminatory practices within state government have disproportionately reduced funding to HBCUs as states grapple with unstable economies and increasing costs for healthcare (Boland & Gasman, 2014, Minor, 2008; Sigritz, 2015).

Despite large funding disparities, HBCUs have been able to accomplish high levels of success with generally less prepared students than PWIs. These accomplishments are

incredibly relevant today, given the current state of reduced federal and state allocation for higher education funding and increasing public expectation for higher education to meet the needs of a wider variety of students, prepare students to be globally competitive, and keep tuition cost low. The high levels of success yielded with minimal resources make HBCUs an ideal subject for investigation of technical efficiency.

Technical Efficiency

The extraordinary success of HBCUs achieve with marginal funding exemplifies technical efficiency, which is defined as achieving maximum output with minimal input (Farrell, 1957). Decreasing state and federal government appropriation for higher education (Sigritz, 2015), coupled with public pressure to keep tuition low and outcomes high (Archibald & Feldman, 2012), create an environment where all institutions of higher education are increasingly required improve technical efficiency. Exploring models of efficiency that might have naturally developed for survival in HBCUs, could yield important information for resource allocation decisions in the larger higher education community. Technically efficient institutional resource allocation is highly valued in the higher education community by both policy makers and practitioners fighting to stretch every dollar to achieve a multitude of goals. The following sections describe the relevance and necessity of technical efficiency in higher education finance policy.

The rise of efficiency in public education. Examination of technical efficiency in the public education sector escalated following the findings of Coleman (1966) and Jencks (1972), which controversially asserted the unalterable characteristics of the student body, not funding nor quality of the school, created the wide variation in performance of the immediate post-segregation era of public schooling. Without a strong

relationship between increased governmental spending and increased student outcomes, opportunities to cap education funding and emphasize resource optimization were entertained (Rolle, 2004). After two decades of conflicting research among economists and education scholars about whether efficiency or adequacy was the most proper method of evaluating school finance, scholars eventually agreed that combination of adequate levels of school funding and high levels of institutional technical efficiency produced the optimal outcomes in public education (Verstegen & King, 1998).

With colleges and universities in little control of state or federal government allocation for adequate resources, achieving technical efficiency emerges as the primary method of achieving optimal higher education outcomes. Examinations of technical efficiency can inform institutional practices and governmental policy that allow higher education to achieve the highest possible outcomes even in the current climate of resource decline. A limited body of research has been published to explore technical efficiency in higher education (Avikiran, 2001; Coupet & Barnum, 2010; Johnes, 2006; Thanassoulis, Kortelainen, Johnes, and Johnes, 2011).

Technical efficiency in higher education. During the 2000s, scholars in the United Kingdom and Australia explored technical efficiency in order to improve efficiency in teaching or resource utilization among different university campuses (Avikiran, 2001; Johnes, 2006; Thanassoulis, Kortelainen, Johnes, and Johnes, 2011). In the United States, Coupet and Barnum (2010) examined technical efficiency in PWIs and HBCUs, finding that HBCUs are just as efficient as PWIs. These limited applications of technical efficiency should be expanded to meet the current demands of the higher education environment in the United States today.

Epilogue

The purpose of this research was to examine a phenomenon of high achievement with resource constraint, or demonstrations of technical efficiency, among HBCUs as a means of solving the problems of increased demand of output and decreasing revenue facing the larger higher education community. The high levels of achievement HBCUs have attained with fractional funding provided an opportunity to explore technical efficiency. These explorations yielded policy and practice helpful to the entire higher education community, and certainly the HBCU community. The research following this introduction evaluated the current HBCU finance policy, the extent to which HBCUs are efficient producers of educational outcomes, and explored the relationships between resource allocation and student outcomes.

References

- Allen, W. (1992). The color of success: African-American college student outcomes at predominantly White and historically Black public colleges and universities. *Harvard Educational Review*, 62(1), 26-45.
- Allen, W. R., Jewell, J. O., Griffin, K. A., & Wolf, D. S. S. (2007). Historically Black colleges and universities: Honoring the past, engaging the present, touching the future. *The Journal of Negro Education*, 263-280.
- Archibald, R. B., & Feldman, D. H. (2012). The anatomy of college tuition. *The American Council on Education*, 1.
- Arroyo, A. T., & Gasman, M. (2014). An HBCU-based educational approach for Black college student success: Toward a framework with implications for all institutions. *American Journal of Education*, 121(1), 57-85.
- Avkiran, N. K. (2001). Investigating technical and scale efficiencies of Australian universities through data envelopment analysis. *Socio-Economic Planning Sciences*, 35(1), 57-80.
- Boland, W., & Gasman, M. (2014). America's Public HBCUs: A Four State Comparison of Institutional Capacity and State Funding Priorities.
- Brady, K., Eatman, T., & Parker, L. (2000). To have or not to have? A preliminary analysis of higher education funding disparities in the post-Ayers v. Fordice era: Evidence from critical race theory. *Journal of Education Finance*, 25(3), 297-322.
- Brown, W. A., & Burnette, D. (2014). Public HBCUs' financial resource distribution disparities in capital spending. *The Journal of Negro Education*, 83(2), 173-182.

- Carnevale, A. P., Jayasundera, T., & Gulish, A. (2016). America's Divided Recovery: College Haves and Have-Nots. *Georgetown University Center on Education and the Workforce*. Retrieved from <https://cew.georgetown.edu/wp-content/uploads/Americas-Divided-Recovery-web.pdf>
- Coleman, J. S., Campbell, E. Q., Hobson, C. J., McPartland, J., Mood, A. M., Weinfeld, F. D., & York, R. (1966). Equality of educational opportunity. *Washington, DC*, 1066-5684.
- Coupet, J., & Barnum, D. (2010). HBCU efficiency and endowments: An exploratory analysis. *International Journal of Educational Advancement*, 10(3), 186-197.
- Davis, J. E. (1998). Cultural capital and the role of historically Black colleges and universities in educational reproduction. *African American culture and heritage in higher education research and practice*, 143-153.
- Gasman, M. (2010). Comprehensive funding approaches for historically Black colleges and Universities: A policy brief. *Philadelphia: University of Pennsylvania, Graduate School of Education & North Carolina Central University*. Retrieved from http://repository.upenn.edu/gse_pubs/331
- Gasman, M. (2013). The changing face of historically Black colleges and universities. *Philadelphia, PA: Center for Minority Serving Institutions, University of Pennsylvania*.
- Gurin, P., Dey, E., Hurtado, S., & Gurin, G. (2002). Diversity and higher education: Theory and impact on educational outcomes. *Harvard educational review*, 72(3), 330-367.
- Farrell, M. J. (1957). The measurement of productive efficiency. *Journal of the Royal*

Statistical Society. Series A (General), 120(3), 253-290.

Fryer, R. G., & Greenstone, M. (2007). *The causes and consequences of attending historically Black colleges and universities* (No. w13036). National Bureau of Economic Research.

Harper, S. R., Patton, L. D., & Wooden, O. S. (2009). Access and equity for African American students in higher education: A critical race historical analysis of policy efforts. *Journal of Higher Education*, 80(4), 389-414.

Hodge-Clark, K., & Daniels, B. D. (2014). Top Strategic Issues Facing HBCUs, Now and into the Future. *Association of Governing Boards of Universities and Colleges*.

Humphreys, J. (2017). HBCUs Make America Strong: The Positive Economic Impact of Historically Black Colleges and Universities. Washington, DC: UNCF Frederick D. Patterson Research Institute.

Jencks, C. (1972). Inequality: A reassessment of the effect of family and schooling in America.

Jett, C. C. (2013). HBCUs propel African American male mathematics majors. *Journal of African American Studies*, 17(2), 189-205.

Johnes, J. (2006). Data envelopment analysis and its application to the measurement of efficiency in higher education. *Economics of Education Review*, 25(3), 273-288.

Kim, M. M. (2002). Historically Black vs. White institutions: Academic development among Black students. *The Review of Higher Education*, 25(4), 385-407.

Kim, M. M. (2011). Early career earnings of African American students: The impact of attendance at historically Black versus White colleges and universities. *The Journal of Negro Education*, 505-520.

- Kim, M. M., & Conrad, C. F. (2006). The impact of historically Black colleges and universities on the academic success of African-American students. *Research in Higher Education*, 47(4), 399-427.
- Lee, J. M., & Keys, S. W. (2013). Land-grant but unequal: State one-to-one match funding for 1890 land-grant universities. *APLU Office of Access and Success publication*, (3000-PB1).
- López, G. R. (2003). The (racially neutral) politics of education: A critical race theory perspective. *Educational Administration Quarterly*, 39(1), 68-94.
- Ma, J., Pender, M., & Welch, M. (2016). Education Pays 2016: The Benefits of Higher Education for Individuals and Society. Trends in Higher Education Series. *CollegeBoard*.
- Minor, J.T. (2008). Contemporary HBCUs: Considering institutional capacity and state priorities. A research report. Michigan State University, College of Education, Department of Educational Administration. East Lansing, MI. Retrieved from: <http://www.msu.edu/~jtminor/>
- Museus, S. D., Palmer, R. T., Davis, R. J., & Maramba, D. (Eds.). (2011). *Racial and Ethnic Minority Student Success in STEM Education: ASHE Higher Education Report, Volume 36, Number 6*. John Wiley & Sons.
- Nichols, A., & Evans-Bell, D. (2017). A look at Black student success: Identifying top- and bottom-performing institutions. *A report for The Education Trust*. Retrieved from <https://edtrust.org/resource/black-student-success/>.
- Office of Management and Budget (2017, March). *America First: A Budget Blueprint to Make America Great Again*. Retrieved from:

https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/budget/fy2018/2018_blueprint.pdf

- Palmer, R. T., Davis, R. J., & Hilton, A. A. (2009). Exploring challenges that threaten to impede the academic success of academically underprepared Black males at an HBCU. *Journal of College Student Development*, 50(4), 429-445.
- Palmer, R. T., Davis, R. J., & Maramba, D. C. (2010). Role of an HBCU in supporting academic success for underprepared Black males. *Negro Educational Review*, 61(1-4), 85.
- Palmer, R. T., Davis, R. J., & Thompson, T. (2010). Theory meets practice: HBCU initiatives that promote academic success among African Americans in STEM. *Journal of college student development*, 51(4), 440-443.
- Palmer, R., & Gasman, M. (2008). "It takes a village to raise a child": The role of social capital in promoting academic success for African American men at a Black college. *Journal of College Student Development*, 49(1), 52-70.
- Perna, L. W. (2001). The contribution of historically Black colleges and universities to the preparation of African Americans for faculty careers. *Research in Higher Education*, 42(3), 267-294.
- Perna, L. W., Milem, J., Gerald, D., Baum, E., Rowan, H., & Hutchens, N. (2006). The status of equity for Black undergraduates in public higher education in the south: Still separate and unequal. *Research in Higher Education*, 47(2), 197-228.
- Rolle, A. (2004). Out with the old-in with the new: Thoughts on the future of educational productivity research. *Peabody Journal of Education*, 79(3), 31-56.

- Sav, G. T. (1997). Separate and unequal: State financing of historically Black colleges and universities. *The Journal of Blacks in Higher Education*, (15), 101-104.
- Sav, G. T. (2010). Funding historically black colleges and universities: Progress toward equality?. *Journal of Education Finance*, 35(3), 295-307.
- Sigritz, B. (2015). State Expenditure Report Summary: Examining Fiscal 2013-2015 StateSpending. Washington, DC: NASBO.
- Thanassoulis, E., Kortelainen, M., Johnes, G., & Johnes, J. (2011). Costs and efficiency of higher education institutions in England: a DEA analysis☆. *Journal of the Operational Research Society*, 62(7), 1282-1297.
- Thurgood Marshall College Fund (2015). Historically Black Colleges & Universities (HBCUs). [Online Image]. Retrieved March 21,2017 from <https://tmcf.org/about-us/our-schools/hbcus>
- United States v. Fordice*, 505 U. S. 717,112 S.Ct.2727 (1992)
- Verstegen, D. A., & King, R. A. (1998). The relationship between school spending and student achievement: A review and analysis of 35 years of production function research. *Journal of Education Finance*, 24(2), 243-262.
- Willie, C. V., & Cunnigen, D. (1981). Black students in higher education: A review of studies, 1965-1980. *Annual Review of Sociology*, 7(1), 177-198.
- Yosso, T. J., Parker, L., Solorzano, D. G., & Lynn, M. (2004). Chapter 1: From Jim Crow to affirmative action and back again: A critical race discussion of racialized rationales and access to higher education. *Review of Research in Education*, 28(1), 1-25

Chapter II

A Review of Current Higher Education Finance Policy: An HBCU Perspective

Introduction

The Higher Education Act of 1965 defines Historically Black Colleges and Universities (HBCUs) as institutions formed prior to 1964 with missions of educating Black Americans. Mainly formed in the South following the Civil War, HBCUs served as the only source of education for most Black Americans until the Civil Rights Act of 1964 extended desegregation laws to higher education (Allen, 1992; Gasman, 2010). De facto (by law) segregation ended with the Civil Rights Act of 1964, but de jure (not by law) segregation continued for more than almost three decades, making HBCUs the primary providers of higher education credentials for Black Americans through the 1990s (Harper, Patton & Wooden, 2009). The impact of HBCUs is often surmised as the creators of the Black middle class (Allen, Jewell, Griffin, & Wolf, 2007; Gasman, 2013).

Contemporary HBCUs represent 3% of institutions of higher education (Gasman, 2013), yet as higher education understands the importance of diversifying the student population, increasing numbers of Black students enroll in and attend other types of institutions (Brown & Burnett, 2014; Gasman, 2013; Minor, 2008). However, Black students attending HBCUs have greater rates of success, dropout at lower rates, are more involved on the campus, have more confidence, and reap the benefits of frequent mentoring by Black faculty (Palmer, Davis, & Hilton, 2009; Palmer, Davis, & Maramba, 2010; Palmer & Gasman, 2008).

HBCUs remain a top producer of educational outcomes for Black Americans. Among institutions serving similar proportions of students from low socio-economic

backgrounds, HBCUs have higher Black student graduation rates (Ma, Pender, & Welch, 2016). In today's workforce, an overwhelming proportion of Black judges, members of Congress, professors, and attorneys attended HBCUs (Thurgood Marshall College Fund, 2015). Furthermore, disproportionate numbers of HBCU graduates continue on to earn graduate degrees in STEM fields (Burrelli & Rapoport, 2008; Upton & Tanenbaum, 2014). Remarkably, HBCUs achieve this success in a higher education environment still riddled with racism and dominated by privilege, most strikingly demonstrated by the disparities in funding allocated to HBCUs and other types of institutions (Minor, 2008; Sav, 1997, 2010).

Public HBCUs receive financial support from both the federal and state government, and both systems give preferential treatment to predominantly white institutions (PWIs) (Arroyo & Gasman, 2014; Harper, Patton, & Wooden, 2009; Roebuck & Murty, 1993). Recent budget decisions made by the Trump administration significantly disenfranchise HBCUs by cutting federal programs for low-income students (Office of Management and Budget, 2017), an important population of the student body served by HBCUs. At the state level, higher education funding policies fund HBCUs at lower rates than other institutions and often first reduce HBCU allocation during economic downturn (Boland & Gasman, 2014; Brady, Eatman, & Parker, 2000; Brown & Burnette, 2014; Gasman, 2010; Lee & Keys, 2013; Minor, 2008; Sav, 1997, 2010; Sigritz, 2015).

The history, student population, educational approach, outcomes, and resources of HBCUs are distinctly different from other American institutions of higher education (Arroyo & Gasman, 2014). This distinction warrants research performed from the lens of HBCUs, as their uniqueness limit the applicability of findings resulting from study of

other institutions. Acknowledging this difference and the limitation of previous research, Arroyo and Gasman (2014) developed the *HBCU-based educational approach for Black college student success*, a framework constructed with the intention of extending higher education research to HBCUs. This research provides an extension of higher education policy analyses historically performed from the lens of predominantly white institutions to the HBCU community by using this framework to review funding policy from the lens of the HBCU.

This qualitative document analysis sought to understand the higher education funding policy in states that operate HBCUs and to determine to what degree they reflect an HBCU ethos.. This study answered two research questions:

- 1) What is the nature of higher education funding policy in the states that operate public HBCUs?
- 2) In what ways do state higher education funding policies reflect the HBCU-specific educational approach?

Utilizing thematic analysis (Boyatzis, 1998) and directed content analysis, (Hsieh & Shannon, 2005), this study explored the current state higher education finance policies specifically as they relate to HBCUs. Thematic analysis provided an inductive approach to understand the major themes common to higher education funding policy in states operating HBCUs. Directed content analysis, guided by the *HBCU educational approach to Black student success* (Arroyo & Gasman, 2014), provided an opportunity to understand the ways in which higher education funding policy is aligned to support the student population, institutional characteristics, student services, instruction, and outcomes specific to HBCUs.

This study contributes to the higher education funding policy literature by extending previous policy research to the HBCU community. Findings from this study can inform state funding allocation decisions to best reflect an HBCU ethos. Next, the literature review section provides a historical review of HBCUs and describes current HBCU funding policies. A discussion of methods follows. Finally, the paper concludes with a discussion of results and implications for policy and practice.

Literature Review

The following literature review contains two components: a historical review of HBCUs and a review of HBCU finance policy.

History of Historically Black Colleges and Universities (HBCUs)

During the mid-1800s, higher education in America was experiencing a period of rapid growth, largely supported with governmental land grants for expansion into all states (Morrill Act of 1862). Unfortunately, that expansion was generally exclusive of Black Americans. Prior to the Civil War, slavery and strictly enforced social customs hindered the education of Black people by prohibiting them from being taught to read and write (Allen & Jewell, 2002; Browning & Williams, 1978). Though strictly prohibited in the slave-holding states of the South, a select few White institutions in the North were leading the slow-spreading realization of the injustice of slavery and allowing Black students to attend as early as the mid-1800s. After the Civil War, education of free Black people slowly expanded in the North, but education of former slaves was quite different in the South.

Reconstruction. In the South, the war extensively damaged or completely destroyed most colleges and universities. Those institutions that did remain held firm to

beliefs that education should be preserved for the majority class. Many southern conservatives perceived the higher education of freed slaves as a threat to White supremacy (Allen & Jewell, 2002). However, southern Whites still needed a stable, skilled labor force to finish the reconstruction of the South after the war (Jones & Weathersby, 1978; Allen & Jewell, 2002). This led to a compromise between the desires of Northern philanthropist and missionaries to educate freed slaves and the South's resistance to education, but need for a work force. The North would provide both federal and philanthropic support for southern schools dedicated to providing an industrial education to freed slaves to prepare them for the vocations necessary for reconstruction (Jones & Weathersby, 1978). The repercussions of the limitation of Black higher education to vocational or industrial education are still present in the gaps in advanced degree attainment between Black and White members of the workforce.

Industrial education and the “talented tenth.” The model for Black industrial education was Hampton Institute (1869), founded as an alternative to classical education for freed slaves and their descendants in Virginia. The Hampton Institute, later renamed Hampton University, provided a structured and labor-intensive daily life to assist freed slaves in the early stages of assimilation into society (Jones & Weathersby, 1978).

A graduate of Hampton Institute, Booker T. Washington built on Hampton's successful model to build Tuskegee Institute in 1881 (Jones & Weathersby, 1978). The success of the Hampton and Tuskegee models, coupled with the extension of the Morrill Act of 1890 to Black colleges and universities providing instruction in agriculture and mechanics, further supported industrial education and sparked growth of state-supported technical and industrial colleges in the south (Allen, & Jewell, 2002).

In opposition to industrial education as the only avenue to higher education for Black citizens was W.E.B. Dubois. Dubois argued that freed slaves and their descendants were amply capable, and a “talented tenth” percentile should be educated to lead Black citizens as doctors, lawyers, teachers and politicians in the same manner White citizens received higher education. Washington and Dubois influenced early curricula at HBCUs, resulting in a mix of the classical higher education liberal arts and industrial education courses (Browning & Williams, 1978).

The passage of the Morrill Act of 1890, the predecessor to the Morrill Act of 1862, sparked more rapid development of HBCUs. The second iteration of the Morrill Act prohibited funds to flow to state education systems that considered race in admissions policies without offering an alternative education for Black students (Lee & Keys, 2013). Rather than open admissions of historically White institutions, many Southern and border states chose to offer a separate state university for Black students, thus the formation of 19 land-grant state universities for Black students (Lee & Keys, 2013).

Separate but equal. Funding provided by White-dominated state government and philanthropy in the 1890s influenced the development of Black schools into technical schools (Allen, & Jewell, 2002). Policies to limit growth of Black education and channel it into vocational schools written in support of these technical schools were only solidified by the 1896 United States Supreme Court decision in *Plessy v. Ferguson* (Browning & Williams, 1978). The Supreme Court allowed the segregation of Black and White students to be constitutional, as long as the provision was equal for both groups. In practice however, though the separation was mandated, the equal opportunity was not.

Many colleges and universities continued to educate White students and directed the education of Black students to vocational schools. Education served as a mechanism of social control, attempting to subjugate Black people as the disciplined labor force (Browning & Williams, 1978).

Desegregation. HBCUs, responsible for 90% of degrees awarded to Black and African American students, remained the dominant opportunity for higher education until the 1954 U.S. Supreme Court case *Brown v. Board of Education* (Harper, Patton, & Wooden, 2009). Brought to trial by African Americans affiliated with the National Association for the Advancement of Colored People (NAACP) unsatisfied with the discriminatory, racist policies that underfunded the education of Black students making it certainly unequal to White education, the court dismantled the segregation of public schools. *Brown v. Board of Education* (1954) involved the primary and secondary public education systems, and it was not until the Civil Rights Act of 1964 that desegregation reached higher education (Harper, Patton, & Wooden, 2009; Roebuck & Murty, 1993).

Official recognition. The Higher Education Act of 1965 officially recognized HBCUs as institutions formed prior to 1964 with missions of educating Black Americans. Though the first federal funding distributed to institutions serving Black students came from the Freedman's Bureau following the Civil War, programmatic federal funding of HBCUs was not established until Title III, part B of the Higher Education Act of 1965 was passed to assist HBCUs with facility and academic costs (Gasman, 2010). After more than 30 years of federal recognition, in 1989, President Reagan appropriated \$100 million for HBCU funding in Title III Part B, the first appropriation made for HBCUs (Harper, Patton, & Wooden, 2009).

Federal HBCU Funding Policy 1965-2017

A total of seven Executive Orders recognizing the accomplishment and importance of HBCUs have been signed by the then sitting President, beginning with President Carter in 1980. President Carter signed an Executive Order to provide some additional funding to HBCUs to compensate for discriminatory treatment of Black students at PWIs (Harper, Patton, & Wooden 2009). Unfortunately, Executive Orders do not provide guaranteed funding for HBCUs and are easily overturned by the following president without congressional approval. Executive Orders signed by President Carter in 1980 and President Bush in 1989 provided the only opportunity for additional funding for HBCUs until President Obama's White House Initiative on HBCUs began in 2009 (Gasman, 2010; U.S. Department of Education, 2016).

Recent history. The Obama administration invested more than \$4 billion in support of HBCUs. Though the funding was heavily leveraged with increased accountability, President Obama increased funding for HBCUs by increasing direct HBCU funding in Title III and increasing federal student aid programs, which resulted in over \$300 million additional Pell Grant dollars to HBCUs (U.S. Department of Education, 2016). Some of the funding provided by President Obama was criticized for the accountability requirements attached, but funding presented opportunity for infrastructure expansion and opportunity for the most successful HBCUs to be featured in federal publications like *Fulfilling the Promise, Serving the Need*, a report exhibiting the programs best serving Pell Grant students (U.S. Department of Education, 2016).

In 2017, the Trump administration abruptly interrupted this platform for recognition and support. Though Trump signed an Executive Order recognizing the

importance of HBCUs like the seven presidents before him, his budget stifled growth and inhibited progress. Trump's budget maintained previous levels of funding for HBCUs without additions for growth and significantly reduced federal student aid programs, a major source of funding for HBCUs (Office of Budget and Management, 2017).

Unfortunately, state allocation for HBCUs is not a place for institutions to find reprieve from decreasing federal funds.

HBCU State Allocation Inequity

Academic literature documents the inequities between HBCU and PWIs funding. Assessing the disparities in funding between HBCUs and PWIs, Brady, Eatman, and Parker (2000) documented the increasing gap in expenditures between the two types of institutions from 1974 through 1994. The authors noted the increases in expenditure at HBCUs were at a significantly slower pace than the increases at PWIs from the 1970s through the 1990s (Brady, Eatman, & Parker, 2000).

Sav (1997) documented the vast differences between state HBCU and PWI funding policy among fifteen states by comparing the different revenue streams of each type of institution. He found that when examined on a per student basis, HBCUs generally relied more heavily on federal grants and appropriations (including federal student aid programs) and less on tuition than PWIs (Sav, 1997). The largest amount of intrastate variation existed in state appropriation. Sav (1997) highlighted Pennsylvania, where HBCUs received roughly three times the funding per student than PWIs, contrasted with Tennessee, where the reverse was true.

After accounting for institutional differences and productivity variation in 1995 Integrated Postsecondary Education Data System (IPEDS) data, Sav (2000) found 17% of

the discrepancy between HBCU and PWI state allocation was due to fiscal discrimination against HBCUs- states were actively choosing to provide more funding to PWIs.

Following up on progress toward equality ten years later using 2006 IPEDs data, Sav (2010) confirmed again that HBCUs receive less state and federal allocation than PWIs and found that only 13% of the discrepancy between HBCUs and PWIs was based upon discriminatory fiscal practices. In the follow up study, Sav (2010) found some key relationships between revenue streams that additionally disadvantaged HBCUs.

Increasing endowment proved to decrease state funding for HBCUs, while the opposite was true for PWIs, and federal funds positively impacted state funds- another disadvantage for HBCUs that have historically struggled to receive federal research grants (Sav, 1997; 2010).

The Association of Public and Land-Grant Universities has documented recent disparities in funding between the 18 HBCU land-grant universities and other land-grant universities (Lee & Keys, 2013). Unlike state land-grant matching funds for PWIs, states have repeatedly failed to meet the one-to-one match of federal dollars for the 18 HBCU land-grant institutions. Between 2010 and 2012, the states' failures to meet one-to-one matching cost these 18 schools more than \$56 million (Lee & Keys, 2013).

Considering the historical denial of resources awarded to PWIs, Brown and Burnette (2014) confirm capital investment disparities among HBCUs and PWIs between 2002 and 2010 and point to policy and practice that further inhibits equity for HBCUs. First, the fiscal stability of HBCUs is directly tied to the economic health of the state and second, state allocation for HBCUs is often not tied to enrollment, as is the case for most PWIs (Brown & Burnette, 2014). Confirming these findings with an HBCU policy

analysis in four states, Bowman and Gasman (2014) also found HBCUs to be one of the first appropriations reduced in times of economic downturn.

The history of HBCU foundational policy has been attributed for the disparities in funding that exist between HBCUs and other institutions. Missing from published literature is a contemporary review of state higher education funding policy and its support of HBCUs. The purpose of this qualitative document analysis was to understand the higher education funding policy financing HBCUs and to determine to what degree higher education funding policy reflects an HBCU ethos. The following sections detail the methodology and methods conducted for this analysis.

Methodology

This research employs a qualitative approach to accomplish the goal of understanding the policy from a particular perspective (Vaismoradi, Turunen, & Bondas, 2013). In this research, the nature of higher education policy and the alignment of that policy to HBCU-specific framework are primary questions. Document analyses best answers these questions are by evaluating the Executive Budgets published by each state's Governor's office.

Document Analysis

By analyzing documents, this qualitative study is able to convey the nature of higher education policy and also examine the policy from the lens of HBCUs. Document analysis provides a systematic means of evaluating the content and context surrounding policy (Bowen, 2009). Familiarization with the Executive Budgets occurred after gathering the Executive Budget documents to 1) understand the general layout and information conveyed in the document 2) locate the higher education funding policy

within the Executive Budget; 3) understand the policy underlying the document. The purpose of this step in the document analysis is to make sense of the data and to understand the dataset as a whole (Elo & Kyngäs, 2008).

Data. The purpose of this qualitative document analysis was to understand the higher education funding policy financing HBCUs and to determine to what degree higher education funding policy reflects an HBCU ethos. The data analyzed for this research were the state Executive Budgets of states operating at least one public, 4-year HBCU. For each state's policy, the Governor's office publicly releases the final budget adopted by the state government following each legislative session. Each office releases an Executive Budget, a document describing the goals and objectives of each state entity or agency funded by the legislature and the descriptions and funding amounts for each allocation. Because Executive Budgets are the product of legislation, and different states have different legislative schedules, so this research analyzed the most recent Executive Budget posted as of March 2018. Appendix A lists the document name and release date for each state Executive Budget reviewed. Executive Budgets were downloaded from the Governor's office website for each state in which an HBCU operated saved to a drive dedicated to this research paper.

The Executive Budgets were chosen over the actual state law and administrative policy as they provide not only credible, factual information about the policy, but also the goals of the policy. The Executive Budgets provide opportunity to examine the multiple pieces of higher education policy providing funding to HBCUs in one comprehensive document. The Executive Budgets often provide context describing the goal and history

of higher education funding, a meaningful contribution to the thematic and content analyses. The following section discusses methodology guiding this research.

Methods

Thematic analysis and directed content analysis provided answers to the two questions this qualitative document analysis sought to answer. The following section independently explains the two analyses and concludes with discussions of researcher positionality and trustworthiness.

Thematic Analysis

Thematic analysis is a qualitative data reduction technique that searches for patterns and relationships in order to convey major concepts in a data set (Given, 2008). In this study, thematic analysis is employed to understand the nature of higher education funding policy for HBCUs. The thematic analysis of higher education funding policy resulted in a description of the themes uniting the higher education policy of states operating public HBCUs.

Analytic Approach

After familiarization occurred by reading each of the higher education funding policy documents several times, the researcher heuristically identified promising ideas of importance (Boyatzis, 1998; Givens, 2008). The primary coding of documents generated 16 different promising ideas, including mentions of *workforce development*, *high demand degrees*, *economic growth*, *capped tuition growth*, *research initiatives*, *student advising*, and *family burden*. Comparing ideas conveyed within and among Executive Budgets, regrouping promising ideas identified yielded eight coding categories (Givens, 2008). For example, the category *specific workforce need* was developed after combining *high*

demand degrees, specific workforce needs, and local business collaboration promising ideas. Once coding categories were developed, the text coded within each category was reviewed, reorganized, and reviewed again as themes began to be developed. The theme *workforce development goals* was created by combining categories of *specific workforce need, economic growth/stimulus, and workforce*. Altogether, four themes were constructed from the thematic analysis.

Directed Content Analysis

Directed content analysis is a particular qualitative analytical method with a goal of providing an extension of an existing theory to an additional discipline (Hsieh & Shannon, 2005). Directed content analysis extends the HBCU-specific framework to higher education finance policy. This research selected directed content analysis because it is an unobtrusive and efficient method that allows the researcher to overlay an HBCU-specific lens on finance policy of all states operating public HBCUs (Hsieh & Shannon, 2005). Specifically, the HBCU educational approach to Black student success analytic framework guided the deductive approach (Arroyo & Gasman, 2014).

Analytic Approach

This research conducted the directed content analysis in in two phases (Hsieh & Shannon, 2005). First, the Executive Budgets were coded by highlighting the documents to identify any instances of the codes, using a different color for each code. The second phase of analysis involved providing exemplars of the coded document in order to describe the nuanced language in the policy reflective of the codes derived from HBCU-specific theoretical framework (Hsieh & Shannon, 2005). In total, five instances of specific mentions of HBCUs, 27 occurrences of Diverse Applicant Population, 52

references to Institutional Entry Point, 46 instances of Reciprocal Process and Outcomes, and 57 occurrences of Grand Outcomes were coded in Executive Budgets.

Analytic Framework

Whereas the thematic analysis to understand the nature of higher education funding policy is inductive in approach, the analytic framework *HBCU-based educational approach for Black college student success* constructed by Arroyo and Gasman (2014) guides the directed content analysis. The purpose of employing this particular analytic framework is to focus the study specifically on HBCUs, and to provide vernacular, and situate the research in a scholarly context (Given, 2008). This study bridges three different disciplines: finance, education, and HBCUs. The *HBCU-based educational approach for Black college student success*, referred to as the *HBCU-specific framework* for brevity, provides a point of reference to limit this study of finance policy to HBCU-educational approach.

Overview. Synthesizing decades of HBCU literature, Arroyo and Gasman (2014) developed a framework to convey the particular student population, educational approach, and student outcomes of HBCUs. Citing the limitations of existing higher education success models as historically grounded in Predominantly White Institutions (PWIs), Arroyo and Gasman assert rigorous study of HBCUs is necessarily grounded in an HBCU-specific framework (Arroyo & Gasman, 2014).

“No higher educational model that was founded upon, draws from, or perpetuates Eurocentric power or privilege is capable of adequately serving historically marginalized populations.” (Arroyo & Gasman, 2014, p. 61)

Figure 1 illustrates the four major components of the HBCU-specific framework:

1) Diverse Applicant Population; 2) Institutional Entry Point; 3) Reciprocal Processes and Outcomes; and 4) Grand Outcome.

Figure 1: HBCU-based framework for Black student success (Arroyo & Gasman, 2014)

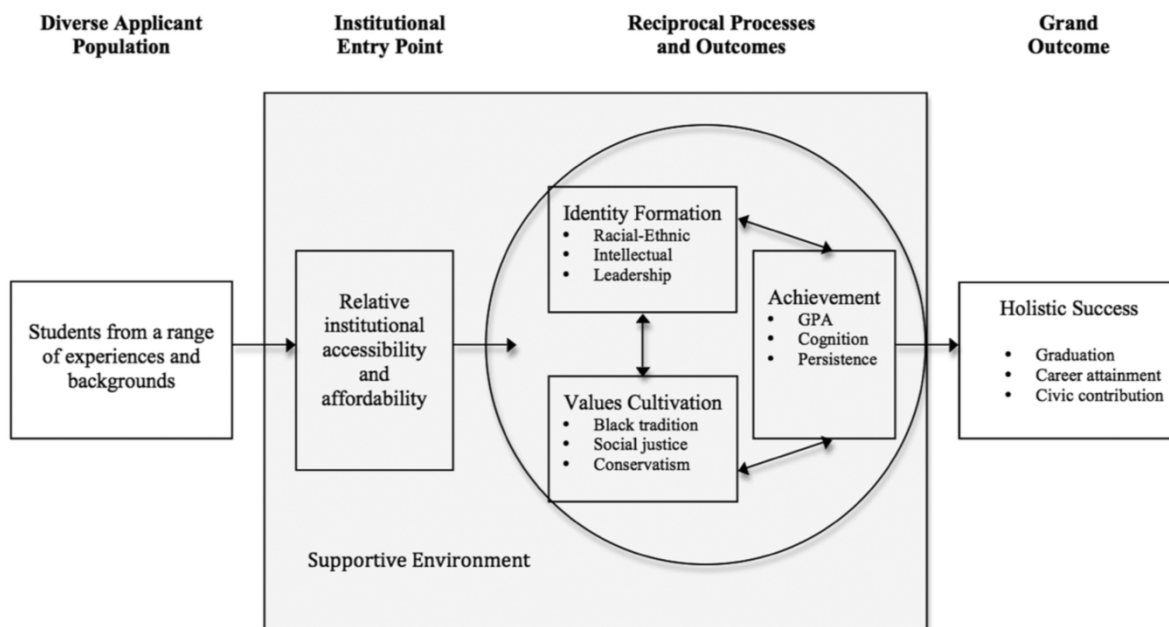


FIG. 1.—Conceptual model: an HBCU-based educational approach for black college student success

Diverse Applicant Population acknowledges the minority and low-income student population that attends HBCUs at much higher rates than other institutions. Within the student population attending HBCUs, there exists a wide range of ability, experience and background that contribute to the diversity of the students.

Institutional Entry Point highlights the barriers of cost and preparedness that HBCUs often remove to increase access to higher education. The Institutional Entry Point component of the HBCU-specific framework reflects the preserved mission of affordability and access, and the sentiment of providing a reasonably-priced education

that meets the student where they are at many HBCUs. HBCUs have implemented this mission with open or relaxed admissions policies and tuition less expensive than PWI peers.

Reciprocal Processes and Outcomes are the means by which HBCUs support and monitor the progress of students. Grand Outcomes are the end results of higher education. Reciprocal Processes and Outcomes encompasses Identity Formation, Values Cultivation, and more traditional Achievement outcomes like grade point average and persistence. By providing a supportive environment to develop Black college students holistically, HBCU students have been able to demonstrate a wide array of success both while in attendance and after graduation (Arroyo & Gasman, 2014). The second and third components of the framework, Institutional Entry Point and Reciprocal Processes and Outcomes, are rooted in a Supportive Environment, a key tenet of the success of HBCU students, according to Arroyo and Gasman (2014).

The Holistic Success of students is the fourth component of the framework. Holistic Success refers to successes accomplished during and after graduation. Graduation, career attainment and civic contributions are three examples of the student success resulting from the HBCU-specific approach to educational success illustrated by Arroyo and Gasman (2014). The four components of the HBCU-specific framework guide this study as it analyzes the higher education funding policy.

Operationalizing Constructs. Arroyo and Gasman's (2014) HBCU-specific framework guides the directed content analysis conducted in this research. In order to understand the current state of higher education funding and in what ways it reflects the

HBCU-specific framework, higher education funding policies were analyzed using codes constructed from the major components of the HBCU-specific framework.

The major components of the HBCU-specific framework were operationalized from Arroyo and Gasman's (2014) discussion of the framework.

HBCU. This code indicates specific mentions of HBCUs as an educational institution, or specific mentions of HBCUs by name.

Diverse Applicant Population. This code signifies the demographic make-up of enrolled students. Text coded here would include references to increasing the proportion of low income or African American students in higher education.

Institutional Entry Point. This code connotes the accessibility and affordability of HBCUs. Accessibility means the ability of students to apply to and be accepted into institutions, regardless of experience or background. Affordability refers to the ability of students to pay for the total cost of attendance of an institution, including tuition and fees charged by institutions. Text coded here would include allocations provided for institutional support to students (housing and low tuition prices) and for institutions to support students in applying for college. Importantly, direct state allocations to students in the form of financial aid or scholarships were not coded, as they do not represent an allocation to the institution.

Reciprocal Processes and Outcomes. This code encompasses the means by which HBCUs support students to achieve Grand Outcomes. This would include reference to supports for student services, faculty, instructional methods, or milestones used to monitor overall progress toward the Grand Outcomes. The focus of this code is the mean of achieving the Grand Outcome, not the outcome itself.

Grand Outcomes. Text coded for Grand Outcomes will make reference to student success in graduation, career attainment or civic engagement. This code designates specifically the outcome, and not the means of achieving the outcome, which was coded as a Reciprocal Process and Outcome. State goals of labor market outcomes, the proportion of the population attaining a higher education credential are examples of text coded under Grand Outcome.

Limitations

The directed content analysis approach to qualitative analysis presents some limitation. Generally, the researcher is more likely to find instances of support for a particular theory using this method because of the bias inherently present with the use of a predetermined theory (Hsieh & Shannon, 2005). Additionally, because the higher education finance policy was studied only from the lens of HBCUs, the findings are constrained to the HBCU community.

Furthermore, not all components of the HBCU-specific framework were directly applicable to state funding policy. The HBCU-specific framework presents a holistic representation of an HBCU-educational approach, most of which are institutional decisions and initiatives that would not be represented in funding policy. For example, the support provided to HBCU students in identity formation and values cultivation Arroyo and Gasman (2014) assert are specific to HBCU institutions are not expected to be reflected in statewide funding policy for higher education. The four components of the framework were applied as appropriate to state-level policy.

Researcher Positionality

The researcher conducting this analysis of higher education finance policy has connections to the higher education finance and HBCU communities. A student of higher education finance and efficiency, the researcher has previously studied the ways in which states allocate funds and has professional experience in state-level education funding policy. Early in the education policy career, the researcher obtained a teaching certificate from a public, 4-year HBCU and describes the affordability, access, and experience in a positive light. The researcher's general advocacy for efficiency in state government intersects with support for social justice in this research.

Trustworthiness

Methods for improving trustworthiness (credibility, dependability, confirmability, and transferability) suggested by Lincoln and Guba (1985) preserved the trustworthiness of the results of this content analysis. Two primary activities: careful documentation of data analysis and thorough external validation from a peer debriefer (Creswell, & Miller, 2000) ensured the preservation of trustworthiness. Careful documentation of the directed content analysis was ensured by creating an audit trail that included the list of policy documents provided in Appendix A, the highlighted policy documents from the first phase of coding, and a matrix of documented exemplars. Another factor that increased trustworthiness was the number of documents coded. The thematic and the content analyses reviewed 20 different Executive Budgets, one from each state that operates a public HBCU. Concluding results from a larger sample size provided power to the analysis.

The researcher explained and discussed the operationalized terms and the process of matrix development with a peer-researcher familiar and experienced with higher

education qualitative research. This ensured the credibility of the coding process. The peer debriefer also coded a sample of five Executive Budgets to ensure the confirmability and dependability of the first phase of analysis. The researcher also discussed exemplars and findings with the peer-debriefer to ensure confirmability and dependability of the second phase. Carefully operationalizing terms and describing the HBCU lens used to evaluate the policy in this analysis ensured transferability of research findings.

Findings

The 40 four-year public HBCUs are located in 19 states, the District of Columbia, and the United States Virgin Islands. The map in Figure 2 indicates the locations of public HBCUs.

Figure 2: Map of Public 4-year HBCUs. Red dots indicate Land Grant institutions, Blue dots indicate Non-Land Grant institutions.



Originally funded by the Morrill Act of 1890, 18 of the institutions are Land Grant institutions. Red dots on the map in Figure 3 signify the Land Grant institutions.

This qualitative analysis was conducted of the higher education funding policy communicated in the Executive Budgets of each of the 19 states, District of Columbia, and United States Virgin Islands. Appendix A lists the Executive Budget document name, publication date, and fiscal year for each document. The thematic analysis and the directed content analysis reviewed all Executive Budget documents, with the exception of Alabama's Executive Budget².

Thematic Analysis

The purpose of the thematic analysis was to understand the nature of higher education funding policy in states that operate public HBCUs. The thematic analysis yielded four main themes discussed in the following paragraphs.

Workforce development goals. Executive Budgets often opened with the stated goals of the system of higher education in the state. Many of these goals directly referenced workforce development as a desired outcome of higher education. Texas' goal of having 60% of Texans in the workforce with a postsecondary credential by 2030 is an example of a goal specifically referencing the workforce. Some states, like South Carolina, targeted a specific need for a particular post-secondary credential and set goals for the higher education system aligned to providing members of the workforce with particular credentials. The Missouri Budget mentioned a specific workforce need for the state's fiscal health:

² Alabama's Executive Budget document contained no text, so no coding was performed.

Missouri's higher education institutions play a critical role in supplying the skilled workers necessary to stimulate economic growth in the state (p.3-1).

Executive Budgets also addressed workforce development with programming aimed at job placement for higher education graduates. Tennessee's Executive Budget included programming to collaborate with local businesses to ensure alignment of higher education to the skills necessary to contribute to the workforce of the state. Virginia provides funding to increase the number of degrees completed in high-needs areas. These high-need areas are determined with collaborations between the institutions of higher education and the local business community.

Unfunded mandates of affordability. Affordability was a theme occurring in Executive Budgets and expressed in the form of the burden of the cost of education, tuition regulation, and increased efficiency. Executive Budgets frequently contained references to reducing the financial burden of higher education on the student and on the student's family. Many states, like Virginia, acknowledged troubling trends of increased burdens on students and their families resulting from institutional increases in fees and tuition to offset limited allocations from the state.

In states where public institution tuition is regulated by the legislature, Executive Budgets included limitations on tuition increases and capped tuition. For example, in Florida, the Governor prohibited tuition increases of any kind. Maryland limited tuition in the Maryland Budget Highlights:

For the third year in a row, tuition growth at Maryland's public four-year institutions is held to 2 percent, helping to keep higher education affordable for Maryland taxpayers (p.14).

Other mentions of affordability put the burden of ensuring affordability on institutions without specific direction of mechanism by simply stating that higher education should be accessible to all students, regardless of socioeconomic status.

Innovative research solutions. In addition to preparing tomorrow's workforce, one of the goals of higher education present in funding policy was the investigations of research solutions to solve problems in industry. States provided programmatic funding for specific initiatives or campus-based research facilities. In Common Ground Solutions for North Carolina the Governor highlighted one University of North Carolina initiative:

Provides \$2 million in additional support to the UNC Research Opportunities Initiative, which funds innovative research projects in engineering, sciences, and technology (p.49).

Another institutions-specific example was found in The Governor's Budget Report in Georgia:

Georgia Tech Research Institute (GRTI) is a research component of the Georgia Institute of Technology. GRTI uses science and engineering expertise to solve some of the toughest problems facing government and industry across the nation and around the globe (p.238).

The Executive Budgets of some states included innovative research alongside workforce development as one of the goals of the higher education system. Many of these goals were specific to agriculture, STEM, or pharmaceutical innovations, and were essentially reflective of the needs of the

major industries in the state. Texas, a major agricultural state for example, made specific reference to institutional research supporting agricultural innovations.

Absence of HBCU-specific language. Positioned as a paper investigating higher education policy from an HBCU perspective, one major theme that was apparent after analysis of higher education funding policy is the absence of specific or general mention of HBCUs as contributors to the higher education community. Only three states (Pennsylvania, Kentucky, and Delaware) and the United States Virgin Islands mentioned HBCUs in their Executive Budget Documents. Kentucky's Executive Budget mentions specific HBCUs only in reference to a leased space for a veterinary program. Delaware and United States Virgin Islands' Executive Budgets included a summary of each institution, so HBCUs received no special attention. Pennsylvania was the only state to mention the contribution of the HBCU to the higher education community. The Executive Budget discussed a particular program that provided capital funds for HBCUs in order to increase access for African American students.

Directed Content Analysis

The purpose of the directed content analysis performed in this study was to understand the ways in which higher education funding policy reflected the HBCU-specific framework. The major constructs from the HBCU-specific framework were operationalized and used to guide the research as codes for analysis. The results of the directed content analysis are summarized then each construct of the framework that served as a code for the analysis is discussed independently.

To concisely display a summary of the directed content analysis, Table 1 contains the frequency of occurrence of each code in higher education funding policy. The

columns of the table represent each of the codes, developed from constructs in the HBCU-specific framework. Table 1 displays the coding for higher education funding policy for each state. The following section contains a discussion of each of the codes and exemplar text from higher education policy.

Table 1: Directed Content Analysis Frequency Coding

	HBCU	Diverse Applicant Population	Institutional Entry Point	Reciprocal Process and Outcomes	Grand Outcomes
Alabama	-	-	-	-	-
Arkansas	0	3	3	4	2
DC	0	0	0	0	0
Delaware	1	0	0	1	3
Florida	0	4	8	1	5
Georgia	0	0	1	1	3
Kentucky	1	4	1	4	1
Louisiana	0	0	2	3	4
Maryland	0	0	2	1	1
Mississippi	0	0	1	3	0
Missouri	0	2	4	0	1
North Carolina	0	0	2	1	0
Ohio	0	0	2	4	1
Oklahoma	0	0	2	3	8
Pennsylvania	2	2	4	3	8
South Carolina	0	1	1	0	1
Tennessee	0	4	2	3	1
Texas	0	0	1	6	8
Virginia	0	2	10	4	5
Virgin Islands	1	1	1	0	0
West Virginia	0	4	5	4	5
Total	5	27	52	46	57

HBCU. Only five times were specific mentions of HBCUs either as a type of educational institution or by name coded in all 20 higher education policy documents. Delaware, Kentucky, and the United States Virgin Islands made reference to HBCUs as an educational institution, and Pennsylvania's Executive Budget specifically mentioned the two HBCUs (Cheyney and Lincoln Universities) in the state as specific support for minority students. From Pennsylvania's 2018-2019 Governor's Executive Budget:

In 1996, the Pennsylvania Department of Education and the United States Department of Education, Office of Civil Rights, embarked on a cooperative agreement designed to assess and address the continued challenges in providing higher education opportunities for African American students. In addition to operating and capital support for Cheyney and Lincoln Universities in the 2018-19 budget, direct support of students is provided through support of the Bond-Hill Scholarship program and the Keystone Honors Academy at Cheyney University (p.E13-15).

Diverse applicant population. Ten of the 20 total Executive Budgets analyzed included reference to the demographics of higher education students. Executive Budgets mentioned low-income or students from low socio-economic backgrounds as student populations in need of financial support to succeed in higher education. From Arkansas' 2017-2019 Agency Request Budget Manuals:

The College Access Challenge Grant Program. (CACGP) is a Federal Program funded by the U. S. Department of Education. The project is designed to foster partnerships among government entities and philanthropic organizations to increase the number of underrepresented students who enter and remain in

postsecondary education. The purpose of this project is to encourage students and families to learn about, prepare for, and finance a postsecondary education. The project includes a statewide outreach effort that will provide tools that can be used on a long-range basis to help tell the story of the importance of higher education. A training program will also be developed for high school guidance counselors who are located in the poorest counties of Arkansas as a means to assist them in reaching out to children from economically disadvantaged families.

Executive Budgets frequently addressed increasing representation of African American students like in Kentucky's 2018-2020 Executive Budget:

The Governor's Minority Student College Preparation Program was established in 1988 to provide academic enrichment activities for middle school students, encourage them to stay in school and to enter college, to make young African-American students aware of the benefits and value of college and make them more likely to consider college as an achievable option, and to prepare these students to be successful in college-level work.

Tennessee's The Budget includes another example of a mention of African American students in the specific references to desegregation litigation remedies in Tennessee's The Budget:

Contract Education is a program through which Tennessee residents are enrolled in Tennessee's private colleges and universities to address special educational needs in the state. Also included in this program is minority teacher education, which provides services through public institutions that expand the recruitment pool of African-Americans preparing to teach in grades K-12. The program also

includes funds for the post-Geier desegregation settlement access and diversity initiative (p. B-108).

The Diverse Applicant Population code in this study was limited to text regarding institutional support for diversity in the student population. Several states funded scholarships and grants administered directly to students from diverse backgrounds to attend institutions, but text coded in this study was limited to the institutional finance policy providing direct institutional support. Programming to increase African American student enrollment stemming from desegregation litigation or legislation was a common source of finance policy regarding Diverse Applicant Populations, and indicative of the Civil Rights issues that continue to plague the southern United States.

Institutional Entry Point. All but two Executive Budgets analyzed were coded for affordability or access under Institutional Entry Point. Text coded for accessibility referred to the ability of students to apply to and be accepted into institutions, regardless of experience or background, and text coded for affordability refers to the ability of students to pay for the total cost of attendance of an institution, including tuition and fees charged by institutions. Virginia's 2018-20 Budget Recommendations for Higher Education in Virginia made the most references to affordability and access:

Funds should be distributed based on an allocation strategy tied to performance, such as student access, retention and graduation, number of high-demand degrees, percent of under-represented student enrollment and graduates, and other student success performance metrics. This funding approach favors outcomes and performance, and it provides targeted incentives to institutions to promote efforts to provide high value at an affordable price (p. 11).

Many higher education policy documents mentioned affordability as a burden on the student and student's family, as cited above for Virginia. Other Executive Budgets focused specifically on regulating tuition in order to keep costs of attendance low. From Governor Rick Scott's 2018-2019 Budget for Florida:

Governor Scott remains a strong advocate for affordable higher education.

Skyrocketing tuition rates and mountains of student debt are unfair burdens that no student should experience. That is why there are NO tuition increases in the Securing Florida's Future budget (p. 5).

Access was referenced generally, as increasing the number of higher education students, and also specifically, as directed efforts to increase representation of a particular population. Some higher education policy documents discussed access generally, as in the case of Pennsylvania's 2018-2019 Governor's Executive Budget:

To help ensure that Pennsylvanians have access to postsecondary credentials that can accelerate opportunity for individuals and families, Pennsylvania's postsecondary programs are aligned to the commonwealth's current and projected economic needs.

Reciprocal Processes and Outcomes. Text coded under Reciprocal Processes and Outcomes referred to the ways in which institutions support student success. Executive Budgets included specific programming aimed at improving student success, allocations to support faculty to instruct and mentor students, and partnerships with a variety of other state agencies and organizations.

Oklahoma's 2019 State of Oklahoma Executive Budget included specific programming to support students:

Selected as one of four states to receive a grant from the Lumina Foundation, in partnership with the State Higher Education Executive Officers Association, to develop and manage an "Adult Promise" program that assists adult students in earning a college degree (p. 103).

Ohio's Building for Ohio's Next Generation; Budget of the State of Ohio featured a partnership to aid the success of students:

Awarding Degrees and Certificates Based on Competency Instead of Just Classroom Time: Ohio's community colleges recently partnered with Western Governors University to provide a flexible option for adult learners. The multi-state, online institution awards college credit and degrees based on a student's demonstrated knowledge instead of just the amount of time spent in the classroom. To build upon that relationship, Ohio will now formalize Western Governors University (p. 2).

Finance policy coded under the Reciprocal Processes and Outcomes code provided means to achievement of the Grand Outcome. In this code, text identified programming created by the higher education governing bodies of the state to be implemented at all institutions throughout the state and also programming specific to one or more institutions. These different approaches express two different levels of autonomy in higher education funding allocation. Providing funding for a specific program to be implemented as guided by the state gives the state more control over the mechanisms

used to improve student outcomes. Programming funds provided to fund a program developed and implemented by one or more institutions is more autonomous in nature, leaving the program design to the institution.

Grand Outcome. The ultimate outcomes of HBCUs—graduation, civic engagement, and career attainment—were coded under Grand Outcomes. This code was most frequently used, as Executive Budget documents often set forth goals for higher education that were directed at preparing the workforce of the state or making students of the state competitive in the global job market. Grand Outcomes were often mentioned in expectations of higher education or goals set for higher education systems like that in Texas’ 2018-2019 Governor’s Budget:

For Texas to remain a leader in the global economy, we need more students graduating with a two- or four-year degree entering the workforce (p. 30).

Many states mentioned aligning the goals of higher education with career attainment of the citizens of the state and with the economic trends of the state. South Carolina’s Executive Budget discusses one particular job shortage to be addressed by higher education:

Also included is \$3.1 million in non-recurring dollars and \$200,000 in recurring funds under the Education Improvement Act for an initiative to train new computer science and coding teachers for every school in the state. Currently, there are 3,633 open computing jobs in South Carolina. This amounts to more than three times the average state demand rate, and approximately \$273,415,957 in unclaimed annual salaries (SC computing jobs boast an average annual salary of \$75,259). It is imperative that we align our educational objectives with our

ever-evolving economy, and computer science is a critical component of South Carolina's burgeoning industrial revolution (p. 17).

The directed content analysis found some alignment between the constructs of the HBCU-specific framework and higher education policy. Two of the framework constructs—Institutional Entry Point and Grand Outcomes—were represented in the higher education policies of more states. Overall, a general absence of specific or general references to HBCUs as a component of the system of higher education was also common. Only one state made specific reference to the contributions of HBCUs.

Discussion

The purpose of this qualitative document analysis was to understand the higher education funding policy financing HBCUs and to determine to what degree higher education funding policy reflects an HBCU ethos. This study answered two research questions:

- 1) What is the nature of higher education funding policy in the states that operate public HBCUs?
- 2) In what ways do state higher education funding policies reflect the HBCU-specific educational approach?

In order to determine the nature of higher education funding policy, thematic analysis was employed. Four major themes were constructed from the analysis: unfunded mandates of affordability, workforce development goals, innovative research solutions, and an absence of HBCU-specific language. Public expectations of higher education to prepare the workforce and to reduce the burden of cost of higher education necessary for societal contribution highlighted in the literature were echoed in higher education finance

policy (Immerwahr, 2004; Immerwahr & Johnson, 2010). Access and affordability references in all but two Executive Budgets demonstrate the wide-spread expectations for higher education to provide educational options suitable for the varied American population.

Higher education literature established the success of a higher education system often rests on its ability to prepare the population to participate in the workforce (Agiomirgianakis et al, 2002 ; Fatima & Paulsen, 2004; Vedder, 2004) and goals of investment in higher education is often the creation of personal financial stability (Pike, 2009; Zhou, 2009). The connection between higher education and the workforce was a theme the researcher expected to surface in higher education policy. Affordability was another theme the researcher expected to materialize from the dataset. The public's expectation of higher education is to provide a high level of service to prepare students for the workforce while maintaining affordable tuition (Immerwahr, 2004; Immerwahr & Johnson, 2010).

To study higher education funding policy from an HBCU lens, a directed content analysis was selected and guided by an HBCU-specific framework (Arroyo & Gasman, 2014). Arroyo and Gasman (2014) asserted that HBCUs were worthy of designation as a separate type of institution, as their student population, supportive environment, and outcomes were distinctly different from other types of institutions. Pennsylvania was the only state to mention the mission and student population served by HBCUs. The failure of other states to include acknowledgement of HBCUs as distinct institutions in their Executive Budget signifies a lack of funding policy specific to HBCUs (Sav, 1997). Despite specific or general references for HBCUs, the directed content analysis found

alignment between the HBCU-specific framework constructs Institutional Entry Point and Grand Outcomes and higher education policy. These findings are synthesized as they relate to and support each other in the following section.

Synthesis of Findings

Higher education funding policy and the HBCU-specific framework aligned in two areas. First, the Institutional Entry Point construct of the HBCU-specific framework aligned to the unfunded mandates of affordability theme identified in the thematic analysis. In Arroyo and Gasman's (2014) HBCU-specific framework, affordability is discussed in the context of economically disadvantaged students. The framework asserts that students from low-income backgrounds often cannot attend school, or attend school only part-time, because they are required to provide income support to their family. The framework also mentions the high percentage of students attending HBCUs that are Pell grant recipients. Pell grant recipients are students in the highest categories of financial need. The thematic analysis conducted found a theme of unfunded mandates of affordability in the higher education policy of states operating HBCUs. The higher education funding policy of many states also mentioned the burden of the cost of higher education on the student and the student's family.

Where the HBCU-specific framework approached affordability predominantly from the student perspective, the higher education funding policy of many states also approached affordability from an institutional mandate. Tuition regulation and caps on tuition increases were common approaches taken to ensure affordability. Though there was discussion of affordability, the mandates to cap tuition increases were indicative of

the public pressures of low-cost tuition found in previous research (Immerwahr, 2004; Immerwahr & Johnson, 2010).

Second, the HBCU-specific framework construct of Grand Outcome aligned with another theme constructed from the thematic analysis, workforce development. The HBCU-specific framework discusses one of the Grand Outcome of higher education to be career attainment. Career or workforce focal points were found in the higher education funding policies of many states as a goal of higher education or as a particular means of economically supporting the state. These findings in both analysis show that the goals of higher education are aligned with previous research which documents the impact of higher education on society, personal financial, and career attainment (Agiomirgianakis et al, 2002; Fatima & Paulsen, 2004; Pike, 2009; Vedder, 2004; Zhou, 2009).

Though Reciprocal Processes and Outcomes were frequently coded in budget documents, no corresponding theme was identified in the thematic analysis. This misalignment is perhaps due to the nature of the funding policy coded under Reciprocal Processes and Outcomes. States indeed mentioned retention, credit attainment, and most often generally referred to the success of students in higher education. However, the nebulous nature and indirect mentions of student support systems were not cohesive enough to warrant thematic development. Furthermore, the directed content analysis recognized little alignment between the three different prongs of Reciprocal Processes and Outcomes of the HBCU-specific framework and the broad mentions of student success in higher education funding policy.

Noteworthy in this study is the way in which the findings support the disparate funding provided to HBCUs. HBCUs are funded at lower rates than other institutions and

they are often the first to face reductions in allocation during economic downturn (Boland & Gasman, 2014; Brady, Eatman, & Parker, 2000; Brown & Burnette, 2014; Gasman, 2010; Lee & Keys, 2013; Minor, 2008; Sav, 1997, 2010, Sigritz, 2015). The absence of HBCU-specific language in higher education policy confirms that HBCUs are not a priority in the higher education system and are not seen as a funding priority at the state level. HBCUs were only mentioned in the Executive Budgets of four states. This lack of prioritization supports the findings of systematic underfunding of HBCUs.

Implications for Policy, Practice, and Theory

In order to meaningfully contribute to the higher education community, HBCUs must be provided adequate funding. The missions, student populations, student supports, and outcomes are markedly different from other institutions and these differences are important to acknowledge as policy is written to support HBCUs. First and foremost, the findings of this study make it alarmingly clear that first HBCUs need to be recognized in higher education funding policy a part of the higher education system and as meaningful contributors to the access and affordability goals of states. The complete absence of mention of HBCUs as an institution of higher education in higher education funding policy signifies the states' low priority for funding all institutions equitably or adequately.

Secondly, in the higher education funding policy of many states, funding for particular programming to improve outcomes was provided at individual institutions. This out-of-formula-type funding was only found on one occasion for HBCUs. Pennsylvania provided funding specifically for HBCU programming to improve African American student outcomes. In other states, the lack of programming funding increased

the gap in funding between other institutions and HBCUs. This source of disparate funding should be made available to HBCUs by either including this type of funding in formulas or budgets used to fund all institutions, or should be expanded to be distributed to all institutions.

Consideration should be given to differentiating higher education funding policy based upon institution type. Using the HBCU-specific framework to create a funding model purposely engineered to best fund HBCUs would provide an opportunity to more efficiently fund institutions based upon cost of student outcomes achieved, support provided, and student population served. Today's higher education funding fails to even recognize HBCUs as unique institutions and certainly makes no appropriation considering the differences between HBCUs and other institutions.

The importance of the impact of HBCUs on the higher education attainment of the Black and African American community in the past and today must be recognized in higher education funding policy. The stated desire of many states to improve the higher education attainment of Black and African American citizens could be directly served by HBCUs, yet the opportunity to improve rates and to appropriately include HBCUs as an integral part of the higher education community is missed.

HBCUs are institutions created by Black Americans for Black Americans where the history, culture, identity and values of the Black and African American community proliferate unadulterated by whitewashing. True representation of the Black and African American community is most appropriately cultivated by Black and African Americans and HBCUs serve as one of the few instances of institutions where this cultivation can occur uncorrupted by white hegemony. Financial support of HBCUs as an integral

component of higher education systems within each state should be reflective of the importance of HBCUs.

The findings of this research also have theoretical implications for the expansion and clarification of Arroyo and Gasman's (2014) HBCU-specific framework. Applying the HBCU-specific framework to finance policy proved difficult, as many of the detailed components of the framework are not readily recognized in qualitative finance policy analysis nor are easily enumerated for quantitative analysis. An extension of the framework could be particularly focused on appropriate proxies for different components, specifically identity formation and values cultivation. Characterization of the different framework components as they might exist in different settings (i.e. finance policy, institutional policy, student surveys) would increase the applicability of the framework to a larger body of research.

Future Research

Future research to understand the ways in which HBCUs contribute to higher education begins with quantification of the institutional differences that exist between HBCUs and other institutions. Studies quantifying the magnitude of the current funding disparities, tuition and cost of attendance, scholarships provided by institutions in total and as a proportion of the overall budget, faculty salaries, and federal allocations between HBCUs and other institutions is missing from contemporary literature. Bringing into academic and common knowledge the differences can facilitate more research into HBCU mechanisms of achievement.

Future research is also needed to understand their specific contributions of affordability, access, and labor market outcomes. Literature has been published from a

student perspective to understand the ways in which students were supported in HBCUs to succeed. Missing from the literature are the institutional perspectives— qualitative case studies of HBCU decision-making that allowed for the student success. Clearly documenting the resource allocation choices made by HBCU leadership to succeed with unconventional student populations and lower-than-average tuition could provide operational solutions to the low-cost/high-expectation environment facing higher education today.

Quantitative analyses of the efficiency of HBCUs, as well as investigations of the relationships between resource allocations and student success are also needed. By analyzing HBCUs for efficiency, then for relationships between resource allocations, literature could validate HBCUs as an efficient producer of educational outcomes and examine resource allocation patterns of efficient schools. This research could solidify a place in the higher education community for HBCUs as model institutions.

Conclusion

The purpose of this qualitative document analysis was to understand the higher education funding policy financing HBCUs and to determine to what degree higher education funding policy reflects an HBCU ethos. The qualitative analysis of Executive Budget documents applied thematic and directed content analysis techniques to answer the research questions. Findings of the thematic analysis included themes of unfunded mandates of affordability, workforce development goals and an absence of HBCU-specific language. The directed content analysis found alignment predominantly between higher education funding policy and two major constructs of HBCU-specific framework—Institutional Entry Point and Grand Outcomes.

Though there is some alignment of the HBCU-specific framework constructs and higher education funding policy, HBCUs must be first regarded as a meaningful contributor to higher education outcomes. The absence of HBCUs from state higher education funding policy provided context from previous findings of inadequate state allocation funding. Future research quantifying the contributions of HBCUs to low-income students could provide a platform of recognition for HBCUs as an integral part of the higher education community.

References

- Allen, W. R., & Jewell, J. O. (2002). A backward glance forward: Past, present and future perspectives on historically Black colleges and universities. *The Review of Higher Education*, 25(3), 241-261.
- Allen, W. R., Jewell, J. O., Griffin, K. A., & Wolf, D. S. S. (2007). Historically Black colleges and universities: Honoring the past, engaging the present, touching the future. *The Journal of Negro Education*, 263-280.
- Boland, W., & Gasman, M. (2014). America's Public HBCUs: A Four State Comparison of Institutional Capacity and State Funding Priorities.
- Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development*. Sage.
- Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative research journal*, 9(2), 27-40.
- Brady, K., Eatman, T., & Parker, L. (2000). To have or not to have? A preliminary analysis of higher education funding disparities in the post-Ayers v. Fordice era: Evidence from critical race theory. *Journal of Education Finance*, 25(3), 297-322.
- Brown v. Board of Education.*, 347 U.S. 483 (1954).
- Brown, W. A., & Burnette, D. (2014). Public HBCUs' financial resource distribution disparities in capital spending. *The Journal of Negro Education*, 83(2), 173-182.
- Browning, J. E., & Williams, J. B. (1978). History and goals of Black institutions of higher learning. *Black colleges in America*, 68-93.

- Burrelli, J., & Rapoport, A. (2008). Role of HBCUs as Baccalaureate-Origin Institutions of Black S&E Doctorate Recipients. InfoBrief. NSF 08-319. *National Science Foundation*.
- Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into practice*, 39(3), 124-130.
- Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of advanced nursing*, 62(1), 107-115
- Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K., & Kyngäs, H. (2014). Qualitative content analysis: A focus on trustworthiness. *Sage Open*, 4(1), 2158244014522633.
- Gasman, M. (2010). Comprehensive Funding Approaches for Historically Black Colleges and Universities. University of Pennsylvania Graduate School of Education and North Carolina Central University, Retrieved from http://repository.upenn.edu/gse_pubs/331
- Gasman, M. (2013). The changing face of historically Black colleges and universities. *Philadelphia, PA: Center for Minority Serving Institutions, University of Pennsylvania*.
- Given, L. M. (Ed.). (2008). *The Sage encyclopedia of qualitative research methods*. Sage Publications.
- Harper, S. R., Patton, L. D., & Wooden, O. S. (2009). Access and equity for African American students in higher education: A critical race historical analysis of policy eAorts. *Journal of Higher Education*, 80(4), 389-414.

- Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative health research*, 15(9), 1277-1288.
- Immerwahr, J. (2004). Public Attitudes on Higher Education: A Trend Analysis, 1993 to 2003. National Center Report Number 04-2. *Public Agenda*.
- Immerwahr, J., & Johnson, J. (2010). Squeeze Play 2010: Continued Public Anxiety on Cost, Harsher Judgments on How Colleges Are Run. *National Center for Public Policy and Higher Education*.
- Jones, S., & Weathersby, G. B. (1978). Financing the Black college. *Black Colleges in America*, 100-131.
- Lee, J. M., & Keys, S. W. (2013). Land-grant but unequal: State one-to-one match funding for 1890 land-grant universities. *APLU Office of Access and Success publication*, (3000-PB1).
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry* (Vol. 75). Sage.
- Ma, J., Pender, M., & Welch, M. (2016). Education Pays 2016: The Benefits of Higher Education for Individuals and Society. Trends in Higher Education Series. *CollegeBoard*.
- Minor, J.T. (2008). Contemporary HBCUs: Considering institutional capacity and state priorities. A research report. Michigan State University, College of Education, Department of Educational Administration. East Lansing, MI. Retrieved from: <http://www.msu.edu/~jtminor/>
- Office of Management and Budget (2017, March). *America First: A Budget Blueprint to Make America Great Again*. Retrieved from:

https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/budget/fy2018/2018_blueprint.pdf

Office of the Press Secretary. (2017). *Presidential Executive Order on The White House Initiative to Promote Excellence and Innovation at Historically Black Colleges and Universities* [Press release]. Retrieved from <https://www.whitehouse.gov/the-press-office/2017/02/28/presidential-executive-order-white-house-initiative-promote-excellence>

Palmer, R. T., Davis, R. J., & Hilton, A. A. (2009). Exploring challenges that threaten to impede the academic success of academically underprepared Black males at an HBCU. *Journal of College Student Development*, 50(4), 429-445.

Palmer, R. T., Davis, R. J., & Maramba, D. C. (2010). Role of an HBCU in supporting academic success for underprepared Black males. *Negro Educational Review*, 61(1-4), 85.

Palmer, R., & Gasman, M. (2008). "It takes a village to raise a child": The role of social capital in promoting academic success for African American men at a Black college. *Journal of College Student Development*, 49(1), 52-70.

Plessy v. Ferguson, 163 U.S. 537 (1896)

Roebuck, J. B., & Murty, K. S. (1993). *Historically Black colleges and universities: Their place in American higher education*. Praeger Publishers, 88 Post Road West, Box 5007, Westport, CT 06881.

Sav, G. T. (1997). Separate and unequal: State financing of historically Black colleges and universities. *The Journal of Blacks in Higher Education*, (15), 101-104.

- Sav, T. (2000). Tests of fiscal discrimination in higher education finance: Funding historically Black colleges and universities. *Journal of Education Finance*, 26(2), 157-172.
- Sav, G. T. (2010). Funding historically Black colleges and universities: Progress toward equality?. *Journal of Education Finance*, 35(3), 295-307.
- Sigritz, B. (2015). State Expenditure Report Summary: Examining Fiscal 2013-2015 StateSpending. Washington, DC: NASBO.
- Thurgood Marshall College Fund (2015). Historically Black Colleges & Universities (HBCUs). [Online Image]. Retrieved March 21,2017 from <https://tmcf.org/about-us/our-schools/hbcus>
- Upton, R., & Tanenbaum, C. (2014). The Role of Historically Black Colleges and Universities as Pathway Providers: Institutional Pathways to the STEM PhD. *American Institutes for Research*.
- U. S. Department of Education. (2016, March). *Fulfilling the Promise, Serving the Need*. Retrieved from: <https://www2.ed.gov/about/overview/focus/advancing-college-opportunity.pdf>
- Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing & health sciences*, 15(3), 398-405.

Appendix A: Higher Education Funding Policy Analyzed

State	Document Name	Publication Date	Fiscal Years
Alabama	Executive Budget	-	2019
Arkansas	2017-2019 Agency Request Budget Manuals	11/1/16	2017-2019
DC	A Fair Shot: 2019 Proposed Budget and Financial Plan	3/21/18	2019
Delaware	Fiscal Year 2018 Operating Budget	-	2018
Florida	Governor Rick Scott's 2018-2019 Budget	-	2018-2019
Georgia	The Governor's Budget Report	-	2019
Kentucky	2018-2020 Executive Budget	1/16/18	2018-2020
Louisiana	Governor's Executive Budget	-	2017-2018
Maryland	Maryland Budget Highlights	-	2019
Mississippi	State of Mississippi Legislative Budget Report	-	2018
Missouri	The Missouri Budget	-	2019
North Carolina	Common Ground Solutions for North Carolina	March 2017	2017-2019
Ohio	Building for Ohio's Next Generation; Budget of the State of Ohio	1/30/17	2018-2019
Oklahoma	2019 State of Oklahoma Executive Budget	2/5/18	2019
Pennsylvania	2018-2019 Governor's Executive Budget	2/6/18	2018-2019
South Carolina	Executive Budget	1/8/18	2018-2019
Tennessee	The Budget	1/29/18	2018-2019
Texas	2018-2019 Governor's Budget	1/31/17	2018-2019
Virgin Islands	Government of The United States Virgin Islands	5/26/17	2017
Virginia	2018-20 Budget Recommendations for Higher Education in Virginia	12/18/17	2018-2020
West Virginia	Executive Budget: Volume II Operating Detail	1/10/18	2019

Chapter III
Accessible, Affordable, and Achieving
An Examination of Technical Efficiency in
Historically Black Colleges and Universities
Introduction

States are allocating less and less of their budgets for higher education (Sigritz, 2015). Nationally, the total general fund³ expenditure for higher education decreased from 58.2% of the total state budget in 1995 to 38.1% in 2014 (Sigritz, 2015). Appropriation for higher education has decreased 15.3% since 2008 and 20% since 1990 (State Higher Education Executive Officers Association, 2016). In addition to state funding reductions, The Trump administration has proposed cuts to federal student aid programs, including a \$3.9 billion reduction to the Pell Grant program, elimination of the Supplemental Educational Opportunity Grants for the poorest of students, and reductions to Federal Work-Study programs (Office of Management and Budget, 2017). As institutions of higher education are asked to achieve more with fewer resources, innovative solutions to direct resource allocation to best support the greatest student success are of the utmost priority.

In the higher education community, Historically Black Colleges and Universities (HBCUs) are especially relevant to the conversation of high achievement amid resource constraint. Funded at levels far below their peer institutions (Brady, Eatman, & Parker,

³ General fund: the predominant fund for financing a state's operations. Revenues are received from broad-based state taxes. However, there are differences in how specific functions are financed from state to state. (Sigritz, 2015)

2000; Brown & Burnette, 2014; Gasman, 2010; Lee & Keys, 2013; Sav, 1997, 2010;) HBCUs have continued to significantly contribute to the number of Black students attaining a Bachelor's degree and beyond (Allen, 1992; Kim, 2002; Ma, Pender, & Welch, 2016; Perna, 2001; Perna et al., 2006; Thurgood Marshall College Fund, 2015; Willie & Cunnigen, 1981). Not only have HBCUs achieved such success, they have also done so with student populations much less prepared for higher education (Hodge-Clark & Daniels, 2014; Nichols & Evans-Bell, 2017). High levels of success in the face of such adversity and resource constraint certainly yields impressive resource utilization. In fact, achieving high levels of outputs with the minimum resource levels defines technical efficiency (Farrell, 1957). In times of resource constraint, investigation of high productivity with few resources becomes imperative information for all institutions of higher education and the governmental entities with duties to fund them.

The purpose of this research is to investigate the technical efficiency of HBCUs in order to understand the allocation of limited resources most supportive of student success. This research seeks to answer the question: To what extent are HBCUs efficient stewards of public funds? Specifically, this research will 1) determine relative technical efficiency among the public HBCUs using Data Envelopment Analysis, 2) compare and contrast environmental characteristics and expenditure patterns among the most efficient and average HBCUs, and 3) suggest specific endogenous characteristics and expenditures to increase outputs among HBCUs and the larger higher education community. Information gleaned from this research will provide necessary policy and practice guidance on persisting through resource constraint to the larger higher education community. The following sections of this paper will lay out the conceptual framework

upon which this research is built, review relevant literature, describe the methods and data to be employed, and present the results of the analysis.

Conceptual Framework

Technical efficiency (Farrell, 1957) serves as the conceptual framework guiding this work. Historically, measures of technical efficiency were developed in order to prioritize optimal operations in industry over regular funding increases without accountability as a means of improving outcomes (Farrell, 1957; Rolle, 2004). Today's higher education landscape presents much of that same challenge and begs again for a discussion of efficiency as governmental subsidy of higher education continues to wane and the public's expectation of higher education to do more with less increase.

In the 1950s, economist M.J. Farrell (1957) challenged the conventional methods of examining productivity in industry (average productivity of labor, indexes of efficiency, or cost comparisons) by offering instead examinations of efficiency, arguing that accurate measures of efficiency would allow policy makers and economists to determine whether to prioritize increased funding or encourage optimization of resource utilization in a given industry. Farrell (1957) noted that prior analyses were limited in their ability to understand to what extent the firm could improve production without increasing inputs. He proposed an efficient production function using the ratio of input variables to units of output as measure of efficiency that would allow for the maximization of a firm's efficiency without increasing inputs. Farrell (1957) asserted technical efficiency was attained when the minimum input was expended to achieve the maximum output. Not long after Farrell sparked development of measures of technical efficiency in industry did political events of the 1960s spark similar developments in K-

12 public education, soon followed by studies of efficiency in higher education, which are detailed in the literature review in this paper.

Today, the higher education landscape is again met with increased expectations, but faces this challenge for the first time with simultaneous decreases in education funding. Therefore, institutions of higher education, as well as government, are interested in determining the best usage of limited resources. As institutions have reacted to decreasing government allocation by expanding to lesser prepared student bodies requiring more support services to succeed (Sigritz, 2015), the most cost effective approach is necessary. As governments continue to cut from the budget, the most efficient of schools will be those saved. By framing this research in technical efficiency, the unique mission, funding, student body, faculty, and community of each Historically Black College and University can be acknowledged and appropriately considered.

Literature Review

Though a few existed in the North prior to the Civil War, Historically Black Colleges and Universities, were founded as emancipation was recognized in the South (Brown and Davis, 2001; Roebuck & Murty, 1993). HBCUs were officially recognized in the Higher Education Act of 1965 as institutions formed prior to 1964 with missions of educating Black Americans. Today, HBCUs maintain their original mission of providing social capital as a means to social equity to Black students (Allen, Jewell, Griffin, & Wolf, 2007).

Resource Constraint in HBCUs

Historically, and today, per student allocations at HBCUs have been well documented as inferior to allocations at PWIs (Harper, Patton, & Wooden, 2009). HBCUs receive less funding than other institutions in every category of funding. States allocate HBCU funding at a lower rate than PWIs and HBCUs are often the first to be cut in economic downturn (Boland & Gasman, 2014, Minor, 2008; Sigritz, 2015). The endowments of HBCUs are meager when compared to their PWI counterparts, and most of the endowment wealth is concentrated in five private HBCUs (Coupet & Barnum, 2010; Drezner & Gupta, 2012). Further, HBCUs are severely underrepresented in federal research grants and contracts (Gasman, 2010; Harper, Patton, & Wooden, 2009; Shavers, Fagan, Lawrence, McCaskill-Stevens, McDonald, Browne, & Trimble, 2005). The following sections explore in more detail the federal and state allocation contribution to funding inequities between HBCUs and other institutions.

Federal funding. Though the first federal funding distributed to institutions serving Black students came from the Freedman's Bureau following the Civil War, programmatic federal funding of HBCUs was not established until Title III, part B of the Higher Education Act of 1965 was passed to assist HBCUs with facility and academic costs (Gasman, 2010). Funding for Title III Part B was not solidified until 1989 when President Reagan appropriated \$100 million for HBCUs (Harper, Patton, & Wooden, 2009). Though seven Presidents since Carter have signed Executive Orders related to the success and achievement of HBCUs, only two provided opportunity for additional HBCU funding (Gasman, 2010; U.S. Department of Education, 2016). President Obama increased federal funding for HBCUs directly with \$4 billion in support of HBCUs and indirectly with increases to the federal student aid programs under Title III over the

course of his two terms (U.S. Department of Education, 2016). However, funding increases became drastic funding decreases with the election of Donald Trump (Office of Budget and Management, 2017).

State funding. Historically, state funding for HBCUs is disproportionately lower than funding provided to PWIs. Following the legal end of segregation in *Brown v. Board of Education* (1954), internal state political battles over integration left HBCUs underfunded (Drezner & Gupta, 2012). Despite court rulings in *Adams v. Richardson* (1974) and *The Coalition for Equity and Excellence in Maryland Higher Education, et al. v. Maryland Higher Education Commission, et al.* (2013) mandating states create plans for remedying the fiscal and physical divide between HBCUs and PWIs, inequity persists (Drezner & Gupta, 2012; Lawyers' Committee for Civil Rights Under Law, 2014). These disparities in state funding are often exacerbated when states face times of fiscal constraint.

Recent trends show how fiscal constraints are causing states to allocate less and less of their budgets for higher education (Sigritz, 2015; Titus, 2009). Continuing rebound from the national recession, state spending in 2015 increased at a rapid pace not seen since 1992⁴. Nationally, the total general fund⁵ expenditure for higher education decreased from 58.2% in 1995 to 38.1% in 2014 (Sigritz, 2015). Literature documents

⁴ The *Affordable Health Care Act* has contributed to the ascendance of Medicaid to the largest appropriation category of state government budgets. Importantly, of the seven functional areas reported by the National Association of State Budget Offices, Medicaid expenditure has increased since 1987 to overcome elementary and secondary education and higher education expenditure, and in fiscal year 2015, became the largest category representing 27.4% of total state expenditures (Sigritz, 2015). The ascendance of Medicaid as a proportion of state budgets completely overshadows appropriation for higher education and states are allocating less and less general revenue to higher education.

⁵ General fund: the predominant fund for financing a state's operations. Revenues are received from broad-based state taxes. However, there are differences in how specific functions are financed from state to state. (Sigritz, 2015)

state government's tendencies to allocate dollars to PWIs in priority over HBCUs (Boland & Gasman, 2014; Minor, 2008). HBCUs take the largest proportional budget cuts, leaving them with revenue equal to half of the per student funding at PWIs (Boland & Gasman, 2014). Understanding the funding disparities that exist between HBCUs and other institutions, the student outcomes achieved become remarkable.

HBCU Student Outcomes

The historical literature documenting student outcomes from HBCUs is limited and often generalizes findings from small samples of students (Simms, 2014). In a review of literature documenting Black student success, Arroyo and Gasman (2014) discuss a historical focus on the gap between Black and White student attainment like that notably published by Allen (1992) and the key factors contributing to Black student success like those documented by Harper (2012). Generally, during the turn of the millennium, HBCUs were the only institutions where Black students were not among the lowest performing subgroup of students (Perna et al, 2006). Today, though some Black students experience success in higher education in other types of institutions, the impact of HBCUs on success of Black students remains incredibly significant (Education Trust, 2017).

Recent examinations of the impact of HBCUs on Black student success concede the impact of HBCUs to be disproportionate given that HBCUs account for less than 3% of the higher education institutions in the nation (Gasman, 2013, Snyder & Dillow, 2015; Upton & Tanenbaum, 2014). Despite this underrepresentation, HBCUs are responsible for producing 14% of Masters degrees and 14% of Doctoral degrees attained by Black students (Snyder & Dillow, 2015). A large proportion of HBCU undergraduates continue

on to obtain advanced degrees in STEM and 14% of STEM doctoral degrees awarded to Black students were from HBCUs (Upton & Tanenbaum, 2014). In Southern states, HBCUs can be attributed with upwards of 50% of all degrees awarded to HBCUs (Boland & Gasman, 2014). HBCU achievement of disproportionate levels of success with underprepared students and comparatively lower funding provides opportunity for the examination of technical efficiency.

Technical Efficiency in Higher Education

In one of the seminal works on technical efficiency in the public sector, Charnes, Cooper and Rhodes (1978) explored the use of Data Envelopment Analysis (DEA) in primary schools. Shortly after, Ahn, Charnes, and Cooper (1988) applied DEA to institutions of higher education specifying instructional, physical, and overhead expenditures as inputs and enrollment and research grants as outputs and found vast opportunities for improvement in expenditures at public institutions with and without medical schools.

Avkiran (2001) examined the number of staff and faculty as inputs and retention, progress and graduation as outputs and found Australian institutions of higher education to all be relatively efficient, but found ample room for improvement of outputs by increasing graduate student enrollment. Johnes (2006) applied DEA to individual students attending universities in the United Kingdom and found opportunities for improved teaching efficiencies as well as resource utilization. In another study of DEA applied to United Kingdom universities, Thanassoulis, Kortelainen, Johnes, and Johnes (2011) found improvements in excess of 20% for resource utilization.

In HBCUs specifically, technical efficiency has only been examined in comparison with and using models developed for PWIs. Coupet and Barnum (2010) examined the effects of endowment on efficiency in an analysis that included both HBCUs and PWIs, concluding that HBCUs can be just as efficient as PWIs and both become more efficient with increased endowment. This limited examination of technical efficiency in HBCUs must be expanded in order to understand how HBCUs have remained a significant contributor to the higher education attainment of Black students with comparably lower funding. Decreasing federal and state funding for higher education, coupled with high expectations of affordability, access, and success from the public creates an environment where technical efficiency is greatly valued. The following sections detail the methods and data used to fill a gap in the efficiency literature.

Study Methods

Data Envelopment Analysis (DEA), a linear programming method of calculating relative efficiencies of decision making units (DMUs), was developed by Charnes, Cooper, & Rhodes (1978) specifically to identify efficiencies and inefficiencies in the inputs and outputs of the public, nonprofit sector. Building upon Farrell and Fieldhouse's (1962) findings, Charnes, Cooper, and Rhodes (1978) created DEA to allow each decision making unit to adopt a set of specific weights which create the most efficient scenario for each in comparison to other units. Thus, the mathematical representation for DEA shown in Figure 3 demonstrates the calculation of an effectiveness score (E) for each DMU in the dataset (Nazarko & Saparauskas, 2014):

Figure 3: Data Envelopment Analysis (Nazarko & Saparauskas, 2014)

$$E_j = \frac{\sum_{r=1}^s u_{rj} y_{rj}}{\sum_{i=1}^m v_{ij} x_{ij}},$$

y_{rj} – the amount of the product r generated by DMU $_j$, output;

x_{ij} – the amount of the resource i used by DMU $_j$, input;

u_{rj} – weight of the output y_{rj} ;

v_{ij} – weight of the input x_{ij} ;

$r = 1, 2, \dots, s$ – number of the generated products;

$i = 1, 2, \dots, m$ – number of resources used;

$j = 1, 2, \dots, n$ – number of DMUs.

DEA models can be specified as either input- or output-oriented (Charnes, Cooper, & Rhodes, 1978). For this particular study, an input-oriented DEA model was selected because output reduction is not a reasonable response for institutions of higher education. The input-oriented model conceptualizes efficiency improvements by decreasing inputs as much as possible without decreasing outputs (Avikran, 2001). Another specification selected for this study was the constant returns to scale assumption, rather than the variable returns to scale. Since the data set used controlled for size by modifying expenditure variables to the per student unit of analysis, the constant returns to scale specification was most appropriate as it assumes no relationship between scale of operation and efficiency (Thanassoulis, et al, 2011). DEA models for each year within the dataset were run.

Data

This research examines the expenditure inputs and graduation and persistence outputs of the 40 4-year, public HBCUs. Not only were public HBCUs selected for their

contribution to Black student degree attainment in spite of unique financial hardships, but the data set analyzed was also limited to this population to increase the quality of the analysis. DEA determines the relative efficiencies of the decision making units in the data set, and narrowing the data set to include homogenous cases leads to more robust and reliable results (Johnes, 2006; Thanassoulis et al., 2011). The dataset examined was created from the Integrated Postsecondary Education Data System (IPEDS) provided by the National Center for Education Statistics. Data for all public HBCUs were downloaded for 2011 through the 2015 fiscal year. Consistencies in reporting financial expenditure categories changed drastically in 2011, thus providing a natural temporal parameter for the dataset.

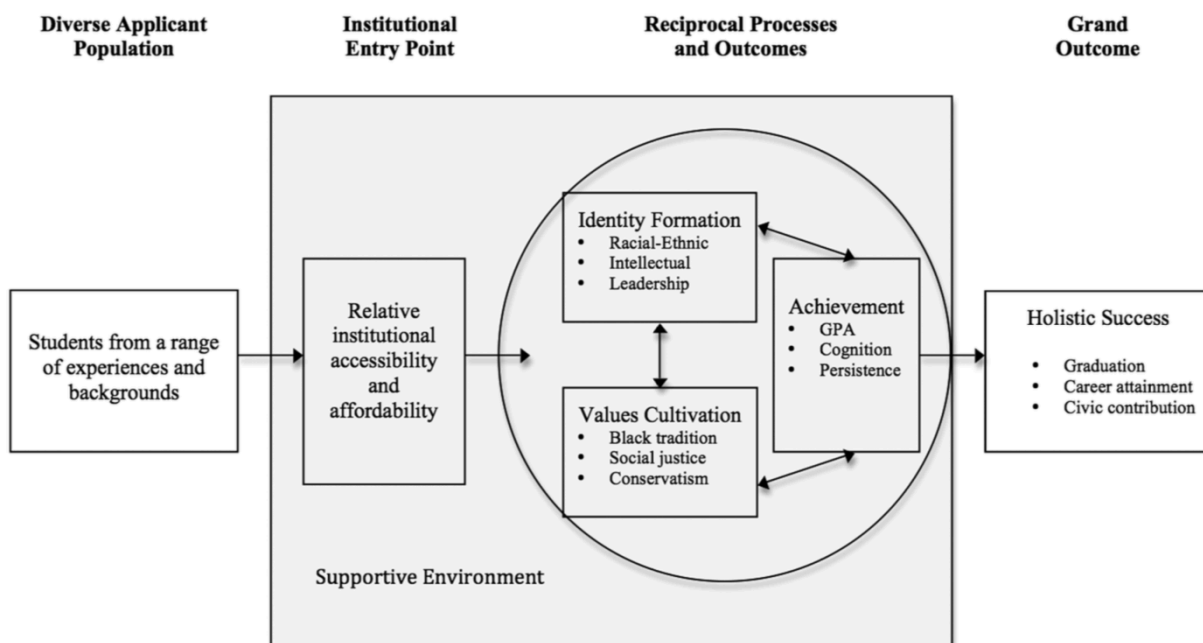
Variables for all reported financial categories of expenditures (Student Services, Academic Support, Institutional Support, Research, Public Service, Instruction, and Auxiliary Services) were downloaded for each year. Descriptions of each expenditure category is provided in Appendix A. The data set containing expenditure variables were merged with a data set of institutional variables including total enrollment, 4- and 6-year Bachelor degree completions, Masters degree completions, Doctoral degree completions, full- and part-time retention rates, average 75th percentile of SAT Reading scores of admitted Freshmen, cost of attendance, and other available endogenous variables. A complete list of downloaded variables and descriptions are included in Appendix B.

Model Specification

Framework Consideration

In order to ensure the model be specifically relevant to HBCUs, final variable selection was informed by the institutional HBCU student success framework developed by Arroyo and Gasman (2014). In the HBCU framework, Arroyo and Gasman (2014) discuss the importance of examining the holistic success of HBCUs that includes graduation, career attainment, and civic contribution. These outcomes are supported by identity, values, and achievement cultivation in a supportive environment carefully conserved as accessible and affordable (Arroyo and Gasman, 2014). A schematic of the conceptual model is displayed in Figure 4.

Figure 4: HBCU-based framework for Black student success (Arroyo & Gasman, 2014)



Considering this model, DEA input and output variables of interest were selected to best reflect HBCU-specific expenditure, outcomes, and institutional and student population differences. To account for the diverse applicant population and the institutional accessibility and affordability, SAT Reading scores of admitted Freshmen, the percentage of Pell grant recipients at each school, and the total cost of attendance were evaluated for the inclusion in the DEA model. Though limited by the quantitative variables currently measured in IPEDS, the reciprocal process and outcomes and grand outcome were considered in the model's outcome variables for graduation rates, full- and part-time retention rates, enrollment, and degrees conferred. In addition to the variables specifically related to the HBCU-framework, categories of expenditures reported to IPEDS, total expenditures, student to faculty ratios, and state appropriation were considered as input variables.

DEA Model Configuration

Standard DEA model specification (Jenkins & Anderson, 2003; Nazarko & Šaparauskas, 2014) requires limiting variables in the model to only those most representative of the inputs and outputs of HBCUs. To isolate the most representative expenditure input variables, environmental variables, and output variables, the correlation technique outlined by Nazarko and Šaparauskas (2014) was employed. The input and output variable selection process began with all available variables. Input and output variables most representative of the HBCU framework were selected using correlation tables, while also being mindful of the HBCU framework guiding the work.

A common guideline used in DEA variable selection is ensuring the total number of variables in the model does not exceed one third of the DMUs in the model (Jenkins &

Anderson, 2003). Nazarko and Šaparauskas (2014) assert that DEA is most accurate when the input and output variables are limited. Correlations were performed among all expenditure variables to select the most representative (Nazarko and Šaparauskas, 2014). Output variables were correlated to determine the most representative and then correlated with environmental variables to include appropriate control variables in the model (Ruggiero, 1996; Nazarko & Saparauskas, 2014). Correlations less than 0.3 were considered weak, correlations between .3 and .5 were considered moderate, and correlations greater than 0.5 were considered strong. Missing values are accommodated using a pairwise deletion suggested by previous literature (Johnes, 2006; Nazarko & Šaparauskas, 2014; Thanassoulis et al., 2011).

Input Variable Selection

First, input variables were selected based upon the resources available to the institutions. These included all expenditure categories and student to faculty ratios, which indicated resource allocation decisions. Table 2 displays the correlations between all possible input variables (reported as amounts per full-time equivalent) and denotes significant correlations ($p < 0.05$) with an asterisk.

Table 2: Input Variable Correlation, 2011-2016

	Instruction	Research	Public Service	Academic Support	Student Services	Institutional Support	Other	Student: Faculty
Instruction	1							
Research	0.0867	1						
Public Service	-0.1043	0.3573*	1					
Academic Support	0.3315*	0.0021	-0.0339	1				
Student Services	0.314*	0.0759	0.3589*	-0.0015	1			
Institutional Support	0.2949*	0.0056	0.2735*	0.2309*	0.607*	1		
Other	0.095	-0.0151	0.2278*	0.2146*	0.2167*	0.3393*	1	
Student: Faculty	-0.4846*	-0.113	0.2655*	-0.2584*	0.3564*	-0.3967*	-0.1007	1

Note: * indicates significant correlations ($p < 0.05$)

Research expenditures were not employed as an input variable, since literature demonstrates research is not a top priority of most HBCUs (Arroyo & Gasman, 2014; Minor, 2008). Because of the moderate correlation of instruction expenditures to expenditures for academic support, student services, institutional support and to student to faculty ratios, one model for input variables, model A, includes instruction expenditures and other expenditures. A second model, model B, is student services expenditures, academic support expenditures, and student to faculty ratios. Model A will be the primary model and model B is compared to understand the model sensitivity. The results of the sensitivity testing are discussed in the section entitled “Model Sensitivity.”

Output Variable Selection

The available output variables were total cohort graduation rate, 8-year bachelor cohort graduation rate (200%), part-time retention rate, and full-time retention rate. As

suggested by Arroyo and Gasman's (2014) HBCU-specific framework, HBCU success is best measured by an array of variables that allow non-traditional student success to be demonstrated. Though the output variables are all significantly correlated (Table 3), only bachelor graduation rates after 8 years and full-time retention rates were eliminated as an output variable due to the strength of the correlation to total cohort graduation rate. Total cohort graduation rate was selected as an output variable since it is the most inclusive of the graduation rates and includes bachelor, master, and doctoral students. Total cohort graduation rate, bachelor cohort still enrolled after 8 years (200%), and part-time retention rate were selected as the output variables for the model.

Table 3: Output Variable Correlation

	Total Cohort Graduation Rate 150%	Bachelor Grad Rate 200%	Full-time Retention	Part-time Retention
Total Cohort Graduation Rate	1			
Bachelor Grad Rate 200%	0.8524*	1		
Full-time Retention	0.6747*	0.6849*	1	
Part-time Retention	0.2124*	0.1894*	0.2027*	1

Note: * indicates significant correlations ($p < 0.05$)

Environmental Variable Selection

After selecting the most appropriate input and output variables, environmental variables were selected. Environmental variables represented external factors outside of the control of the institution that could influence outcomes. Total enrollment, the percent of applying Freshmen admitted each year, the 75th percentile SAT Critical Reading scores of admitted Freshmen, the total cost of attendance (price), state appropriation, federal

appropriation, the percentage of Pell recipients at each school were available environmental control variables. As shown in Table 4, the output variables (Bachelor cohort still enrolled, part-time retention rate, and total graduation rate) were most strongly and significantly correlated to enrollment, SAT scores, federal appropriation, and Pell grant recipients. For the final model, Pell grant recipients were chosen over SAT scores given the large number of HBCUs that are open-access and do not require a submission of an SAT score for enrollment (Harper, 2012).

Table 4: Environmental and Output Variable Correlation

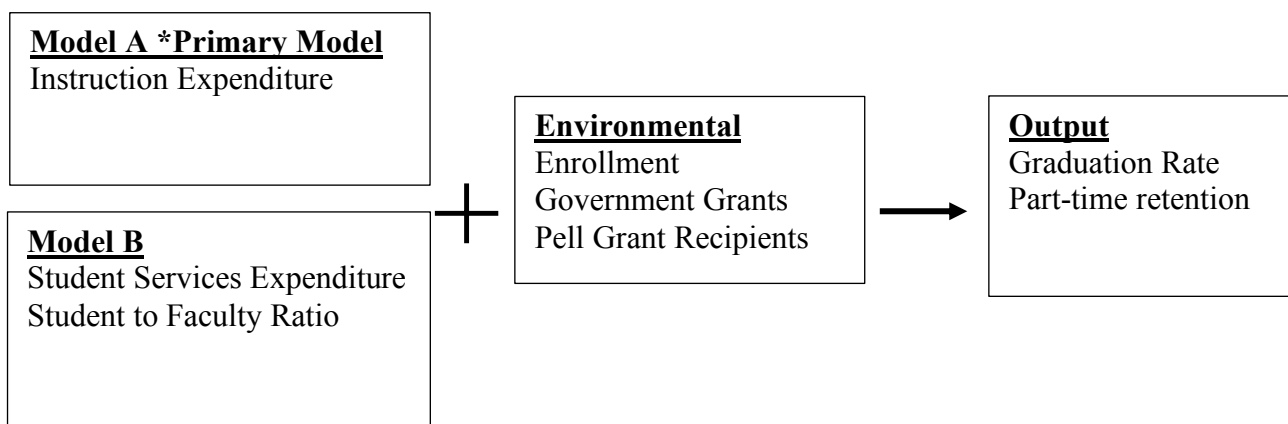
	Part-time Retentio n	Total Cohort Graduatio n Rate	Total Enrollmen t	Percent Admitte d	75th Percentile SAT Reading	Price	State Approp	Governm ent Grants	Pell
Part-time Retention	1								
Total Graduation Rate	0.2266*	1							
Total Enrollment	0.1546*	0.4915*	1						
Percent Admitted	0.1	0.2067*	0.0385	1					
75th %ile SAT Reading	0.1701*	0.0816	0.1732*	0.0294	1				
Price	-0.0439	0.0084	0.0797	0.2297*	0.0019	1			
State Appropriation	-0.1551*	-0.0688	-0.0414	-0.1839*	-0.0215	0.0765	1		
Government Grants	-0.1965*	-0.2645*	-0.3872*	0.1357	0.0125	-0.047	0.0199	1	
Pell	-0.2041*	-0.2299*	-0.1962*	-0.2289*	-0.4008*	0.1168	-0.1029	0.1354*	1

Note: * indicates significant correlations (p<0.05)

Model Sensitivity

The final step in determining the ideal model was to examine the sensitivity of the two possible models. DEA was conducted for Model A and for Model B. Spearman's rank correlation was conducted on the efficiency scores generated for each model to determine the association between the two. Figure 5 illustrates the two different DEA models considered. Given the similarity of the efficiency scores produced by both models, model A was the final model selected for analysis.

Figure 5: DEA models



Limitations. IPEDS data creates some limitations in this analysis. During the academic years examined, some HBCUs reported values of 0 for variables in the data set. Unfortunately, there is not a way to differentiate between true zero values and missing data. For example, in one year, if an HBCU reported a zero value for a particular expenditure, then reported a value in the next year, doubt exists about the quality of the data. This analysis assumed that a reported zero was the equivalent of a missing value. Institutions with missing values for input, environmental, or output variables were

excluded from that year's DEA. Data Envelopment Analysis (DEA) is a measure of technical efficiency relative only to the observations in the data set. This analysis will provide information on the efficiency of public HBCUs as they relate to one another, but will not be a point of comparison for institutions outside of the dataset.

Furthermore, the consideration of the HBCU-specific framework in variable selection was limited by the availability of representative variables. Many of the detailed components of the HBCU-specific framework, like civic engagement and identity development, were only considered by proxy. Public service expenditures (a proxy for civic engagement) and student service expenditures (a proxy for identity development) were not strongly correlated to the outcome variables of interest and were not included in the model.

Results

The 39 four-year public HBCUs⁶ analyzed in this research are located in 20 states, the District of Columbia, and the United States Virgin Islands. In the following sections, descriptive statistics are first provided to understand the data set, then the results of the Data Envelopment Analysis are presented.

Descriptive Statistics

Student Population. As shown in Figure 6, total HBCU enrollment decreased by 20,721 students from 202,123 total students in 2011 to 181,402 students in 2016.

⁶ There are 40 total HBCUs in the IPEDS data set. However, Lincoln University (213598) was dropped from the data set because the expenditure variables for the institution were reported using FASB standards, as opposed to the GASB standards used by all other public HBCUs

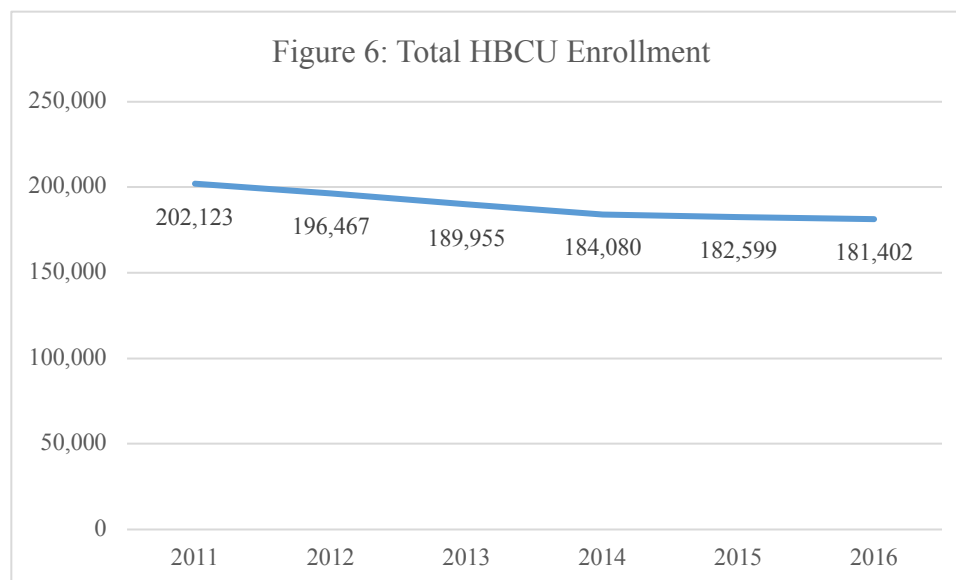


Table 4 details the enrollment totals for every category of student attending an HBCU. Part-time students make up 20% of HBCU enrollment, and graduate students make up 15% of enrollment. The overwhelming majority of students on an HBCU campus are full-time undergraduate students.

Table 4: Total Student Enrollment

	Full-time	Part-time	Undergraduate	Graduate
2011	160,913	41,210	173,047	29,076
2012	155,609	40,858	167,554	28,913
2013	151,635	38,320	161,342	28,613
2014	145,780	38,300	156,048	28,032
2015	145,858	36,741	155,250	27,349
2016	145,989	35,413	154,635	26,767

Appendix C displays average student population characteristics of all HBCUs. On average, HBCUs serve a student population composed of 76% Black or African American students. Only two HBCUs have less than a majority of Black or African American students: Bluefield State College and West Virginia State University, both in

West Virginia. Notably, the average percent Black or African American students did consistently decrease each year in the dataset from 78% in 2011 to 74% in 2016. During each year in the dataset, the average HBCU served a student population composed of at least 72% Pell grant recipients. The average HBCU admitted 51% of applying Freshmen in 2012, but in 2015 and 2016 this increased to more than 60%. Interestingly during the same time period, the 75th percentile Reading SAT Score of first-time freshmen increased from 341 in 2010-2011 to 379 in 2014-2015.

Student Success. Student success rates at public HBCUs have remained stable since 2011. Appendix C displays the means and standard deviations of graduation rates, part-time retention rates, and full-time retention rates. The average total cohort graduation rate (6 years) at HBCUs has remained close to 30% since 2011. When only the Bachelor cohort is examined and the time period is increased to 8 years, the graduation rate increases to roughly 34%. The part-time retention rate has fluctuated between 34% and 41% since 2011 and the retention rate of full-time students has remained close to 65%. The percent of Bachelor cohort students still enrolled after 8 years hovered near 34% during each year reported in the dataset.

Revenue. Total public HBCU revenue is displayed in Appendix D. Public HBCU total revenue declined sharply from \$4.2 billion in 2011 to \$3.8 billion in 2014. However, despite a continued loss of student enrollment, the total revenue for HBCUs increased from \$3.8 billion in 2014 to \$4.1 billion in 2016. Appendix D also details the revenue sources in total and per FTE for the public HBCUs in the data set. Tuition revenue is the main source of increased revenue for HBCUs, followed by slight increases in state appropriation and private grants. Federal appropriation declined from 2011 to

2015, as well as investment return. Both categories experienced slight increases in 2016.

Revenue categories are defined in Appendix B.

In 2011, the average public HBCU received \$23,239 in total revenue per full-time equivalent, as shown in Table 6. That number increased to \$26,178 per FTE in 2016.

Table 5 demonstrates the wide range of revenues for HBCUs. In 2016, the maximum HBCU total revenue per FTE was over \$43,000, while the minimum was \$14,900.

Table 6: HBCU Total Revenue per FTE, 2011-2016

Year	Mean	SD	Max	Min
2011	23,239	5,808	45,125	13,995
2012	23,014	5,896	41,210	12,242
2013	23,869	5,778	41,194	12,430
2014	24,452	6,067	42,113	13,492
2015	25,468	6,970	45,617	13,738
2016	26,178	7,138	43,366	14,900

Note: Revenue for each year in current dollar amounts, unadjusted.

Expenditure. Expenditure categories in the IPEDS data set are described in detail in Appendix A. Mean expenditures per FTE for the 39 HBCUs are reported for each category in Table 7. Instruction is the largest category of expenditure, followed by institutional support. Expenditures for institutional support have increased the most since 2011. Instruction expenditures have also increased since 2011.

Table 7: Mean Expenditures per FTE by Category

			Public	Academic	Student	Institutional	
year	Instruction	Research	Service	Support	Services	Support	Other
2011	7,616	1,736	1,066	2,183	1,823	3,761	2,853
2012	7,553	1,816	1,127	2,129	1,909	4,021	2,477
2013	8,034	1,861	1,159	2,385	2,075	4,290	2,586
2014	8,139	1,803	1,190	2,330	2,095	4,240	2,651
2015	8,284	1,806	1,243	2,444	2,229	4,449	2,697
2016	8,242	1,801	1,235	2,487	2,288	4,596	3,667

Note: Expenditures for each year in current dollar amounts, unadjusted.

Data Envelopment Analysis

Data Envelopment Analysis was conducted for each year of data, 2011-2016. The input variables in the model were instruction and other expenditures, environmental variables were the percentage of Pell grant recipients, total enrollment, and the governmental grants, and output variables were graduation rates (150%) and par-time retention rates. DEA produces an efficiency score, which can be interpreted as necessary improvement to achieve optimal efficiency. Table 7 displays the mean and standard deviation for the efficiency scores resulting from the Data Envelopment Analysis (DEA) for each year.

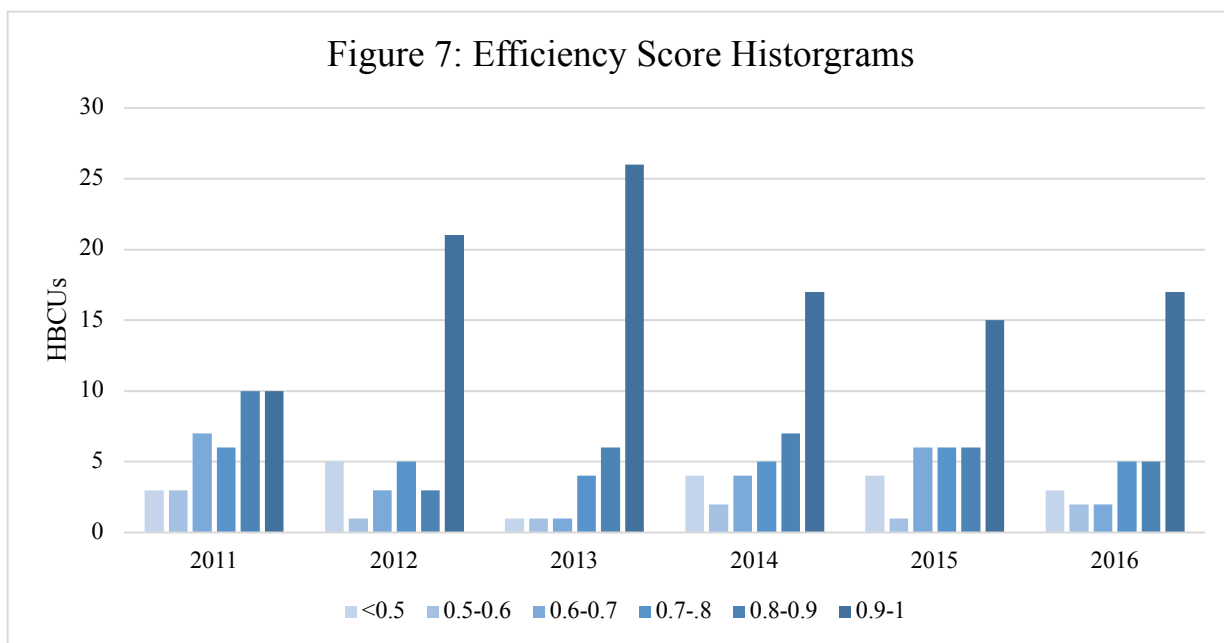
In Table 8, the DEA efficiency scores for each year indicate an average percentage of optimal efficiency (100%). Because the DEA employed in this analysis was an input-oriented model, by subtracting these percentages from 100%, these results can be interpreted as a percentage by which the inputs to the model can be decreased in order to attain optimal efficiency. For example, in 2011, inputs to the model can be decreased 22.93% ($100\% - 78.07\% = 22.93\%$).

Table 8: Mean Data Envelopment Analysis Efficiency Scores, 2011-2016

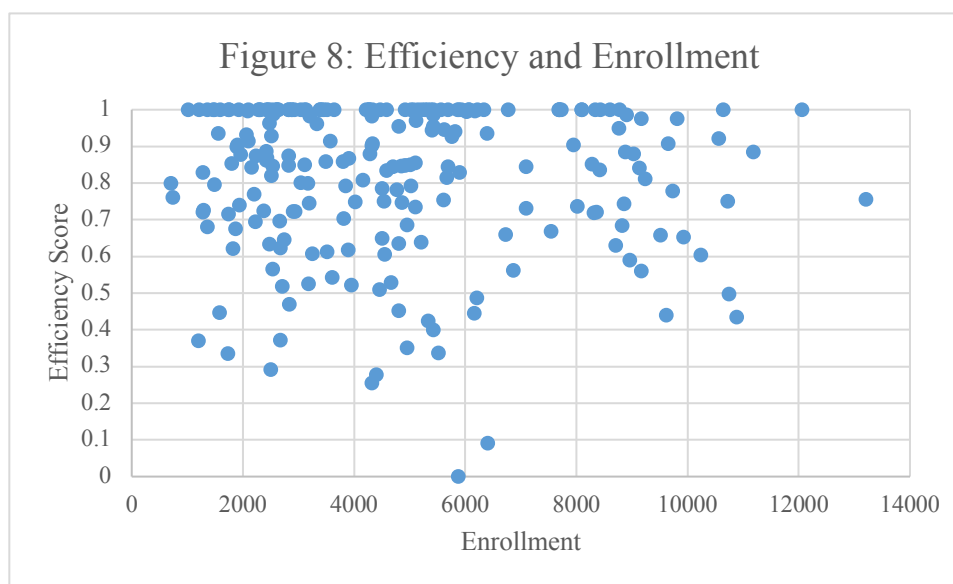
	2011	2012	2013	2014	2015	2016
Mean	78.07%	82.29%	90.20%	80.18%	80.11%	82.53%
SD	19.15	23.88	13.64	23.79	18.40	19.89

The year in which public HBCUs demonstrated the highest levels of efficiency was 2013, where the average efficiency score was 90.20%. This year was also the year with the smallest standard deviation (13.64). The average efficiency score was the lowest in 2011 (78.07%), and the results from 2012, 2014, and 2015 were all relatively similar with efficiency scores in the 80 percent range. The following section details the distribution of the individual institution scores for each year.

Figure 7 illustrates histograms for DEA efficiency scores for each year of the analysis. For each year on the x axis, the number of HBCUs falling into a range of efficiency scores is displayed. For example, in 2016, 17 HBCUs received efficiency scores ranging from 90% to 100% (0.9-1), 5 HBCUs received efficiency scores between 80-90% (0.8-0.9), 5 HBCUs received efficiency scores between 70-80% (0.7-0.8), 2 HBCUs received efficiency scores between 60-70% (0.6-0.7), 2 HBCUs received efficiency scores between 50-60% (0.5-0.6), and 3 HBCUs received efficiency scores below 50% (<0.5). Because the general distribution of efficiency scores for each year in the data set skewed toward efficiency (100%), the graph groups all scores below 50% in one bucket for display in the histogram. The largest number of HBCUs fell into the most efficient (efficiency score of 0.9 to 1.0) range in each year, with the exception of 2011, where equal numbers of HBCUs received scores in the 80%-90% range and the 90%-100% range.



The scatterplot in Figure 8 shows the efficiency scores as a function of enrollment. The x axis represents the enrollment of individual HBCUs and the y axis represents the efficiency score obtained by each institution. The data for all years in the analysis is combined and displayed in Figure 6. It is clear that there are efficient HBCUs along the range of enrollment, though most efficient scores tend to be in smaller HBCUs.



Characteristics of the Most and Least Efficient HBCUs

In each year included in the analysis, several HBCUs received an efficiency score of 1 or 100%, meaning they are producing outcomes at maximum efficiency levels. In 2011, 8 HBCUs received a score of 1, 14 in 2012, 15 in 2013, 16 in 2014, 9 in 2015, and 11 in 2016. Also in each year of the analysis, a number of HBCUs received efficiency scores of less than 50%. In 2011, 3 HBCUs received efficiency scores of less than 50%, in 2012 there were 4, in 2013 there was 1, in 2014 and 2015 there were 4, and in 2016 there were 3. The following paragraphs describe the characteristics of these most efficient HBCUs. Descriptive statistics for the characteristics of these most and least efficient schools are provided in the following paragraphs.

Efficient HBCUs. The average enrolment, student demographics, student to faculty ratio, graduation rate, and part-time retention rates of only the most efficient HBCUs are displayed in Table 9. In 2016, the HBCUs that received an efficiency score of 1 had an average enrollment of 4,229, and a student body composed of 62% African American students and 69% Pell Grant recipients, and a student to faculty ratio of 15. In 2016, the average graduation rate was 35% and the average part-time retention rate was 57% among the most efficient HBCUs. Noteworthy are the markedly different characteristics of the most efficient schools in 2014. During this year, the most efficient schools enrolled 5,004 students and served a student body that was 77% African American and 70% Pell grant recipients. Also in 2014, the student to faculty ratio was 16, the graduation rate was 20% and the part-time retention rate was 48%.

Table 9: Mean student demographic, student to faculty ratios, and student success rates of the most efficient HBCUs

			African	Pell Grant	Student to Faculty Ratio	Graduation Rate	Part Time Retention Rate
	n	Enrollment	American	Recipients			
2011	8	3,992	73%	68%	17	34%	56%
2012	14	4,692	74%	75%	18	34%	48%
2013	15	4,903	77%	72%	17	32%	48%
2014	16	5,004	77%	70%	16	39%	46%
2015	9	4,167	73%	70%	16	36%	73%
2016	11	4,229	62%	69%	15	35%	57%

Table 10 contains the mean revenues per full time equivalent (FTE) for the most efficient HBCUs. In 2016, the most efficient HBCUs received \$4,238 in tuition, \$8,987 in state appropriation, \$7,044 in government grants and contracts, \$208 in private gifts, \$46 in investment return, and \$3,234 in other revenue. Tuition revenue per FTE reached its peak in 2014 at \$4,481 per FTE and declined in 2015 and 2016. State appropriation per FTE of the most efficient schools increased from \$6,585 in 2011 to \$8,987 in 2016. Investment return per FTE varied considerably from a low of \$46 per FTE in 2016 to a high of \$522 per FTE in 2014.

Table 10: Mean revenue per FTE of the most efficient HBCUs.

Row Labels	Tuition	State Approp	Government Grants/Contracts	Private Gifts	Investment Return	Other
2011	3,241	6,585	6,811	292	223	3,281
2012	3,882	6,999	7,163	223	71	2,717
2013	4,461	7,682	7,098	333	287	2,225
2014	4,481	8,192	6,828	233	522	2,142
2015	4,480	8,345	6,913	347	104	4,302
2016	4,238	8,987	7,044	208	46	3,234

Note: Revenue for each year in current dollar amounts, unadjusted.

Table 11 displays the mean expenditures per FTE of the most efficient HBCUs.

The most efficient HBCUs spent \$8,190 per FTE on Instruction, \$1,392 on Research, \$1,933 on Academic Support, \$2,319 on Student Services, \$3,765 on Institutional Support, and \$2,316 on Other expenditures in 2016. In 2011, the expenditures per FTE for the most efficient HBCUs were dramatically different: \$6,922 on Instruction, \$867 on Research, \$360 on Public Service, \$1,726 on Academic Support, \$1,595 on Student Services, \$3,781 on Institutional Support and \$2,106 on Other expenditures.

Table 11: Mean Expenditures per FTE of Efficient HBCUs, 2011-2016

	Instruction	Research	Public Service	Academic Support	Student Services	Institutional Support	Other
2011	6,922	867	360	1,726	1,595	3,781	2,106
2012	7,250	1,608	859	1,703	2,063	4,071	1,843
2013	8,064	1,509	903	2,524	2,079	4,349	2,180
2014	8,060	1,446	698	2,274	2,016	4,014	2,091
2015	8,123	1,431	847	2,282	2,304	3,732	2,249
2016	8,190	1,392	917	1,934	2,319	3,765	2,316

Note: Expenditure for each year in current dollar amounts, unadjusted.

Inefficient HBCUs. The characteristics of the least efficient HBCUs, those receiving an efficiency score of less than 0.5, are described in the following paragraphs.

Table 12 contains, the mean student demographics, student to faculty ratios, and student success rates of the least efficient HBCUs. In 2016, the least efficient HBCUs enrolled an average of 5,200 students and served a student population of 66% African American students and 69% Pell grant recipients. In the same year, the average student to faculty ratio was 15, graduation rate 13%, and part-time retention rate was 10%. In 2013, the unique characteristics of the one HBCU that received an efficiency score of less than 0.5 is displayed.

Table 12: Mean student demographic, student to faculty ratio, and student success rates of the least efficient HBCUs

			African	Pell Grant	Student to Faculty	Graduation	Part Time Retention
	n	Enrollment	American	Recipients	Ratio	Rate	Rate
2011	3	5,424	71%	76%	16	12%	29%
2012	4	4,315	83%	80%	16	13%	24%
2013	1	5,011	60%	70%	11	16%	29%
2014	4	4,450	75%	81%	15	10%	13%
2015	4	4,467	76%	81%	15	14%	36%
2016	3	5,200	66%	69%	15	13%	10%

Table 13 shows the mean revenues per full time equivalent (FTE) of the least efficient HBCUs. In 2016, the least efficient HBCUs received an average of \$21,109 in tuition, \$33,983 in state appropriation, \$24,671 in government grants and contracts, \$1,127 in private gifts, \$1,654 in investment return and \$10,477 in other revenue per full time equivalent. The revenue reported for 2013 reflects the revenue of the one HBCU that received an efficiency score of less than 0.5, which had unusually low levels of

revenue per FTE. Revenue from investment return varied substantially from \$106 per FTE in 2015 to \$3,418 per FTE in 2014.

Table 13: Mean Revenues per FTE of least efficient HBCUs

	Tuition	State Appropriation	Government Grants/Contracts	Private Gifts	Investment Return	Other
2011	5,356	10,581	8,113	386	273	4,010
2012	2,791	8,237	7,592	206	113	2,284
2013	7,364	18,877	7,839	664	680	5,770
2014	5,122	10,260	7,365	369	855	3,338
2015	5,807	9,453	7,153	232	27	4,278
2016	7,036	11,328	8,224	376	551	3,492

Note: Revenue for each year in current dollar amounts, unadjusted.

The mean expenditures per full time equivalent (FTE) of the HBCUs receiving an efficiency score of less than 0.5 are displayed in Table 14. In 2016, the least efficient HBCUs spend \$9,775 per FTE on instruction, \$3,426 per FTE on research, \$643 per FTE on public service, \$2,641 on academic support, \$2,087 per FTE on student services, \$4,145 per FTE on institutional support, and \$5,013 on other expenditures. Instruction expenditures were highest for the one efficient school at \$15,051 per FTE in 2013. However, despite a reported average expenditure of \$10,660 per FTE on instruction in 2011, instructional expenditures remained below \$10,000 per FTE.

Table 14: Mean expenditures per FTE of the least efficient HBCUs.

	Instruction	Research	Public Service	Academic Support	Student Services	Institutional Support	Other
2011	10,660	879	1,270	3,315	2,087	4,778	3,289
2012	8,377	1,639	598	1,842	1,793	4,063	2,322
2013	15,051	1,639	809	5,001	3,123	5,369	3,263
2014	9,682	2,845	676	2,202	1,892	3,577	3,918
2015	8,866	489	708	2,357	2,014	4,623	4,556
2016	9,775	3,426	643	2,641	2,087	4,145	5,013

Note: Expenditure for each year in current dollar amounts, unadjusted.

Discussion

The efficiency scores resulting from the Data Envelopment Analysis of public, 4-year HBCUs skew toward efficiency. However, the number of HBCUs scoring in the highest levels of efficiency (0.9 and above) have been on a decreasing trend since 2013 (Figure 5). In 2016, there was a slight increase in the number of efficient HBCUs. In order to ensure that the results of this analysis were not affected by the decreasing enrollment population of HBCUs, the efficiency scores of all HBCUs were graphed against the enrollment (Figure 6). Since schools receiving an efficiency score of 1 occurred all along the spectrum of enrollment, this research concludes that size was appropriately accounted for in the DEA model specifications.

Most and Least Efficient HBCUs

By comparing the characteristics of the most and least efficient HBCUs, this research provides some insight into the differences among the two types of institutions. It should be noted that the least and most efficient HBCUs were very consistent over time. Stated differently, the population of most and least efficient HBCUs changed little in

composition over time. There were three schools assigned an efficiency score of 1 in each year of the dataset. All three of these schools vary in size and student to faculty ratios, serve a range of proportions of Pell grant recipients, and exhibit differences in expenditure categories. One of the three most efficient HBCUs has a total cost of attendance one-half the amount of the other two HBCUs. Two of the schools are Master's level and one is a Doctoral university.

Institutional characteristics. One particularly interesting finding was that the inefficient schools were slightly larger than the most efficient schools. This research does not support the notion that larger institutions have economies of scale that allow them to operate more efficiently (Avkiran, 2001; Coupet and Barnum, 2010; Thanassoulis, Kortelainen, Johnes, and Johnes, 2011). Also contrary to conventional thought, the student to faculty ratios of the least efficient schools were lower than the most efficient schools. Though the average student to faculty ratios of the two institution types didn't consistently differ by more than 2, prior research (Avkiran, 2001; Thanassoulis, Kortelainen, Johnes, and Johnes, 2011) might have led to the assumption that the more efficient schools would have smaller student to faculty ratios. However, HBCU student success literature does cite the more frequent, positive interactions with faculty as a means of student success in HBCUs (Harper, 2012; Minor, 2008).

Student Success. The most and least efficient HBCUs varied substantially in the student success outcomes. Graduation rates of the most efficient institutions were consistently 2 to 3 times the rates of the least efficient HBCUs. Additionally, the part-time retention rates of the most and least efficient HBCUs varied even more than graduation rates. In 2016, the part-time retention rate of the efficient HBCUs was almost

6 times that of the least efficient and in 2014, the most efficient HBCUs had part-time retention rates 3.5 times that of the least efficient. These vast differences might be due to differences in student population. With the exception of 2013 where there was only one HBCU categorized as least efficient, the most efficient HBCUs served student populations characterized by smaller proportions of Pell grant recipients. In previous research (citations), Pell grant recipients have been a major factor contributing to lower student success.

Expenditures. Comparing the average expenditures per FTE of the most efficient HBCUs (Table 10) to the least efficient HBCU expenditures (Table 13), the most efficient HBCUs consistently spend less on instruction. A trend of more recent years, the most efficient schools spent less on academic support, as the least efficient HBCUs spent more. The most efficient HBCUs also spent less on institutional support in recent years. Student services expenditures increased in both the most and least efficient HBCUs, with the most efficient spending close to \$300 more per FTE. The differences in expenditure could reflect choices made in the face of revenue stream changes. The most efficient of schools experienced a steady increase in tuition revenue from 2011 to 2015, with a slight decrease in 2016. The most efficient schools also experienced a steady increase in state appropriation revenue. The least efficient schools, however, experienced a much more sporadic trends in revenue changes over time. The difficult to predictable trends resulting from the culmination of decreasing revenue and decreasing enrollment could be a factor in the least efficient HBCU's inconsistent expenditure patterns.

Conclusion

The purpose of this research was to investigate the technical efficiency of HBCUs in order to understand the allocation of limited resources most supportive of student success. This research sought to answer the question: To what extent are HBCUs efficient stewards of public funds? Specifically, this research sought to 1) determine relative technical efficiency among the public HBCUs using Data Envelopment Analysis, 2) compare and contrast environmental characteristics and expenditure patterns among the most efficient and average HBCUs, and 3) suggest specific endogenous characteristics and expenditures to increase outputs among HBCUs and the larger higher education community.

This study examined the 39 public, 4-year HBCUs and found that the large majority of HBCUs are efficient producers of education outcomes, with over half assigned an efficiency score greater than 0.9 in each year of the analysis. Compared to the least efficient HBCUs, the most efficient institutions spent less on instruction and in recent years, decreased expenditures to academic support. Both most and least efficient schools have increased expenditures for student services. These expenditure patterns for technical efficiency are informative to the larger higher education community attempting to maximize outputs with minimal inputs. It should be noted, however, that this study does not consider the effect of allocative efficiency in the higher education community.

Policy and Practice Implications

This research is the first step of many to uncover the resource allocation decisions impacting student outcomes. DEA results in efficiency scores signify technical efficiency

and should be carefully and appropriately interpreted for policy and practice.

Improvements toward greater technical efficiency in HBCUs can be accomplished with resource allocation decisions at the institution level. As noted by this research, the average HBCU could decrease inputs by more than 10%. This suggests that institutions could begin to improve efficiency by reallocating expenditures from the institutional support and academic support categories to the student service category, thus becoming more aligned with the expenditure patterns of the most efficient HBCUs. The most efficient institutions, though they spent less per student on instruction and research, have increased overall expenditures in both categories over time. More detail about the resource allocation choices behind these changes can be deciphered with future research in the most efficient institutions.

Future Research Implications

Further research is needed to examine the decision-making and purchases made with expenditures in the Student Services, Academic Support, and Instruction categories at the most efficient HBCUs. More detailed, perhaps qualitative analyses of the resource allocation decisions made at the most efficient institutions could yield valuable information for practice and policy. Additionally, the increasing student services expenditure seems contradictory to the observation that many HBCUs don't have the large student centers. Further research should be conducted to understand how these student services expenditures are related to student outcomes. Investigation of the most efficient schools would yield practices that could be replicated in the policies and practices of the larger higher education community.

References

- Adams v. Richardson*, 156 U.S.App. D.C. 267, 480 F.2d 1159, 1164-65 (1973)
- Ahn, T., Charnes, A., & Cooper, W. W. (1988). Some statistical and DEA evaluations of relative efficiencies of public and private institutions of higher learning. *Socio-Economic Planning Sciences*, 22(6), 259-269.
- Alexander Jr, M. (2009). *An exploration of the relationship between student engagement and academic performance of undergraduate students at a public historically Black higher education institution in the southeast* (Doctoral dissertation, University of Alabama Libraries).
- Allen, W. (1992). The color of success: African-American college student outcomes at predominantly White and historically Black public colleges and universities. *Harvard Educational Review*, 62(1), 26-45.
- Allen, W. R., Jewell, J. O., Griffin, K. A., & Wolf, D. S. S. (2007). Historically Black colleges and universities: Honoring the past, engaging the present, touching the future. *The Journal of Negro Education*, 263-280.
- Arroyo, A. T., & Gasman, M. (2014). An HBCU-based educational approach for Black college student success: Toward a framework with implications for all institutions. *American Journal of Education*, 121(1), 57-85.
- Avkiran, N. K. (2001). Investigating technical and scale efficiencies of Australian universities through data envelopment analysis. *Socio-Economic Planning Sciences*, 35(1), 57-80.
- Boland, W., & Gasman, M. (2014). America's Public HBCUs: A Four State Comparison of Institutional Capacity and State Funding Priorities.

- Brady, K., Eatman, T., & Parker, L. (2000). To have or not to have? A preliminary analysis of higher education funding disparities in the post-Ayers v. Fordice era: Evidence from critical race theory. *Journal of Education Finance*, 25(3), 297-322.
- Brown v. Board of Education.*, 347 U.S. 483 (1954).
- Brown, M. C., & Davis, J. E. (2001). The historically Black college as social contract, social capital, and social equalizer. *Peabody journal of Education*, 76(1), 31-49.
- Brown, W. A., & Burnette, D. (2014). Public HBCUs' financial resource distribution disparities in capital spending. *The Journal of Negro Education*, 83(2), 173-182.
- Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European journal of operational research*, 2(6), 429-444.
- Coalition for Equity & Excellence in Maryland Higher Education, et al. v. Maryland Higher Education Commission, et al.*, Civ. No. 06-2773-CCB (2006)
- Coupet, J., & Barnum, D. (2010). HBCU efficiency and endowments: An exploratory analysis. *International Journal of Educational Advancement*, 10(3), 186-197.
- Drezner, N. D., & Gupta, A. (2012). Busting the myth: Understanding endowment management at public historically black colleges and universities. *The Journal of Negro Education*, 81(2), 107-120.
- Farrell, M. J. (1957). The measurement of productive efficiency. *Journal of the Royal Statistical Society. Series A (General)*, 120(3), 253-290.
- Farrell M.J. and Fieldhouse M. (1962) Estimating efficient production functions under increasing returns to scale, *J.R. Statis. Soc. Series A* 125, 252-267.
- Gasman, M. (2010). Comprehensive funding approaches for historically Black colleges and universities.

- Gasman, M. (2013). The changing face of historically Black colleges and universities. *Philadelphia, PA: Center for Minority Serving Institutions, University of Pennsylvania.*
- Harper, S. R., Patton, L. D., & Wooden, O. S. (2009). Access and equity for African American students in higher education: A critical race historical analysis of policy efforts. *The Journal of Higher Education*, 80(4), 389-414.
- Harper, S. R. (2012). *Black male student success in higher education: A report from the National Black Male College Achievement Study*. University of Pennsylvania, Graduate School of Education, Center for the Study of Race and Equity in Education.
- Hodge-Clark, K., & Daniels, B. D. (2014). Top Strategic Issues Facing HBCUs, Now and into the Future. *Association of Governing Boards of Universities and Colleges.*
- Jenkins, L., & Anderson, M. (2003). A multivariate statistical approach to reducing the number of variables in data envelopment analysis. *European Journal of Operational Research*, 147(1), 51-61.
- Johnes, J. (2006). Data envelopment analysis and its application to the measurement of efficiency in higher education. *Economics of Education Review*, 25(3), 273-288.
- Kim, M. M. (2002). Historically Black vs. White institutions: Academic development among Black students. *The Review of Higher Education*, 25(4), 385-407.
- Lawyer's Committee for Civil Rights Under Law, (2014). Maryland Historically Black Colleges and Universities Litigation. Retrieved from:
<https://lawyerscommittee.org>

- Lee, J. M., & Keys, S. W. (2013). Land-grant but unequal: State one-to-one match funding for 1890 land-grant universities. *APLU Office of Access and Success publication*, (3000-PB1).
- Ma, J., Pender, M., & Welch, M. (2016). Education Pays 2016: The Benefits of Higher Education for Individuals and Society. Trends in Higher Education Series. *CollegeBoard*.
- Minor, J. T. (2008). A contemporary perspective on the role of public HBCUs: Perspicacity from Mississippi. *The Journal of Negro Education*, 323-335.
- Nazarko, J., & Šaparauskas, J. (2014). Application of DEA method in efficiency evaluation of public higher education institutions. *Technological and Economic development of Economy*, 20(1), 25-44.
- Nichols, A., & Evans-Bell, D. (2017). A look at Black student success: Identifying top- and bottom-performing institutions. *A report for The Education Trust*. Retrieved from <https://edtrust.org/resource/black-student-success/>.
- Office of Management and Budget (2017, March). *America First: A Budget Blueprint to Make America Great Again*. Retrieved from: https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/budget/fy2018/2018_blueprint.pdf
- Perna, L. W. (2001). The contribution of historically Black colleges and universities to the preparation of African Americans for faculty careers. *Research in Higher Education*, 42(3), 267-294.

- Perna, L. W., Milem, J., Gerald, D., Baum, E., Rowan, H., & Hutchens, N. (2006). The status of equity for Black undergraduates in public higher education in the south: Still separate and unequal. *Research in Higher Education*, 47(2), 197-228.
- Roebuck, J. B., & Murty, K. S. (1993). Historically Black colleges and universities: Their place in American higher education. Praeger Publishers, 88 Post Road West, Box 5007, Westport, CT 06881.
- Rolle, A. (2004). Out with the old-in with the new: Thoughts on the future of educational productivity research. *Peabody Journal of Education*, 79(3), 31-56.
- Ruggiero, J. (1996). Efficiency of educational production: An analysis of New York school districts. *The Review of Economics and Statistics*, 499-509.
- Sav, G. T. (1997). Separate and unequal: State financing of historically Black colleges and universities. *The Journal of Blacks in Higher Education*, (15), 101-104.
- Sav, G. T. (2010). Funding historically Black colleges and universities: Progress toward equality?. *Journal of Education Finance*, 35(3), 295-307.
- Shavers, V. L., Fagan, P., Lawrence, D., McCaskill-Stevens, W., McDonald, P., Browne, D., ... & Trimble, E. (2005). Barriers to racial/ethnic minority application and competition for NIH research funding. *Journal of the National Medical Association*, 97(8), 1063.
- Sigritz, B. (2015). State Expenditure Report Summary: Examining Fiscal 2013-2015 StateSpending. Washington, DC: NASBO.
- Simms, K. (2014). Educational Outcomes at Historically Black Colleges and Universities: Eclectic or Cohesive?. *SAGE Open*, 4(2), 2158244014530131.

Snyder, T. D., & Dillow, S. A. (2015). Digest of Education Statistics 2014. NCES 2016-006. *National Center for Education Statistics*.

State Higher Education Executive Officers Association. (2016). *SHEF: FY 2015 State Higher Education Finance*. Retrieved from http://sheeo.org/sites/default/files/project-files/SHEEO_FY15_Report_051816.pdf

Thanassoulis, E., Kortelainen, M., Johnes, G., & Johnes, J. (2011). Costs and efficiency of higher education institutions in England: a DEA analysis☆. *Journal of the Operational Research Society*, 62(7), 1282-1297.

Thurgood Marshall College Fund (2015). Historically Black Colleges & Universities (HBCUs). [Online Image]. Retrieved March 21,2017 from <https://tmcf.org/about-us/our-schools/hbcus>

Titus, M. A. (2009). The production of bachelor's degrees and financial aspects of state higher education policy: A dynamic analysis. *The Journal of Higher Education*, 80(4), 439-468.

Upton, R., & Tanenbaum, C. (2014). The Role of Historically Black Colleges and Universities as Pathway Providers: Institutional Pathways to the STEM PhD. *American Institutes for Research*.

U.S. Department of Education, October 24, 2016. Fact Sheet: Obama Administration Investments in Historically Black Colleges and Universities. Retrieved from: <https://www.ed.gov/news/press-releases/fact-sheet-obama-administration-investments-historically-Black-colleges-and-universities>

Willie, C. V., & Cunnigen, D. (1981). Black students in higher education: A review of studies, 1965-1980. *Annual Review of Sociology*, 7(1), 177-198.

Appendix A: IPEDS Expenditure Variable Descriptions

Variable	Description
Institutional support	A functional expense category that includes expenses for the day-to-day operational support of the institution. Includes expenses for general administrative services, central executive-level activities concerned with management and long range planning, legal and fiscal operations, space management, employee personnel and records, logistical services such as purchasing and printing, and public relations and development. Also includes information technology expenses related to institutional support activities. If an institution does not separately budget and expense information technology resources, the IT costs associated with student services and operation and maintenance of plant will also be applied to this function.
Academic support	A functional expense category that includes expenses of activities and services that support the institution's primary missions of instruction, research, and public service. It includes the retention, preservation, and display of educational materials (for example, libraries, museums, and galleries); organized activities that provide support services to the academic functions of the institution (such as a demonstration school associated with a college of education or veterinary and dental clinics if their primary purpose is to support the instructional program); media such as audiovisual services; academic administration (including academic deans but not department chairpersons); and formally organized and separately budgeted academic personnel development and course and curriculum development expenses. Also included are information technology expenses related to academic support activities; if an institution does not separately budget and expense information technology resources, the costs associated with the three primary programs will be applied to this function and the remainder to institutional support. Institutions include actual or allocated costs for operation and maintenance of plant, interest, and depreciation.
Public service	A functional expense category that includes expenses for activities established primarily to provide noninstructional services beneficial to individuals and groups external to the institution. Examples are conferences, institutes, general advisory service, reference bureaus, and similar services provided to particular sectors of the community. This function includes expenses for community services, cooperative extension services, and public broadcasting services. Also includes information technology expenses related to the public service activities if the institution separately budgets and expenses information technology resources (otherwise these expenses are included in academic support).

	Institutions include actual or allocated costs for operation and maintenance of plant, interest, and depreciation.
Research	A functional expense category that includes expenses for activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution. The category includes institutes and research centers, and individual and project research. This function does not include nonresearch sponsored programs (e.g., training programs). Also included are information technology expenses related to research activities if the institution separately budgets and expenses information technology resources (otherwise these expenses are included in academic support.) Institutions include actual or allocated costs for operation and maintenance of plant, interest, and depreciation.
Instruction	A functional expense category that includes expenses of the colleges, schools, departments, and other instructional divisions of the institution and expenses for departmental research and public service that are not separately budgeted. Includes general academic instruction, occupational and vocational instruction, community education, preparatory and adult basic education, and regular, special, and extension sessions. Also includes expenses for both credit and non-credit activities. Excludes expenses for academic administration where the primary function is administration (e.g., academic deans). Information technology expenses related to instructional activities if the institution separately budgets and expenses information technology resources are included (otherwise these expenses are included in academic support). Institutions include actual or allocated costs for operation and maintenance of plant, interest, and depreciation.
Auxiliary enterprises	Expenses for essentially self-supporting operations of the institution that exist to furnish a service to students, faculty, or staff, and that charge a fee that is directly related to, although not necessarily equal to, the cost of the service. Examples are residence halls, food services, student health services, intercollegiate athletics (only if essentially self-supporting), college unions, college stores, faculty and staff parking, and faculty housing. Institutions include actual or allocated costs for operation and maintenance of plant, interest and depreciation.
Student Services	A functional expense category that includes expenses for admissions, registrar activities, and activities whose primary purpose is to contribute to students emotional and physical well-being and to their intellectual, cultural, and social development outside the context of the formal instructional program. Examples include student activities, cultural events, student newspapers, intramural athletics, student organizations, supplemental instruction outside the normal administration, and student records. Intercollegiate athletics and student health services may also be included except when operated as self-supporting auxiliary enterprises. Also may include information technology expenses related to student service activities if the institution separately budgets and expenses

	information technology resources (otherwise these expenses are included in institutional support.) Institutions include actual or allocated costs for operation and maintenance of plant, interest, and depreciation.
--	---

Appendix B: IPEDS Institutional Variable Description

Variable	Description
75th Percentile SAT Reading score	The score above which 25 percent of students submitting SAT Reading test scores to an institution scored.
Total Enrollment	This annual component of IPEDS collects data on the number of students enrolled in the fall at postsecondary institutions. Students reported are those enrolled in courses creditable toward a degree or other formal award; students enrolled in courses that are part of a vocational or occupational program, including those enrolled in off-campus or extension centers; and high school students taking regular college courses for credit. Institutions report annually the number of full- and part-time students, by gender, race/ethnicity, and level (undergraduate, graduate, first-professional); the total number of undergraduate entering students (first-time, full- and part-time students, transfer-ins, and non-degree students); and retention rates. In even-numbered years, data are collected for state of residence of first-time students and for the number of those students who graduated from high school or received high school equivalent certificates in the past 12 months. Also in even-numbered years, 4-year institutions are required to provide enrollment data by gender, race/ethnicity, and level for selected fields of study. In odd-numbered years, data are collected for enrollment by age category by student level and gender.
Cost of Attendance	Total cost of attendance is the sum of published tuition and required fees (lower of in-district or in-state for public institutions), books and supplies, and the weighted average for room and board and other expenses.
Full Time Equivalent	The full-time-equivalent (FTE) enrollment used is the sum of the institutions' FTE undergraduate enrollment and FTE graduate enrollment (as calculated from or reported on the 12-month Enrollment component) plus the estimated FTE of first-professional students. Undergraduate and graduate FTE are estimated using 12-month instructional activity (credit and/or contact hours).
Percentage Pell Grant Recipients	(Higher Education Act of 1965, Title IV, Part A, Subpart I, as amended.) Provides grant assistance to eligible undergraduate postsecondary students with demonstrated financial need to help meet education expenses.
Bachelor's Degrees Awarded	An award (baccalaureate or equivalent degree, as determined by the Secretary, U.S. Department of Education) that normally requires at least 4 but not more than 5 years of full-time equivalent college-level

	work. This includes all bachelor's degrees conferred in a 5-year cooperative (work-study) program. A cooperative plan provides for alternate class attendance and employment in business, industry, or government; thus, it allows students to combine actual work experience with their college studies. Also includes bachelor's degrees in which the normal 4 years of work are completed in 3 years.
Full Time Retention Rate	A measure of the rate at which students persist in their educational program at an institution, expressed as a percentage. For four-year institutions, this is the percentage of first-time bachelors (or equivalent) degree-seeking undergraduates from the previous fall who are again enrolled in the current fall. For all other institutions this is the percentage of first-time degree/certificate-seeking students from the previous fall who either re-enrolled or successfully completed their program by the current fall. Full Time Students- Undergraduate: A student enrolled for 12 or more semester credits, or 12 or more quarter credits, or 24 or more contact hours a week each term. Graduate: A student enrolled for 9 or more semester credits, or 9 or more quarter credits, or a student involved in thesis or dissertation preparation that is considered full-time by the institution. Doctor's degree - Professional practice- as defined by the institution.
Part-time Retention Rate	A measure of the rate at which students persist in their educational program at an institution, expressed as a percentage. For four-year institutions, this is the percentage of first-time bachelors (or equivalent) degree-seeking undergraduates from the previous fall who are again enrolled in the current fall. For all other institutions this is the percentage of first-time degree/certificate-seeking students from the previous fall who either re-enrolled or successfully completed their program by the current fall. Part time students - Undergraduate: A student enrolled for either less than 12 semester or quarter credits, or less than 24 contact hours a week each term. Graduate: A student enrolled for less than 9 semester or quarter credits.
Graduation Rate- total cohort	This annual component of IPEDS was added in 1997 to help institutions satisfy the requirements of the Student Right-to-Know legislation. Data are collected on the number of students entering the institution as full-time, first-time, degree/certificate-seeking undergraduate students in a particular year (cohort), by race/ethnicity and gender; the number completing their program within 150 percent of normal time to completion; the number that transfer to other institutions if transfer is part of the institution's mission. Prior to 2007, institutions who offered athletically-related student aid were asked to report, by sport, the number of students receiving aid and whether they completed within 150 percent of normal time to completion. Now, these institutions only need to report a URL where

	the athletic data is located on their website, when available. GR automatically generates worksheets that calculate rates, including average rates over 4 years.
Local Appropriation	<p>Revenues from local appropriations per FTE enrollment for public institutions using GASB 34/35 is derived as follows:</p> <p>Local appropriations (F1B12) divided by 12-month FTE enrollment (FTE12MN)</p> <p>Local appropriations, education district taxes, and similar support - Local appropriations are government appropriations made by a governmental entity below the state level. Education district taxes include all tax revenues assessed directly by an institution or on behalf of an institution when the institution will receive the exact amount collected. These revenues also include similar revenues that result from actions of local governments or citizens (such as through a referendum) that result in receipt by the institution of revenues based on collections of other taxes or resources (sales taxes, gambling taxes, etc.).</p>
Government Grants	<p>Revenues from government grants and contracts per FTE enrollment for public institutions using GASB 34/35 is derived as follows: Government grants and contracts is equal to the sum of</p> <p>Federal operating grants and contracts (F1B02)</p> <p>State operating grants and contracts (F1B03)</p> <p>Local operating grants and contracts (F1B04A)</p> <p>Federal nonoperating grants (F1B13)</p> <p>State nonoperating grants (F1B14)</p> <p>Local nonoperating grants (F1B15)</p> <p>Government grants and contract revenues is then divided by 12-month FTE enrollment (FTE12MN). Government grants and contracts (revenues) - Revenues from governmental agencies that are for specific research projects, other types of programs , or for general institutional operations (if not government appropriations). Examples are research projects, training programs, student financial assistance, and similar activities for which amounts are received or expenses are reimbursable under the terms of a grant or contract, including amounts to cover both direct and indirect expenses. Includes Pell Grants and reimbursement for costs of administering federal financial aid programs. Grants and contracts should be classified to identify the governmental level - federal, state, or local - funding the grant or contract to the institution; grants and contracts from other sources are classified as nongovernmental grants and contracts. GASB institutions are required to classify in financial reports such grants and contracts as either operating or nonoperating.</p>

Private Gifts	<p>Revenues from private gifts, grants, and contracts per FTE (GASB) is derived as follows:</p> <p>Private gifts, grants, and contracts is the sum of</p> <p>Private operating grants and contracts (F1B04B) Gifts, including contributions from affiliated organizations (F1B16)</p> <p>Private gifts, grants, and contracts is then divided by 12-month FTE enrollment (FTE12MN)</p> <p>Private operating grants and contracts - Revenues from nongovernmental agencies and organizations that are for specific research projects or other types of programs and that are classified as operating revenues. Examples are research projects and similar activities for which amounts are received or expenditures are reimbursable under the terms of a grant or contract.</p> <p>Gifts, including contributions from affiliated organizations - Revenues from private donors for which no legal consideration is provided; these would be nonexchange transactions as defined in GASB Statement No. 33 Accounting and Financial Reporting for Nonexchange Transactions. Includes all gifts or contributions to the institution except those classified as additions to permanent endowments or capital grants & gifts. Includes gifts from affiliated organizations. Includes the amount of contributed services recognized by the institution. Amounts from capital grants and contracts are not included.</p>
Investment Return	<p>Revenues from investment return per FTE (GASB) is derived as follows:</p> <p>Investment return (F1B17) is divided by 12-month FTE enrollment (FTE12MN)</p> <p>Investment income - Revenues derived from the institution's investments, including investments of endowment funds. Such income may take the form of interest income, dividend income, rental income or royalty income and includes both realized and unrealized gains and losses</p>
Tuition	<p>Revenues from tuition and fees per FTE enrollment for public institutions using GASB 34/35 standard is derived as follows: Tuition and fees revenues (F1B01) divided by 12-month FTE enrollment</p>

	(FTE12MN) . Tuition and fees (revenues) (F1B01) - Revenues from all tuition and fees assessed against students (net of refunds and discounts and allowances) for educational purposes. If tuition or fees are remitted to the state as an offset to the state appropriation, the total of such tuition or fees are deducted from the total state appropriation and added to the total for tuition and fees.
State Appropriation	Revenues from State appropriations per FTE enrollment for public institutions using GASB 34/35 is derived as follows: State appropriations (F1B11) divided by 12-month FTE enrollment (FTE12MN). State appropriations are amounts received by the institution through acts of a state legislative body, except grants and contracts and capital appropriations. Funds reported in this category are for meeting current operating expenses, not for specific projects or programs.
Other	Revenues from other core revenue sources per FTE enrollment for public institutions using GASB 34/35 is derived as follows: Other core revenues is equal to the sum of: Other operating sources (F1B08) Federal appropriations (F1B10) Other nonoperating revenues (F1B18) Total other revenues and additions (F1B24) Other core revenues is then divided by 12-month FTE enrollment (FTE12MN)

Appendix C: Student Population Descriptive Statistics, 2011-2016

HBCU Student Population, 2011-2016

	2011		2012		2013		2014		2015		2016	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
				20.1		20.1		19.8				19.9
Percent African American	78.28	20.25	77.44	9	77.31	7	76.38	9	75.90	19.83	74.33	7
Percent Pell Grant												
Recipients	73.08	9.84	74.62	8.69	73.13	9.63	72.10	9.93	74.15	8.84	72.05	8.85
75th percentile SAT			465.5	17.5		39.2	473.4	19.0	471.8		481.2	32.5
Reading	467.50	22.71	2	9	474.70	9	8	2	1	30.03	3	2
Percent Freshmen				19.3		19.7		17.8				22.7
Admitted	52.47	19.90	50.79	6	52.61	3	55.85	9	61.79	20.09	60.52	4

HBCU Student Success, 2011-2016

	2011		2012		2013		2014		2015		2016	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Graduation Rate-150%	29.55	9.02	29.49	9.36	29.51	9.33	30.90	10.89	29.56	10.09	28.97	10.07
Bachelor GradRate-200%	34.44	8.92	32.97	9.98	33.03	9.49	34.38	11.14	33.51	9.32	34.08	10.60
Percent Still Enrolled	17.49	16.01	17.15	17.97	17.21	15.90	15.13	16.63	14.85	16.62	12.79	12.77
Full-time Retention Rate	63.92	9.56	63.54	10.58	64.03	8.91	65.82	9.22	66.51	10.36	64.85	9.99
Part-time Retention Rate	40.69	19.89	39.50	21.51	39.08	17.93	34.26	23.69	41.67	28.28	34.14	23.55

Appendix D: Institutional Revenue, 2011-2016

Total HBCU Revenue per Source, 2011-2016

	Tuition	State Appropriation	Local Appropriation	Government Grants	Private Grants	Investment Return	Other	Total
2011	745,617,113	1,349,460,622	26,834,054	1,371,264,863	36,575,001	50,069,045	570,986,500	4,150,807,198
2012	804,404,273	1,293,962,249	23,524,600	1,251,385,246	34,783,418	28,238,593	479,055,400	3,915,353,779
2013	854,960,024	1,318,806,977	25,085,837	1,194,466,642	38,153,740	39,393,052	377,688,600	3,848,554,872
2014	836,397,041	1,308,086,975	27,633,946	1,123,093,161	41,693,100	75,312,396	432,090,900	3,844,307,519
2015	852,420,244	1,376,452,736	27,509,492	1,127,202,832	49,635,483	13,793,352	537,499,000	3,984,513,139
2016	870,074,267	1,407,459,066	27,390,131	1,149,489,754	47,842,960	19,343,185	566,626,200	4,088,225,563

HBCU mean revenue per full-time equivalent, by source, 2011-2016

	Tuition	State Appropriation	Local Appropriation	Government Grants	Private Gifts, Grants, Contracts	Investment Return	Other
2011	3979.21	7414.74	352.67	8017.97	241.77	247.72	2985.18
2012	4383.26	7444.21	326.05	7715.59	238.38	161.18	2745.36
2013	4882.03	8001.15	359.44	7789.41	256.59	219.69	2360.28
2014	4864.72	8207.46	398.21	7501.54	277.21	428.38	2774.95
2015	4923.21	8808.97	375.54	7574.46	332.10	36.49	3416.90
2016	5042.72	9291.13	377.69	7855.36	336.41	63.18	3211.82

Appendix E: Institutional Expenditures per FTE, 2011-2016

Institutional expenditures reported per Full Time Equivalent (FTE)

	2011		2012		2013		2014		2015		2016	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Instruction	7,616	2,212	7,553	2,047	8,034	1,913	8,139	1,828	8,284	1,751	8,242	2,163
Research	1,736	1,435	1,816	1,619	1,861	1,876	1,803	1,869	1,806	1,958	1,801	1,835
Public Service	1,066	1,009	1,127	1,117	1,159	1,155	1,190	1,257	1,243	1,353	1,235	1,306
Academic												
Support	2,183	956	2,129	903	2,385	1,052	2,330	1,027	2,444	1,122	2,487	1,352
Student												
Service	1,823	903	1,909	985	2,075	1,080	2,095	1,186	2,229	1,252	2,288	1,357
Instructional												
Support	3,761	1,572	4,021	2,099	4,290	2,084	4,240	2,118	4,449	1,995	4,596	2,465
Other	2,853	1,910	2,477	1,432	2,586	1,726	2,651	1,614	2,697	1,928	3,667	2,650

Appendix F: Environmental and Output Variable Correlation Table, 2011-2016

Revenue input variables reported per FTE											
	Total Cost	State Approp	Pell	SAT 75	Capital Approp	Federal Approp	Tuition	Grad Rate	PT Retention	FT Retention	Enrollment
Total Cost of											
Attendance	1										
State Appropriation	-0.1041	1									
Pell	-0.1168	-0.0770	1								
SAT 75	0.0019	-0.0634	-0.4008*	1							
Capital Appropriation	0.1499*	0.3528*	-0.2123*	-0.0311	1						
	-										
Federal Appropriation	0.1555*	-0.0742	0.0539	-0.0672	-0.1145	1					
				-							
Tuition	0.4263*	0.0459	-0.1575*	0.1795*	0.0363	-0.0361	1				
					-						
Grad Rate	0.0084	-0.0636	-0.2299*	0.0816	0.2119*	0.0485	0.0854	1			
		-									
PT Retention	-0.0439	0.1470*	-0.2041*	0.1701*	0.0588	0.0986	-0.0046	0.2266*	1		
FT Retention	-0.0199	0.0259	-0.2634*	0.2304*	0.0163	-0.0846	-0.206	0.6684*	0.2137*	1	
Enrollment	0.0797	-0.0652	-0.1962*	0.1732*	-0.0304	0.1655*	0.2755*	0.4915*	0.1546*	0.4827*	1

Chapter IV

Expenditure and Success in HBCUs

Introduction

Historically Black Colleges and Universities (HBCUs) provide support for Black students unlike student support in other institutions. Literature has documented the higher completion rates, lower dropout rates, improved confidence, increased campus activity involvement, and more frequent, positive faculty interactions of African American students attending HBCUs (Palmer, Davis, & Hilton, 2009; Palmer, Davis, & Maramba, 2010; Palmer & Gasman, 2008). This support has allowed for marked success of Black students attending HBCUs and has influenced the educational attainment of a large proportion of Black professionals. HBCUs have provided educational attainment for 40% of Black members of Congress, 12.5% of Black CEOs, 40% of Black engineers, 50% of Black professors at non-HBCUs, 50% of Black lawyers, and 80% of Black judges were all graduates of HBCUs (Thurgood Marshall College Fund, 2015).

The distinctive influence of HBCUs on student outcomes is well-documented in research examining a multitude of student outcomes (Constantine, 1995; Ehrenberg & Rothstein, 1993; Fryer & Greenstone, 2007; Hamrick, Schuh, & Shelley, 2004; Webber & Ehrenberg, 2010). Also well documented in literature is this achievement despite being funded at only a fraction of the allocation of their peers (Brown & Burnette, 2014; Lee & Keys, 2013). Scholars suggest by incorporating the family, providing African American mentors, offering spiritual and ethical leadership, and prioritizing financial support, HBCUs have produced a disproportionate number of Black graduates, despite disparate

funding (Jett, 2013; Palmer, Davis, & Hilton, 2009; Palmer, Davis, & Maramba, 2010; Palmer, Davis & Thompson, 2010; Museus, Palmer, Davis & Maramba, 2011).

Though a robust literature base exists detailing the supports Black students receive at HBCUs, studies specifically investigating the relationships between HBCU-specific institutional expenditures and student outcomes do not exist. Consensus has been reached on the positive impacts of expenditure on outcomes (Jackson, Johnson, & Persico, 2015; Powell, Suitt Gileland, & Pearson, 2012; Webber & Ehrenberg, 2010), yet HBCUs have not been studied in isolation for their unique methods of achieving high levels of performance despite low levels of funding.

The purpose of this research was to extend the seminal literature base that established positive relationships between institutional expenditure and student outcomes into the HBCU community. Conceptually, the high achievement of HBCUs is contradictory to the established relationships between high levels of expenditure and high student outcomes in other institutions of higher education. Using ordinary least squares regression production function modeling specified for the uniquely supportive environment of HBCUs, this research sought to answer the question: In public 4-year HBCUs, what relationships exist between institutional expenditure categories and student outcomes? For this research, institutional expenditure categories are the annual categorical expenditures reported to the National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS). Student outcomes refer to graduation rates, retention rates, credit attainment, enrollment, and degrees conferred also reported to IPEDS.

In times of resource constraint and pressure to keep tuition low (Sigritz, 2015), institutions of higher education must understand the effects of expenditure on student outcomes. Understanding relationships between student outcomes and institutional expenditures within the HBCU community may provide opportunity for the greater higher education community to alter resource allocation strategies to better support student success. The following sections of the paper discuss the theoretical framework guiding the research, review relevant literature, and detail the analysis to be performed.

Theoretical Framework

The theoretical framework that guided this work is the *HBCU-based educational approach for Black college student success* proposed by Arroyo and Gasman (2014), referred to as the *HBCU-based framework* for brevity. Guidance provided by this institution-focused framework ensured the analytical methods were specifically relevant to the HBCU dataset that served as the focus of this research. The analytical methods of this work were specified to optimally measure the relationships between HBCU expenditure and student success in the HBCU context provided by Arroyo and Gasman's (2014) framework.

Recognizing that HBCUs are able to achieve a myriad of student successes by providing a supportive environment for a varied student population in white-dominated higher education, Arroyo and Gasman's (2014) framework includes four main components: 1) diverse applicant population, 2) institutional entry point, 3) reciprocal processes and outcomes, and 4) grand outcome. The framework illustrated by Arroyo and Gasman (2014) in Figure 9 demonstrates the range of ethnicities, races, cultures, abilities, preparedness, and socio-economic statuses and cultures of students attending HBCUs as

integral to the success of the institutions. The framework also necessarily factors in the broad access and affordability in the missions of most HBCUs. By maintaining a supportive environment – complete with support for identity formation, values cultivation, and achievement – HBCUs purposefully design programming and support for the student population.

Figure 9 : HBCU-based educational approach for Black college student success, Arroyo and Gasman (2014)

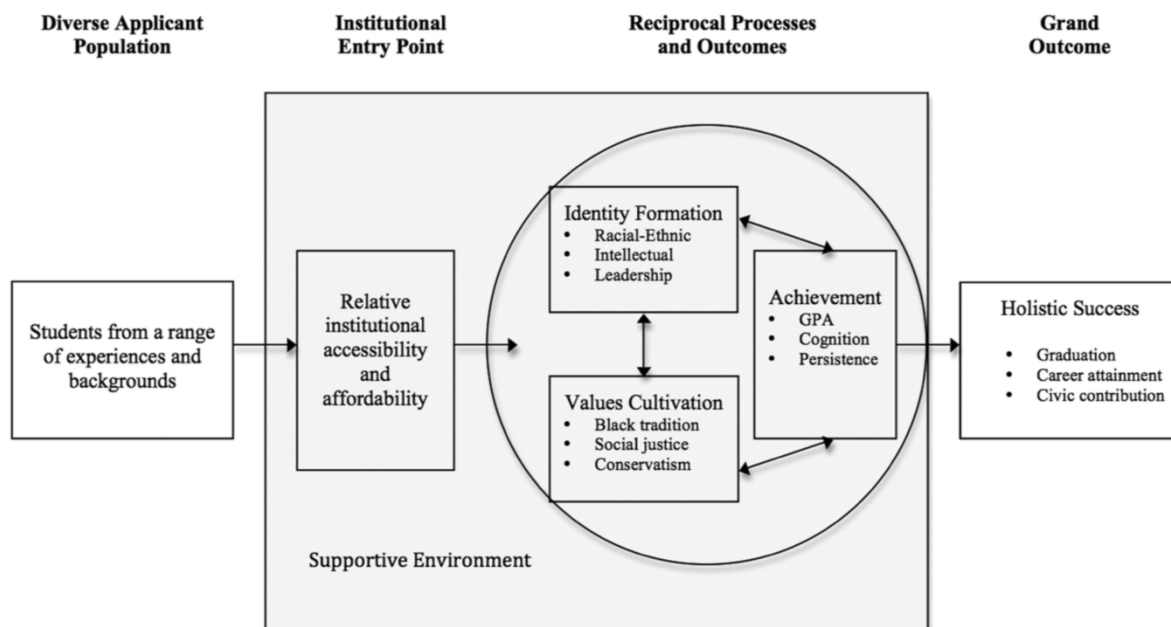


FIG. 1.—Conceptual model: an HBCU-based educational approach for black college student success

Also important to understanding HBCUs as an institution, Arroyo and Gasman (2014) refer to the grand outcome as a measure of holistic success attained after development of the student. The identity formation, values cultivation, and achievement of students are seen as milestones contributing to the grand outcome of career attainment and civic contribution after graduation. This research utilizes this framework to ensure the analytical models developed are truly representative of the supportive

environment of HBCUs. The following section contextualizes this analysis by providing a review of relevant literature.

Literature Review

In his book, *Resource Allocation in Higher Education*, William Massy (1996) pinpoints the 1990s as a shift in public perception of higher education. Prior to the 1990s, the increasing cost of higher education was attributable to the exploding enrollment first experienced with the Servicemen's Readjustment Act of 1944 (GI Bill). This enrollment increase continued into the 1980s with higher education attainment became increasingly necessary for higher paying jobs. Massy posits as more people accessed higher education and more jobs required a higher education credential, public opinion shifted to hold higher education more accountable to rapidly increasing costs (Massy, 1996). It is this change in public perception and accountability for funds that spawned much of the first literature examining relationships between higher education expenditures and student outcomes.

Student Outcomes and Institutional Expenditure.

Early investigations of relationships between student outcomes and institutional expenditures are limited to a set of studies published in the 2000s (Gansemer-Topf & Schuh (2006; Pike, Smart, Kuh, & Hayek, 2006; Ryan, 2005; Smart & Toutkoushian; 2001; Titus, 2006). These studies analyzed the relationships among different aspects of institutional expenditure (total expenditure and categorical expenditure) and a variety of student outcomes (student self-reported learning and institutionally reported outcomes). Varied in the control variables, outcomes of interest, and expenditure unit of analysis, these studies not surprisingly found conflicting results.

Measuring impact on student-reported gains in learning via student engagement surveys submitted by 2,269 students at 315 different institutions, Smart and Toutkoushian (2001) found that higher per student expenditures were related to self-reported learning. Exploring the relationship further, the authors also found negative relationship between academic support expenditures and student learning and no consistent relationship could be established between instructional spending and student learning (Smart & Toutkoushian, 2001).

Using data for 142 colleges' and universities' National Survey of Student Engagement⁷ and Integrated Postsecondary Education Data System, John Ryan (2005) found a negative relationship between administrative expenditures at the institutional level and student engagement, but noted the study was limited by the voluntary nature of much of the data. Pike, Smart, Kuh, & Hayek (2006) contradicted Ryan's (2005) findings stating that expenditure had no effect on student engagement, but rather student engagement is much more dependent upon student demographics and institution type.

The research using student engagement as a proxy for student outcomes was followed by studies examining the relationships between institutional expenditures and student outcomes of graduation rates and retention. Employing hierarchical linear modeling, Titus (2006) found a negative relationship between student persistence and administrative expenditures. Gansemer-Topf and Schuh (2006) found positive

⁷ Extending from the foundational relationships between student involvement and success in higher education created by Tinto (1975), Chickering and Gamson (1987) and Astin (1993), George Kuh (2001) developed the National Survey of Student Engagement (NSSE) as a primary data source to investigate the ways in which students engage in educationally purposeful activities.

relationships between total institutional expenditures and retention and graduation rates at private baccalaureate institutions, but found no relationship between student services expenditures and graduation rates.

Other studies of the relationships between institutional expenditure and student outcomes employed econometric analyses. One of the first applications of the education production function to institutions of higher education was performed by Wolf-Wendel, Baker and Morpew (2000) who determined instructional expenditures were positively related to the success of women earning Baccalaureate degrees. Webber and Ehrenberg's (2010) production function approach found that student services expenditures were positively related to graduation rates and first year persistence and that schools with larger numbers of Pell Grant recipients and lower test scores demonstrated stronger relationships. Narrowing the data set to public universities in Ohio, Webber (2012) was able to isolate the positive effects of student services expenditures on students with low SAT/ACT scores and instruction expenditures on students with higher scores. These studies, common in method, control, and design, all reached similar conclusions of the positive impacts of expenditure on student outcomes.

This consensus was also supported by the application of structural equation modeling to understand the relationships between institutional expenditure and student outcomes. Powell, Suitt Gileland, and Pearson (2012) showed positive relationships between expenditures on instruction, student services, and academic support and a variety of student outcomes. Extending the student outcomes to labor market outcomes, Jackson, Johnson, and Persico (2015) established relationships between institutional expenditure

on instruction, student services, academic support, and research and earnings of graduates.

Limitations of existing research. Though recent scholars agree generally that expenditure positively influences student outcomes, the research asserting these findings are based on analyses of large-scale national datasets (Jackson, Johnson, & Persico, 2015; Powell, Suitt Gileland, & Pearson, 2012; Webber & Ehrenberg, 2010). In order to be truly relevant to the diverse settings of higher education, nuanced relationships between expenditure and student outcome could be determined by examining smaller, more homogenous groups of institutions. In the case of HBCUs, the differences in funding, mission, student population, location, and student support provide ample rationale for their study in isolation and analysis of the homogenous data set is more likely to yield strong results.

Production function and other analyses examining the link between student outcomes and institutional resource allocation often include a dummy variable to control for the institutional differences between HBCU and non-HBCU institutions (Hamrick, Schuh, & Shelley, 2004; Webber & Ehrenberg, 2010). This limitation prevents the researcher from examining the ways in which the independent variables of interest affect the dependent variable of interest within HBCUs. It simply notes that the institutional characteristics of HBCUs vary such from other institution types that the simple characteristic of being an HBCU is related to student outcomes.

The limitation of existing examinations of institutional expenditure and student outcomes is precisely the reason for this research. Examining student outcomes and institutional expenditures within the community of public HBCUs, this research analyzed

the specific ways in which resource allocation has supported student success. The following sections describe the data set and selected analysis method.

Data and Methods

Data

This research examines the relationships between student outcomes and expenditure categories of 39⁸ 4-year, public HBCUs. The dataset analyzed was created from the Integrated Postsecondary Education Data System (IPEDS) provided by the National Center for Education Statistics. Data for all public HBCUs were downloaded for 2011 through the 2016 fiscal year and a panel data set of 236 observations was created. Consistencies in reporting financial expenditure categories changed drastically in 2011, thus providing a natural temporal parameter for the dataset.

Variables for all reported financial categories of expenditures (Student Services, Academic Support, Institutional Support, Research, Public Service, Instruction, Auxiliary Services, and Other) were downloaded for each year. Variables were reported per full-time equivalent (FTE). Descriptions of each expenditure category is provided in Appendix A. The dataset containing expenditure variables was merged with a data set of institutional variables including total enrollment, full- and part-time retention rates, average 75th percentile of SAT Reading scores of admitted Freshmen, cost of attendance, and other available endogenous variables. A complete list of downloaded variables and descriptions are included in Appendix B.

⁸ As of 2016, there were 40 public 4-year HBCUs. Lincoln University reported expenditures according to FASB standards, unlike all other HBCUs which reported expenditures per GASB standards. For this reason, Lincoln University was removed from the dataset.

Method

Two different pieces of literature serve as guides for the methodology and specification in this analysis. In order to determine relationships between expenditure categories and student outcomes while controlling for important differences among institutions, a series of education production functions were specifically modeled for HBCUs using the methodological approach of Webber and Ehrenberg (2010). Specific attention was paid to the HCBU-based framework (Arroyo & Gasman, 2014) for the selection of dependent and control variables.

Dependent Variable Selection. Production function models were employed to determine the relationship between independent variables of interest and dependent variables of interest. Dependent variables of interest are those representative of the success of non-traditional student population served by public HBCUs: part-time retention rates and total cohort 6-year graduation rates. The part-time retention rates allowed to capture the success of the institution at maintaining student investment for those unable to commit to full-time enrollment. The total cohort 6-year graduation rate is a graduation rate of all full-time, first-time, degree-seeking students extended past the typical 4-year benchmark. Two production functions were developed, one for each independent variable of interest.

Control Variable Selection. Literature documents several control variables important to include in models of student success—student ability, size, student body composition, endowment, cost of attendance, and highest degrees awarded (Ryan, 2005; Smart & Toutkoushian, 2001; Titus, 2006; Webber & Ehrenberg, 2010). Analyzing public HBCUs in isolation, the need to include all of the aforementioned control variables

is mitigated by the homogeneity of the dataset. Correlation matrices were created in order to deduce which of the control variables are significantly related to the outcome variables of interest for inclusion in the models. Table 15 shows the correlations among the control variables and the dependent variables of interest.

Table 15: Environmental and Output Variable Correlation

	Part-time Retention	Total Grad Rate	Total Enrollmen t	Percent Admitted	75th Percentile SAT Reading	Price	State Approp	Gov't Grants	Pell
Part-time Retention	1								
Total Grad Rate	0.2266*	1							
Total Enrollment	0.1546*	0.4915*	1						
Percent Admitted	0.1	0.2067*	0.0385	1					
75th Percentile SAT Reading	0.1701*	0.0816	0.1732*	0.0294	1				
Price	-0.0439	0.0084	0.0797	0.2297*	0.0019	1			
State Appropriatio n	-0.1551*	-0.0688	-0.0414	-0.1839*	-0.0215	-0.0765	1		
Government Grants	-0.1965*	-0.2645*	-0.3872*	0.1357	0.0125	-0.047	0.0199	1	
Pell	-0.2041*	-0.2299*	-0.1962*	-0.2289*	-0.4008*	-0.1168	-0.1029	0.1354 *	1

Note: * Indicates significant correlation ($p < 0.05$)

Enrollment, SAT Reading scores, state appropriation, government grants, and the percentage of Pell recipients are all significantly, albeit weakly, correlated to part-time retention rates. Enrollment, the percentage of admitted freshmen, government grants and the percentage of Pell recipients are all significantly correlated to graduation rate. These control variables significantly correlated to outcome variables of interest were included in the models.

Independent Variable Selection. The independent variables of interest are the categorical expenditure variables representing resource allocation decisions by HBCUs. The correlation of expenditure category variables is examined in order to prevent violating the independence assumption of regression. Table 16 displays correlations among the expenditure category variables.

Table 16: Independent Variable Correlation, 2011-2016

	Instruction	Research	Public Service	Academic Support	Student Services	Institutional Support	Other	Student: Faculty
Instruction	1							
Research	0.0867	1						
Public Service	-0.1043	0.3573*	1					
Acad. Support	0.3315*	0.0021	-0.0339	1				
Student Services	0.314*	0.0759	0.3589*	-0.0015	1			
Inst. Support	0.2949*	0.0056	0.2735*	0.2309*	0.607*	1		
Other	0.095	-0.0151	0.2278*	0.2146*	0.2167*	0.3393*	1	
Student: Faculty	-0.4846*	-0.113	0.2655*	-0.2584*	0.3564*	-0.3967*	0.1007	1

Note: * indicates significant correlations ($p < 0.05$)

Several of the expenditure category variables and the student to faculty ratio are strongly ($r > 0.5$) or moderately ($0.5 > r > 0.3$) correlated to one another. Academic support and student services expenditures are moderately correlated, as are instructional expenditures and student to faculty ratios.

For the graduation rate regression, the dependent variable of interest was total cohort 6-year graduation rate, the independent variables were the six institutional expenditure categories, and control variables were enrollment, the percentage of admitted

freshmen, government grants and the percentage of Pell recipients. For the part-time retention rate, the dependent variable of interest was part-time retention rate, the independent variables were the six institutional expenditure categories, and control variables were enrollment, the 75th percentile SAT Critical Reading score of admitted freshmen, state appropriation, government grants and the percentage of Pell recipients. After models were chosen, they were tested for omitted variable bias. The Ramsey reset test showed there are no omitted variables ($F=0.71$; $p>0.05$) in the graduation rate model, nor were there omitted variables in the part-time retention rate model ($F=3.72$; $p>0.05$).

Assumptions. The dataset was tested for the assumptions of regression-normality, homoscedasticity, and independence. The pooled data set met all the assumptions of regression, with the exception of normality. The Shapiro Wilk test for graduation rate and part-time retention rates yielded the same result ($z=3.205$, $p<0.05$), which rejects the null hypothesis of normality. The distribution of the dependent variable was reviewed during model specification. The Breusch-Pagan/Cook-Weisberg test for heteroskedasticity failed to reject the null hypothesis of homoscedasticity in the graduation rate data ($\chi^2=3.06$, $p>0.05$) and in the part-time retention rate data ($\chi^2=1.14$, $p>0.05$) and independence was assumed because multicollinearity was not problematic as none of the variables had a VIF that exceeded 2.69.

As a panel data set, the data failed to meet the assumption of homoscedasticity. Homoskedasticity was tested in the panel data set using a modified Wald test for homoscedasticity for graduation rate and for part-time retention rate ($\chi^2=436.15$, $p<0.05$; $\chi^2=1199.57$, $p<0.05$), and the results indicated a need to include a robust standard error correction to accommodate heteroskedasticity in the panel set. As the result of the

Shapiro-Wilk test ($W=0.99$; $p>0.05$; $W=0.523$, $p>0.05$) was not enough to reject the null hypothesis of normality, so the assumption of normality is upheld. The significant test statistic ($z=-10.45$, $p<0.05$; $z=-9.45$, $p<0.05$) of the runs test for serial independence rejects the null hypothesis and indicates serial correlation. However, the literature states that serial correlation is not a threat to regression assumptions in small panel sets (<20 years), so this violation will not affect our six-year panel set (Torres-Reyna, 2007).

Models. The theoretical production function used for this research is that detailed by Webber and Ehrenberg (2010). The researchers assumed, as does this research, that the output variables of interest (retention and graduation) (G) can be modeled for school i at time t as a function of institutional expenditures (X), student characteristics (Y), and institutional characteristics (Z):

$$G_{it} = F(X_{it}, Y_{it}, Z_{it})$$

Importantly, Webber and Ehrenberg (2010) note that geographical differences in price, if not accounted for in the model, will create unnecessary error.

In order to determine whether or not the linear production-function model was most appropriate, curve estimation techniques were employed. Of the curves estimated (logarithmic, inverse, quadratic, cubic, logistic and linear), only linear, cubic, and quadratic were able to be fit to the data. Of the three, the linear relationship was the strongest and thus the linear production functions described below were employed. Appendix D displays the linear and quadratic curve results.

To select the most appropriate regression for this analysis, three different regression models were considered: a Pooled OLS regression model, a Random Effects

regression model, and a Fixed Effects regression model. First a Pooled OLS model is represented by the simplified equation:

$$G_{it} = \beta_1 + \beta_2 X_{it} + \beta_3 Y_{it} + \beta_4 Z_{it} + u_{it}$$

By design, the Pooled OLS model neglects the cross-section and time series nature of the data and creates one grand regression with a common intercept (β_1) for all institutions (Gujarati, 2009). Acknowledging that the vast fundamental differences existing between HBCUs may influence the dependent variable, a Random Effects model is created and represented with the simplified equation:

$$TG_{it} = \beta_1 + \beta_2 X_{it} + \beta_3 Y_{it} + \beta_4 Z_{it} + w_{it}$$

Where TG_{it} represents a mean-corrected outcome variable of interest for a specific institution and w_{it} is a combination of the institution-specific error terms and the error that varies over time, or error between institutions and error within institutions. Specifically, the selected Random Effects model assumes that the institution's error term is not correlated with the predictors in the model and allows for the introduction of time-invariant predictors (Gujarati, 2009).

Another model to account for the differences between institutions is the Fixed Effects model represented by the simplified equation:

$$tg_{it} = \beta_1 + \beta_2 x_{it} + \beta_3 y_{it} + \beta_4 z_{it} + u_{it}$$

where lower-case variables represent mean-corrected values. The preceding equation represents a Within Group Estimator Fixed Effect model, as opposed to a Least Squares Dummy Variable Fixed Effect model. Because the LSDV model would require the introduction of dummy variables for the 40 institutions and compromise degrees of freedom in the model for the limited data set, the Within Group Estimator model was

chosen. The Within Group Estimator model accounts for heterogeneity among institutions by correcting the values of each variable to represent values differenced from the institution-specific sample mean (Gujarati, 2009).

After performing all three regression analyses, the fixed-effect model with a within-group estimator was selected as the most appropriate model. The result of the Bruesch and Pagan Lagrangian multiplier test for random effects ($\chi^2=231.30$; $p<0.05$; $\chi^2=522.43$; $p<0.05$) allowed to reject the null hypothesis that variance across the institutions is zero and to eliminate the pooled OLS as the most appropriate model. The result of the Hausman random effects test ($\chi^2=21.9$; $p<0.05$; $\chi^2=13.9$; $p<0.05$) allowed to reject the null hypothesis that the coefficients of the estimators are similar under the fixed and random effects models. Thus, the fixed effect model is most appropriate.

Limitations

This analysis was limited by the nature of the data reported to IPEDS. Erroneous or missing data could add error to the model. The data is also limited to predetermined, broad expenditure categories reported to IPEDS. Additionally, student success not reported to IPEDS will not be studied, but could produce successes that should be evaluated in connection to institutional expenditure.

Results

The purpose of this research is established relationships between institutional expenditure and student outcomes specific to the HBCU community. In order to examine these relationships, ordinary least squares regressions were performed on the dataset of

HBCU variables spanning from 2011 to 2016. First, some descriptive statistics will provide context about the HBCU landscape and then the results of the OLS are discussed.

Descriptive Statistics

Student Population. As shown in Figure 10, total HBCU enrollment decreased by 20,721 students from 202,123 total students in 2011 to 181,402 students in 2016.

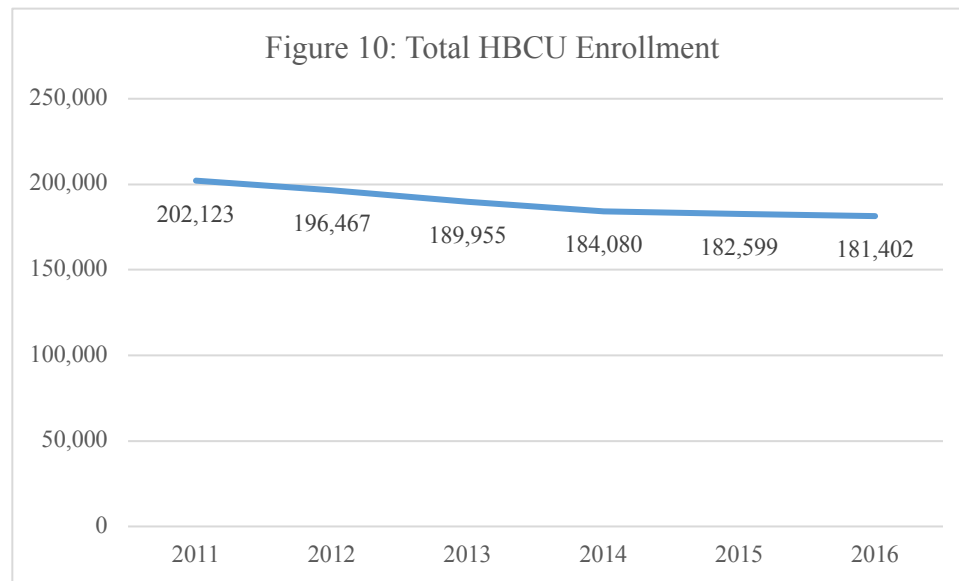


Table 17 details the enrollment totals for every category of student attending an HBCU. Part-time students make up 20% of HBCU enrollment and graduate students make up 15% of enrollment. The overwhelming majority of students on an HBCU campus are full-time undergraduate students.

Table 17: Total Student Enrollment

	Full-time	Part-time	Undergraduate	Graduate
2011	160,913	41,210	173,047	29,076
2012	155,609	40,858	167,554	28,913
2013	151,635	38,320	161,342	28,613
2014	145,780	38,300	156,048	28,032
2015	145,858	36,741	155,250	27,349
2016	145,989	35,413	154,635	26,767

Appendix C displays average student population characteristics of all HBCUs. On average, HBCUs serve a student population composed of 76% Black or African American students. Only two HBCUs have less than a majority of Black or African American students: Bluefield State College and West Virginia State University, both in West Virginia. Notably, the average percent Black or African American students did consistently decrease each year in the dataset from 78% in 2011 to 74% in 2016. During each year in the dataset, the average HBCU served a student population composed of at least 72% Pell grant recipients. The average HBCU admitted 51% of applying freshmen in 2012, but in 2015 and 2016 this increased to more than 60%, possibly indicating the relaxation of admission requirements to offset a decrease enrollment. Interestingly during the same time period, the 75th percentile Reading SAT Score of first-time freshmen increased from 341 in 2010-2011 to 379 in 2014-2015.

Student Success. Student success rates at public HBCUs have remained stable since 2011. Appendix C displays the means and standard deviations of graduation rates, part-time retention rates, and full-time retention rates. The average total cohort graduation rate (6 years) at HBCUs has remained close to 30% since 2011. When only the Bachelor cohort is examined and the time period is increased to 8 years, the graduation rate increases to roughly 34%. The part-time retention rate has fluctuated between 34% and 41% since 2011 and the retention rate of full-time students has remained close to 65%. The percent of Bachelor cohort students still enrolled after 8 years hovered near 34% during each year reported in the dataset.

Expenditure. Expenditure categories in the IPEDS data set are described in detail in Appendix A. Mean expenditures per FTE for the 39 HBCUs are reported for each

category in Table 18. Instruction is the largest category of expenditure, followed by institutional support. Expenditures for institutional support have increased the most since 2011. Instruction expenditures have also increased since 2011.

Table 18: Mean HBCU Expenditures per FTE by Category, 2011-2016

			Public	Academic	Student	Institutional	
year	Instruction	Research	Service	Support	Services	Support	Other
2011	7615.92	1736.26	1065.54	2183.10	1822.59	3760.95	2853.49
2012	7552.64	1816.46	1127.10	2128.64	1909.41	4021.08	2476.59
2013	8034.10	1860.77	1158.95	2384.67	2075.21	4290.46	2586.13
2014	8138.97	1802.67	1189.51	2329.92	2095.46	4240.13	2650.85
2015	8283.59	1806.33	1242.62	2443.87	2229.23	4449.23	2697.10
2016	8241.51	1800.72	1234.67	2486.87	2288.41	4596.23	3666.72

Regression Results

In order to understand the relationships between the student success demonstrated by HBCUs and institutional resource allocation, production function regressions were employed.

Graduation Rate. In the first model⁹, the dependent variable of interest was total cohort 6-year graduation rate, the independent variables were the six institutional expenditure categories, and control variables were enrollment, the percentage of admitted freshmen, government grants and the percentage of Pell recipients. The results of the regression indicated the independent and control variables explained 16.54% of the

⁹ The model presented demonstrates the strongest model identified. An array of variable configurations entered in block and stepwise fashion were tested. Additionally, regressions were analyzed using bootstrapped datasets for each year, resulting in similar findings.

variance ($R^2 = .1654$, $F(10,32)=4.10$, $p<0.05$). The coefficients and significance of the independent and control variables are shown in Table 19.

Table 19: Total Cohort Graduation Rate Regression; Independent and control variable coefficients and significance.

	Coefficient	Standard Error	t	P>t
Enrollment	-0.0006	0.0008	0.76	0.451
Pell	0.1343	0.0473	2.84	0.008
Government Grants	-0.0001	0.0002	0.27	0.791
% Freshmen Admitted	-0.0007	0.0225	0.03	0.974
Academic Support	-0.0010	0.0007	1.45	0.158
Other	-0.0007	0.0002	3.89	0
Instruction	0.0005	0.0003	1.93	0.062
Public Service	0.0009	0.0003	2.59	0.014
Institutional Support	-0.0004	0.0003	1.34	0.189
Student Services	-0.0001	0.0011	0.05	0.96
Constant	26.3039	6.7482	3.9	0

This regression resulted in only three significant predictors of total cohort graduation rate: the percentage of Pell grant recipients at each institution ($\beta=0.1343$, $p<0.05$), Other expenditures ($\beta=-0.0007$, $p<0.05$), and Public Service expenditures ($\beta=0.0003$, $p<0.05$).

Part-time retention rate. In the second model¹⁰, the dependent variable of interest was part-time retention rate, the independent variables were the six institutional expenditure categories, and control variables were enrollment, the 75th percentile SAT Critical Reading score of admitted freshmen, state appropriation, government grants and the percentage of Pell recipients. The weak model failed to be significantly explain the variance in the dependent variable ($R^2 = .0596$, $F(11,31)=1.41$,

¹⁰ Fixed effect, random effect, and pooled models were tested for part-time retention rate. Additionally, an array of independent and control variables were tested, in block entry and stepwise fashion. Bootstrapped datasets for each year in the dataset were analyzed with regressions, yielding similar results. No tested model configuration could significantly explain variance in the dependent variable.

$p > 0.05$). Additionally, none of the independent nor control variables were significant predictors of part-time retention rates.

Discussion

To understand the relationships between HBCU expenditures and student success, this research analyzed a panel data set spanning 6 years, 2011-2016. In each year of the data set, variables representing endogenous and exogenous institutional characteristics were analyzed for the 39 public, 4-year HBCUs. Two different student outcomes were analyzed using two different regression models. The regression model exploring relationships between expenditure and part-time retention rates could not significantly explain the variation among institutions. The regression model exploring relationships between expenditure and graduation rates was able to significantly explain 16.54% of the variance demonstrated among HBCUs.

Graduation Rate

Within the graduation rate model, the percentage of Pell grant recipient students attending the institution was positively and significantly related to the graduation rates of the institution. Though the finding of significance is intuitive, the positive nature of the relationship is not. The positive coefficient suggests that as the percentage of Pell grant recipients increases, the graduation rates increase. The positive nature of this relationship could suggest that the financial aid of Pell grants provides support for students that leads to an increased graduation rate. Webber and Ehrenberg (2010) assert this finding suggests that institutions serving larger percentages of Pell grant recipients, in general, spend more per student, and it is that greater expenditure that explains the positive nature of the relationship.

Two different expenditure categories, other and public service, were also significantly related to graduation rates of HBCUs. The other expenditure category contains expenditures for scholarships and fellowships, among other expenditures that cannot be categorized otherwise. The significant negative relationship between this expenditure category and graduation rates is contradictory to previous research establishing relationships between educational funding that covers the total cost of education for students and student success (Perna & Thomas, 2008). This previous research suggests that as the amount of financial aid increases, the graduation rates of students receiving financial aid should increase. However, the negative nature of the relationship demonstrates that this might not be the case at public HBCUs.

A large proportion of students attending HBCUs receive Pell grants, and total cost of attendance is lower at HBCUs than peer institutions, but the Pell grant alone is not enough to completely cover the cost of attendance (Perna & Thomas, 2008). Previous research has shown that HBCUs understand this limitation and prioritize financial aid to students (Palmer, Davis, & Hilton, 2009; Palmer, Davis, & Maramba, 2010; Palmer & Gasman, 2008). One possible explanation for the negative relationship between graduation rate and other expenditures is that if the scholarships and supplemental aid coded in this category are in the form of work-study opportunities, too much of a burden could be placed on the student. By attempting to offer all possible forms of aid to a student, the HBCU might be over-burdening the student. Students working too many hours could be negatively affected by this opportunity. This suggestion requires further research, as scholarships and other aid to students is just one source of expenditure in the other expenditure category.

The public service expenditure category was also positively and significantly related to graduation rates of HBCUs. The public service expenditure category includes expenses for non-instructional services aimed at benefitting members of the community outside of the institution. This finding might suggest that the public services offered by institutions are supporting families and community members integral to the success of HBCU students. Previous research stresses the positive impact of HBCUs on the communities in which they are situated by providing economic stimulation (Humphreys, 2017). This economic situation could directly or indirectly affect a student's ability to pursue graduation by providing jobs to support the student or by providing jobs to support the students' families.

Nature of the Data

The weak relationships between expenditure and outcomes in this analysis of public HBCUs could be partially attributable to the nature of the dataset upon which this analysis is based. Historically, the relationships between expenditures and outcomes in higher education have been studied using a linear modeling approach (Ryan, 2005; Smart & Toutkoushian, 2001; Titus, 2006; Webber & Ehrenberg, 2010). Employing similar methods specified for the particular dataset containing only public 4-year HBCUs, this research found moderate relationships between expenditure and outcomes, at best. Upon examination of the scatterplots of data presented in Appendix C, illustrating the nature of the relationship between available outcome measures and expenditure categories, the nature of the data ruled out findings of a strong relationship. While curve estimations deemed linear relationships the most appropriate to examine the relationship between expenditure and outcome, linear relationships were not strong.

Previous studies examining the relationships between expenditure and outcomes used large, heterogeneous datasets. By limiting the dataset to only public HBCUs, this research sought to minimize the large error that plagued earlier studies. Though homogenous compared to national datasets of all public 4-year institutions, it is possible the public, 4-year HBCU dataset retained enough variance to illicit similar weak linear relationships between expenditure and student success.

Assumptions

One of the underlying assumptions of this research was that the various expenditures category totals reported to IPEDs would reflect resource allocation decisions. It was assumed that the expenditures per full-time equivalent for each of the expenditure categories would reflect specific choices made by each institution to support student success. Though there is variance among HBCUs to suggest this, perhaps it is the case that expenditure categorization is not a suitable proxy for resource allocation decisions. Perhaps the expenditure categories themselves are too broad to be examined as resource allocation decisions.

Implications for Policy and Practice

Because the findings of this research all signify the importance of financial support- both direct and indirect- provided to students in need, institutions would be best served by allocating as much of available resources to omitting financial barriers to student access and success. Students from low income backgrounds can be successful, as shown by the high levels of achievement of the largely Pell grant recipient student bodies of public HBCUs , if their needs in and outside of school are met. Institutional and

governmental policy aimed at removing student financial barriers to higher education attendance will ultimately improve the success rates of higher education institutions.

Future Research

As indicated by the weak relationships between expenditure categories and student success, more research is needed to understand the resource allocation decisions and student supports provided at public HBCUs. Additionally, research investigating the ways in which public service dollars indirectly benefit the students of HBCUs is needed. By better understanding the ways in which students most in need have been successful in the HBCU setting, all higher education institutions can learn to serve students in ways that will most directly impact their success.

Conclusion

The purpose of this research was to extend the seminal literature base that established positive relationships between institutional expenditure and student outcomes into the HBCU community. Specifically, this research answered the question: In public HBCUs, what relationships exist between institutional expenditure categories and student outcomes? In order to properly extend the literature base to include HBCUs, the HBCU-based educational approach to Black student success, a theoretical framework proposed by Arroyo and Gasman (2014) was used to ensure appropriate model specification for the HBCU data set.

The HBCU data set analyzed spanned six years, from 2011 through 2016, and contained 39 public, 4-year institutions. This research found that the percentage of Pell grant recipients, institutional expenditures for scholarships and financial aid (other expenditure category), and institutional expenditures for public service were all positively

and significantly related to the graduation rates of HBCUs. These findings indicate a high level of support provided directly and indirectly to low-income students are contributing to the successes demonstrated by public, 4-year HBCUs.

References

- Arroyo, A. T., & Gasman, M. (2014). An HBCU-based educational approach for Black college student success: Toward a framework with implications for all institutions. *American Journal of Education*, 121(1), 57-85.
- Astin, A. W. (1993). *What matters in college?: Four critical years revisited* (Vol. 1). San Francisco: Jossey-Bass.
- Brown, W. A., & Burnette, D. (2014). Public HBCUs' financial resource distribution disparities in capital spending. *The Journal of Negro Education*, 83(2), 173-182.
- Chickering, A. W., & Gamson, Z. F. (1987). Seven principles for good practice in undergraduate education. *AAHE bulletin*, 3, 7.
- Constantine, J. M. (1995). The effect of attending historically black colleges and universities on future wages of black students. *ILR Review*, 48(3), 531-546.
- Ehrenberg, R. G., & Rothstein, D. S. (1993). *Do historically Black institutions of higher education confer unique advantages on Black students: An initial analysis* (No. w4356). National Bureau of Economic Research.
- Fryer, R. G., & Greenstone, M. (2007). *The causes and consequences of attending historically Black colleges and universities* (No. w13036). National Bureau of Economic Research.
- Gansemer-Topf, A. M., & Schuh, J. H. (2006). Institutional selectivity and institutional expenditures: Examining organizational factors that contribute to retention and graduation. *Research in Higher Education*, 47(6), 613-642.
- Gujarati, D. N. (2009). *Basic econometrics*. Tata McGraw-Hill Education.

- Hamrick, F. A., Schuh, J. H., & Shelley, M. C. (2004, May 4). Predicting higher education graduation rates from institutional characteristics and resource allocation. *Education Policy Analysis Archives*, 12, 19. Retrieved [Date] from <http://epaa.asu.edu/epaa/v12n19/>.
- Humphreys, J. (2017). *HBCUs Make America Strong: The positive economic impact of Historically Black Colleges and Universities*. Washington, DC: UNCF Frederick D. Patterson Research Institute.
- Jackson, C. K., Johnson, R. C., & Persico, C. (2015). The effects of school spending on educational and economic outcomes: Evidence from school finance reforms. *The Quarterly Journal of Economics*, 131(1), 157-218.
- Jett, C. C. (2013). HBCUs propel African American male mathematics majors. *Journal of African American Studies*, 17(2), 189-205.
- Kuh, G. D. (2001). Assessing what really matters to student learning inside the national survey of student engagement. *Change: The Magazine of Higher Learning*, 33(3), 10-17.
- Lee, J. M., & Keys, S. W. (2013). Land-grant but unequal: State one-to-one match funding for 1890 land-grant universities. *APLU Office of Access and Success publication*, (3000-PB1).
- Massy, W. F. (Ed.). (1996). *Resource allocation in higher education*. University of Michigan Press.
- Museus, S. D., Palmer, R. T., Davis, R. J., & Maramba, D. (Eds.). (2011). *Racial and Ethnic Minority Student Success in STEM Education: ASHE Higher Education Report, Volume 36, Number 6*. John Wiley & Sons.

- Palmer, R. T., Davis, R. J., & Hilton, A. A. (2009). Exploring challenges that threaten to impede the academic success of academically underprepared Black males at an HBCU. *Journal of College Student Development*, 50(4), 429-445.
- Palmer, R. T., Davis, R. J., & Maramba, D. C. (2010). Role of an HBCU in supporting academic success for underprepared Black males. *Negro Educational Review*, 61(1-4), 85.
- Palmer, R. T., Davis, R. J., & Thompson, T. (2010). Theory meets practice: HBCU initiatives that promote academic success among African Americans in STEM. *Journal of college student development*, 51(4), 440-443.
- Palmer, R., & Gasman, M. (2008). "It takes a village to raise a child": The role of social capital in promoting academic success for African American men at a Black college. *Journal of College Student Development*, 49(1), 52-70.
- Perna, L. W., & Thomas, S. L. (2008). Theoretical Perspectives on Student Success: Understanding the Contributions of the Disciplines. *ASHE higher education report*, 34(1), 1-87.
- Pike, G. R., Smart, J. C., Kuh, G. D., & Hayek, J. C. (2006). Educational expenditures and student engagement: When does money matter?. *Research in Higher Education*, 47(7), 847-872.
- Powell, B.A., Suitt Gileland, D., & Pearson, C.L. (2012). Expenditures, efficiency, and effectiveness in U.S. undergraduate education: A national benchmark model. *The Journal of Higher Education*, 83(1), 102-127.

- Ryan, J. F. (2005). Institutional expenditures and student engagement: A role for financial resources in enhancing student learning and development?. *Research in higher education*, 46(2), 235-249.
- Sigritz, B. (2015). State Expenditure Report Summary: Examining Fiscal 2013-2015 StateSpending. Washington, DC: NASBO.
- Smart, J. C., & Toutkoushian, R. K. (2001). Do institutional characteristics affect student gains from college?. *The Review of Higher Education*, 25(1), 39-61.
- Titus, M. A. (2006). Understanding the influence of the financial context of institutions on student persistence at four-year colleges and universities. *The Journal of Higher Education*, 77(2), 353-375.
- Thurgood Marshall College Fund (2015). Historically Black Colleges & Universities (HBCUs). [Online Image]. Retrieved March 21,2017 from <https://tmcf.org/about-us/our-schools/hbcus>
- Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of educational research*, 45(1), 89-125.
- Torres-Reyna, O. (2007). Fixed and Random Effects Using Stata. *Panel Data Anlaysis*. Retrieved from <https://www.princeton.edu/~otorres/Panel101.pdf>
- Webber, D. A. (2012). Expenditures and postsecondary graduation: An investigation using individual-level data from the state of Ohio. *Economics of Education Review*, 31(5), 615-618.
- Webber, D. A., & Ehrenberg, R. G. (2010). Do expenditures other than instructional expenditures affect graduation and persistence rates in American higher education?. *Economics of Education Review*, 29(6), 947-958.

Wolf-Wendel, L.E., Baker, B.D., & Morphey, C.C. (2000). Dollars and Sense:

Institutional resources and the baccalaureate origins of women doctorates. *The Journal of Higher Education*, 71(2), 165-186.

Appendix A: IPEDS Expenditure Variable Descriptions

Variable	Description
Institutional support	A functional expense category that includes expenses for the day-to-day operational support of the institution. Includes expenses for general administrative services, central executive-level activities concerned with management and long range planning, legal and fiscal operations, space management, employee personnel and records, logistical services such as purchasing and printing, and public relations and development. Also includes information technology expenses related to institutional support activities. If an institution does not separately budget and expense information technology resources, the IT costs associated with student services and operation and maintenance of plant will also be applied to this function.
Academic support	A functional expense category that includes expenses of activities and services that support the institution's primary missions of instruction, research, and public service. It includes the retention, preservation, and display of educational materials (for example, libraries, museums, and galleries); organized activities that provide support services to the academic functions of the institution (such as a demonstration school associated with a college of education or veterinary and dental clinics if their primary purpose is to support the instructional program); media such as audiovisual services; academic administration (including academic deans but not department chairpersons); and formally organized and separately budgeted academic personnel development and course and curriculum development expenses. Also included are information technology expenses related to academic support activities; if an institution does not separately budget and expense information technology resources, the costs associated with the three primary programs will be applied to this function and the remainder to institutional support. Institutions include actual or allocated costs for operation and maintenance of plant, interest, and depreciation.
Public service	A functional expense category that includes expenses for activities established primarily to provide non-instructional services beneficial to individuals and groups external to the institution. Examples are conferences, institutes, general advisory service, reference bureaus, and similar services provided to particular sectors of the community. This function includes expenses for community services, cooperative extension services, and public broadcasting services. Also includes information technology expenses related to the public service activities if the institution separately budgets and expenses information technology resources (otherwise these expenses are included in academic support). Institutions include actual or allocated costs for operation and maintenance of plant, interest, and depreciation.

Research	A functional expense category that includes expenses for activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution. The category includes institutes and research centers, and individual and project research. This function does not include nonresearch sponsored programs (e.g., training programs). Also included are information technology expenses related to research activities if the institution separately budgets and expenses information technology resources (otherwise these expenses are included in academic support.) Institutions include actual or allocated costs for operation and maintenance of plant, interest, and depreciation.
Instruction	A functional expense category that includes expenses of the colleges, schools, departments, and other instructional divisions of the institution and expenses for departmental research and public service that are not separately budgeted. Includes general academic instruction, occupational and vocational instruction, community education, preparatory and adult basic education, and regular, special, and extension sessions. Also includes expenses for both credit and non-credit activities. Excludes expenses for academic administration where the primary function is administration (e.g., academic deans). Information technology expenses related to instructional activities if the institution separately budgets and expenses information technology resources are included (otherwise these expenses are included in academic support). Institutions include actual or allocated costs for operation and maintenance of plant, interest, and depreciation.
Auxiliary enterprises	Expenses for essentially self-supporting operations of the institution that exist to furnish a service to students, faculty, or staff, and that charge a fee that is directly related to, although not necessarily equal to, the cost of the service. Examples are residence halls, food services, student health services, intercollegiate athletics (only if essentially self-supporting), college unions, college stores, faculty and staff parking, and faculty housing. Institutions include actual or allocated costs for operation and maintenance of plant, interest and depreciation.
Student Services	A functional expense category that includes expenses for admissions, registrar activities, and activities whose primary purpose is to contribute to students emotional and physical well-being and to their intellectual, cultural, and social development outside the context of the formal instructional program. Examples include student activities, cultural events, student newspapers, intramural athletics, student organizations, supplemental instruction outside the normal administration, and student records. Intercollegiate athletics and student health services may also be included except when operated as self-supporting auxiliary enterprises. Also may include information technology expenses related to student service activities if the institution separately budgets and expenses information technology resources (otherwise these expenses are included in institutional support.) Institutions include actual or allocated costs for

	operation and maintenance of plant, interest, and depreciation.
Other	<p>All other core expenses per FTE enrollment for public institutions using GASB 34/35 standards is derived as follows:</p> <p>Other core expenses is equal to the sum of expenses for the following functions: Scholarships and fellowships expenses (F1C101)</p> <p>Other expenses and deductions (F1C141)</p> <p>Other core expenses is then divided by 12-month FTE enrollment (FTE12MN)</p>

Appendix B: IPEDS Institutional Variable Description

Variable	Description
75th Percentile SAT Reading score	The score above which 25 percent of students submitting SAT Reading test scores to an institution scored.
Total Enrollment	This annual component of IPEDS collects data on the number of students enrolled in the fall at postsecondary institutions. Students reported are those enrolled in courses creditable toward a degree or other formal award; students enrolled in courses that are part of a vocational or occupational program, including those enrolled in off-campus or extension centers; and high school students taking regular college courses for credit. Institutions report annually the number of full- and part-time students, by gender, race/ethnicity, and level (undergraduate, graduate, first-professional); the total number of undergraduate entering students (first-time, full- and part-time students, transfer-ins, and non-degree students); and retention rates. In even-numbered years, data are collected for state of residence of first-time students and for the number of those students who graduated from high school or received high school equivalent certificates in the past 12 months. Also in even-numbered years, 4-year institutions are required to provide enrollment data by gender, race/ethnicity, and level for selected fields of study. In odd-numbered years, data are collected for enrollment by age category by student level and gender.
Cost of Attendance	Total cost of attendance is the sum of published tuition and required fees (lower of in-district or in-state for public institutions), books and supplies, and the weighted average for room and board and other expenses.
Full Time Equivalent	The full-time-equivalent (FTE) enrollment used is the sum of the institutions' FTE undergraduate enrollment and FTE graduate enrollment (as calculated from or reported on the 12-month Enrollment component) plus the estimated FTE of first-professional students. Undergraduate and graduate FTE are estimated using 12-month instructional activity (credit and/or contact hours).
Percentage Pell Grant Recipients	(Higher Education Act of 1965, Title IV, Part A, Subpart I, as amended.) Provides grant assistance to eligible undergraduate postsecondary students with demonstrated financial need to help meet education expenses.
Bachelor's Degrees Awarded	An award (baccalaureate or equivalent degree, as determined by the Secretary, U.S. Department of Education) that normally requires at least 4 but not more than 5 years of full-time equivalent college-level work. This includes all bachelor's degrees conferred in a 5-

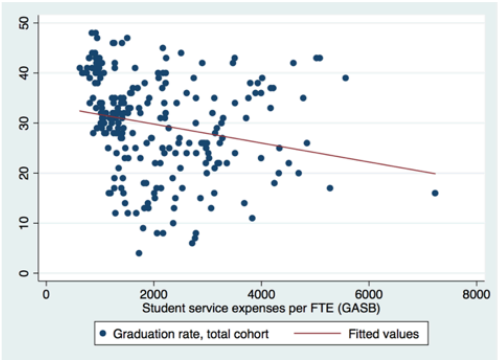
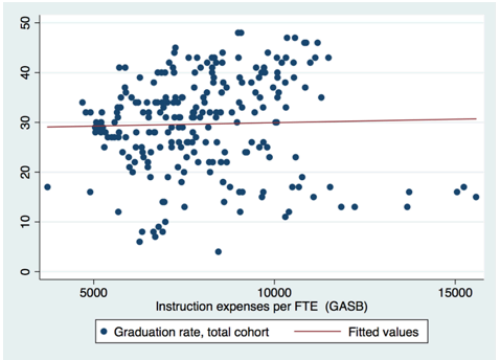
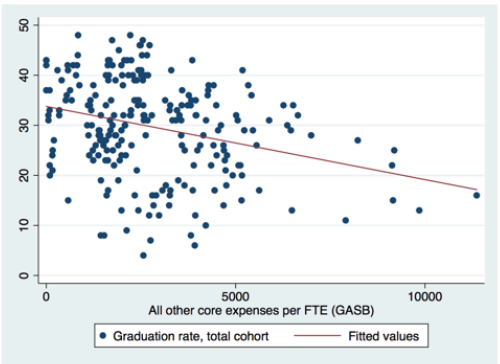
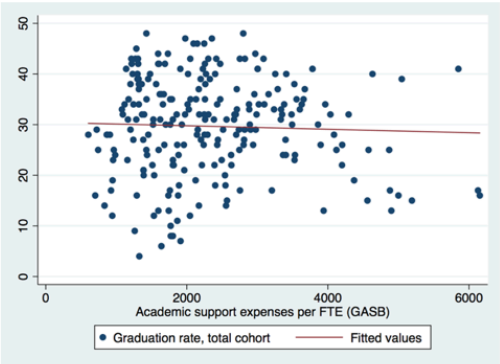
	year cooperative (work-study) program. A cooperative plan provides for alternate class attendance and employment in business, industry, or government; thus, it allows students to combine actual work experience with their college studies. Also includes bachelor's degrees in which the normal 4 years of work are completed in 3 years.
Full Time Retention Rate	A measure of the rate at which students persist in their educational program at an institution, expressed as a percentage. For four-year institutions, this is the percentage of first-time bachelors (or equivalent) degree-seeking undergraduates from the previous fall who are again enrolled in the current fall. For all other institutions this is the percentage of first-time degree/certificate-seeking students from the previous fall who either re-enrolled or successfully completed their program by the current fall. Full Time Students- Undergraduate: A student enrolled for 12 or more semester credits, or 12 or more quarter credits, or 24 or more contact hours a week each term. Graduate: A student enrolled for 9 or more semester credits, or 9 or more quarter credits, or a student involved in thesis or dissertation preparation that is considered full-time by the institution. Doctor's degree - Professional practice- as defined by the institution.
Part-time Retention Rate	A measure of the rate at which students persist in their educational program at an institution, expressed as a percentage. For four-year institutions, this is the percentage of first-time bachelors (or equivalent) degree-seeking undergraduates from the previous fall who are again enrolled in the current fall. For all other institutions this is the percentage of first-time degree/certificate-seeking students from the previous fall who either re-enrolled or successfully completed their program by the current fall. Part time students - Undergraduate: A student enrolled for either less than 12 semester or quarter credits, or less than 24 contact hours a week each term. Graduate: A student enrolled for less than 9 semester or quarter credits.
Graduation Rate- total cohort	This annual component of IPEDS was added in 1997 to help institutions satisfy the requirements of the Student Right-to-Know legislation. Data are collected on the number of students entering the institution as full-time, first-time, degree/certificate-seeking undergraduate students in a particular year (cohort), by race/ethnicity and gender; the number completing their program within 150 percent of normal time to completion; the number that transfer to other institutions if transfer is part of the institution's mission. Prior to 2007, institutions who offered athletically-related student aid were asked to report, by sport, the number of students receiving aid and whether they completed within 150 percent of normal time to completion. Now, these institutions only need to report a URL where the athletic data is located on their website, when available. GR

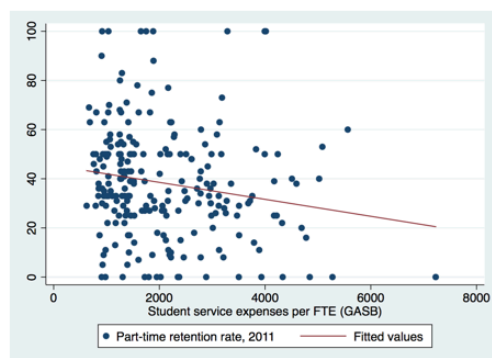
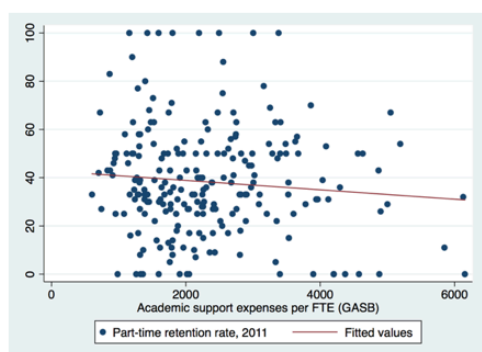
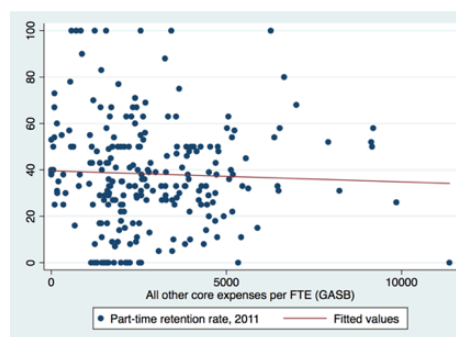
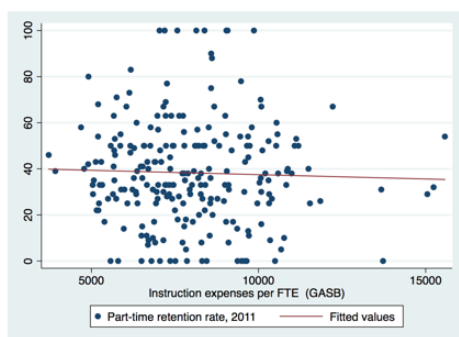
	automatically generates worksheets that calculate rates, including average rates over 4 years.
Local Appropriation	<p>Revenues from local appropriations per FTE enrollment for public institutions using GASB 34/35 is derived as follows:</p> <p>Local appropriations (F1B12) divided by 12-month FTE enrollment (FTE12MN)</p> <p>Local appropriations, education district taxes, and similar support - Local appropriations are government appropriations made by a governmental entity below the state level. Education district taxes include all tax revenues assessed directly by an institution or on behalf of an institution when the institution will receive the exact amount collected. These revenues also include similar revenues that result from actions of local governments or citizens (such as through a referendum) that result in receipt by the institution of revenues based on collections of other taxes or resources (sales taxes, gambling taxes, etc.).</p>
Government Grants	<p>Revenues from government grants and contracts per FTE enrollment for public institutions using GASB 34/35 is derived as follows: Government grants and contracts is equal to the sum of</p> <p>Federal operating grants and contracts (F1B02)</p> <p>State operating grants and contracts (F1B03)</p> <p>Local operating grants and contracts (F1B04A)</p> <p>Federal nonoperating grants (F1B13)</p> <p>State nonoperating grants (F1B14)</p> <p>Local nonoperating grants (F1B15)</p> <p>Government grants and contract revenues is then divided by 12-month FTE enrollment (FTE12MN). Government grants and contracts (revenues) - Revenues from governmental agencies that are for specific research projects, other types of programs , or for general institutional operations (if not government appropriations). Examples are research projects, training programs, student financial assistance, and similar activities for which amounts are received or expenses are reimbursable under the terms of a grant or contract, including amounts to cover both direct and indirect expenses. Includes Pell Grants and reimbursement for costs of administering federal financial aid programs. Grants and contracts should be classified to identify the governmental level - federal, state, or local - funding the grant or contract to the institution; grants and contracts from other sources are classified as nongovernmental grants and contracts. GASB institutions are required to classify in financial reports such grants and contracts as either operating or nonoperating.</p>

Private Gifts	<p>Revenues from private gifts, grants, and contracts per FTE (GASB) is derived as follows:</p> <p>Private gifts, grants, and contracts is the sum of</p> <p>Private operating grants and contracts (F1B04B) Gifts, including contributions from affiliated organizations (F1B16)</p> <p>Private gifts, grants, and contracts is then divided by 12-month FTE enrollment (FTE12MN)</p> <p>Private operating grants and contracts - Revenues from nongovernmental agencies and organizations that are for specific research projects or other types of programs and that are classified as operating revenues. Examples are research projects and similar activities for which amounts are received or expenditures are reimbursable under the terms of a grant or contract.</p> <p>Gifts, including contributions from affiliated organizations - Revenues from private donors for which no legal consideration is provided; these would be nonexchange transactions as defined in GASB Statement No. 33 Accounting and Financial Reporting for Nonexchange Transactions. Includes all gifts or contributions to the institution except those classified as additions to permanent endowments or capital grants & gifts. Includes gifts from affiliated organizations. Includes the amount of contributed services recognized by the institution. Amounts from capital grants and contracts are not included.</p>
Investment Return	<p>Revenues from investment return per FTE (GASB) is derived as follows:</p> <p>Investment return (F1B17) is divided by 12-month FTE enrollment (FTE12MN)</p> <p>Investment income - Revenues derived from the institution's investments, including investments of endowment funds. Such income may take the form of interest income, dividend income, rental income or royalty income and includes both realized and unrealized gains and losses</p>
Tuition	<p>Revenues from tuition and fees per FTE enrollment for public institutions using GASB 34/35 standard is derived as follows: Tuition and fees revenues (F1B01) divided by 12-month FTE enrollment (FTE12MN) . Tuition and fees (revenues) (F1B01) - Revenues from</p>

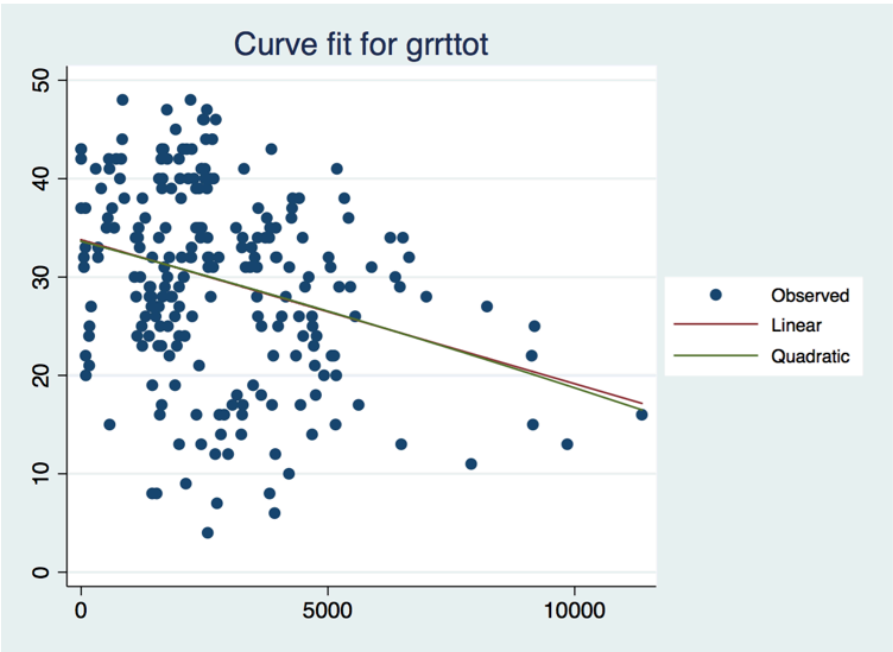
	all tuition and fees assessed against students (net of refunds and discounts and allowances) for educational purposes. If tuition or fees are remitted to the state as an offset to the state appropriation, the total of such tuition or fees are deducted from the total state appropriation and added to the total for tuition and fees.
State Appropriation	Revenues from State appropriations per FTE enrollment for public institutions using GASB 34/35 is derived as follows: State appropriations (F1B11) divided by 12-month FTE enrollment (FTE12MN). State appropriations are amounts received by the institution through acts of a state legislative body, except grants and contracts and capital appropriations. Funds reported in this category are for meeting current operating expenses, not for specific projects or programs.
Other	Revenues from other core revenue sources per FTE enrollment for public institutions using GASB 34/35 is derived as follows: Other core revenues is equal to the sum of: Other operating sources (F1B08) Federal appropriations (F1B10) Other nonoperating revenues (F1B18) Total other revenues and additions (F1B24) Other core revenues is then divided by 12-month FTE enrollment (FTE12MN)

Appendix C: Scatterplots of Dependent and Independent Variables





Appendix D: Best curve fits
Curve Fit

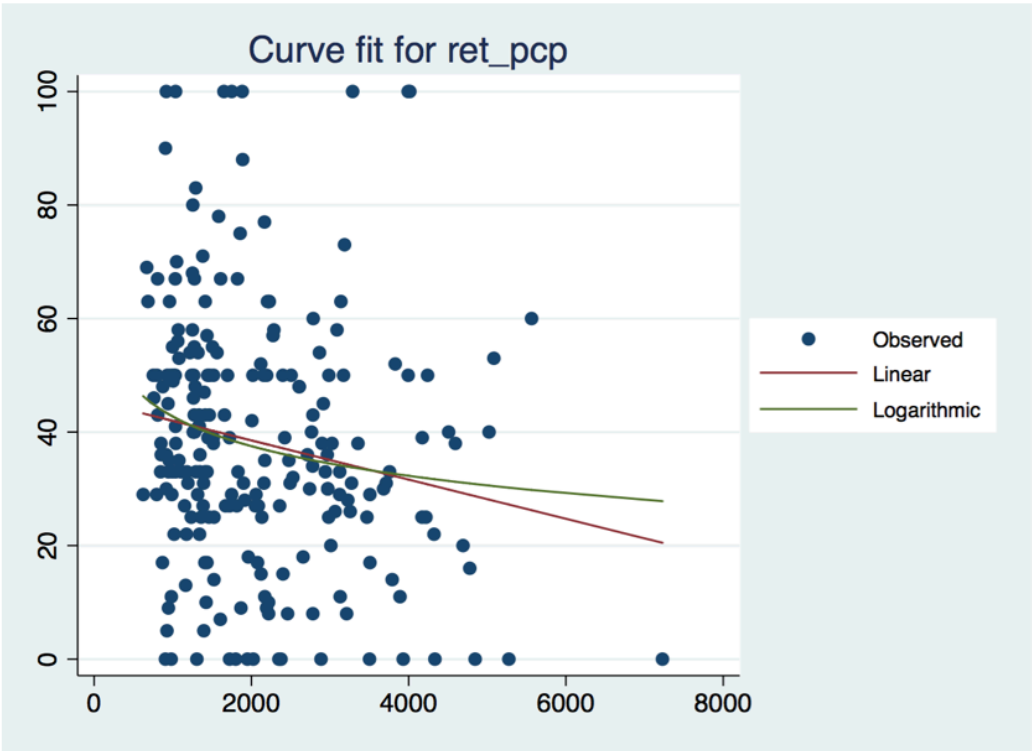


Curve Estimation between grrttot and flotexft

Variable	Linear	Quadratic
b0		
_cons	33.783521	33.631727
	31.31	22.00
	0.0000	0.0000
b1		
_cons	-.00146318	-.00135262
	-4.63	-1.59
	0.0000	0.1121
b2		
_cons		-1.367e-08
		-0.14
		0.8884
Statistics		
N	233	233
r2_a	.0809439	.07702725

legend: b/t/p

(1 missing value generated)



```
. curvefit ret_pcp flstsvft, f(1,2)

Curve Estimation between ret_pcp and flstsvft
```

Variable	Linear	Logarithmic
b0		
_cons	45.430422	94.874875
	14.81	4.43
	0.0000	0.0000
b1		
_cons	-.00345001	-7.5452533
	-2.67	-2.65
	0.0082	0.0086
Statistics		
N	231	231
r2_a	.02591267	.0255027

legend: b/t/p

Chapter V

Conclusion

Faced with increasingly constrained resources and expected to mitigate the burden of cost to the student, institutions of higher education are forced to produce of tomorrow's workforce in the most efficient way possible. The purpose of this series of studies was to understand a natural occurrence of efficiency in higher education: Historically Black Colleges and Universities (HBCUs). HBCUs are institutions founded prior to 1964 with missions to provide educational options to Black students (Allen, 1992). Despite never receiving funding equal to that of their peers, HBCUs have managed to navigate a white-dominated higher education community and provide education and workforce training to Black Americans in an affordable and accessible environment (Allen, 1992; Arroyo and Gasman, 2014; Harper, Patton, & Wooden, 2009). This ability to produce high educational outcomes with few resources exemplifies the definition of technical efficiency (Farrell, 1957).

This series of studies sought to understand the higher education funding policy providing resources to HBCUs, the degree of efficient operations of HBCUs, and the relationships between expenditures and student outcomes at HBCUs. The purpose was to provide guidance to the larger higher education community which is now facing high success expectations and resource constraint. The first study sought to understand the current landscape of higher education finance policy and the theoretical alignment of that policy to the educational approach of HBCUs, the second investigated the extent to which HBCUs are efficient producers of higher education outcomes, and the third explored relationships that might exist between different categories of expenditures and student

outcomes at HBCUs. The following sections of this paper briefly discuss the findings of each of the studies, then offers a final synthesis of the new knowledge gained as a result of this research.

Findings

This research consisted of three independent studies. Each of the three studies performed in this research answered specific research questions. The findings of each study are discussed in the following section.

A Review of Current Higher Education Finance Policy: A HBCU Perspective

Thematic analysis of the higher education policy providing resources to public institutions of higher education in states operating HBCUs yielded four themes: unfunded mandates of affordability, workforce development goals, innovative research solutions, and an absence of HBCU-specific language. State higher education funding policy expects institutions to prepare a globally competitive workforce capable of economically sustaining while reducing the financial burden on students and parents. The states make these expectations clear, yet provide no funding to offset the increasing cost of education to be absorbed by institutions.

A directed content analysis of the same higher education policy found higher education funding policy to be somewhat aligned to two of the four components of the HBCU-specific approach to educational outcomes. Higher education policy generally aligned to HBCU-framework components describing affordability and access and grand outcomes of graduation and career attainment. This alignment suggests that expectations of institutions to prepare the workforce in an affordable and accessible manner are similar in HBCUs, as well as in the higher education community.

Both the thematic analysis and the directed content analysis performed highlighted the absence of HBCU-specific language from higher education funding policy. The absence of recognition of HBCUs as a distinct institution provided supporting evidence for the claims of privilege and racism in state funding policy. Without specific mention in policy, HBCUs miss out on opportunities for discretionary and programmatic funding available to other institutions.

An Examination of Efficiency in HBCUs

The data envelopment analysis performed sought to determine the relative efficiency within the HBCU community. In total, efficiency scores skewed toward efficiency and efficiency was found among HBCUs of all sizes. The number of HBCUs receiving the highest levels of efficiency scores displayed a decreasing trend. When the characteristics of the most and least efficient HBCUs were compared, size and student preparedness were not contributing factors to efficiency, the student to faculty ratio was lower in the least efficient schools, and most strikingly, the graduation rates of the most efficient schools were two to three times that of the least efficient schools. Also noteworthy, the least efficient schools received less in state appropriation than the most efficient.

An examination of the expenditures of the most and least efficient HBCUs found that the most efficient institutions spent less on instruction, less on academic support, and less on institutional support than the least efficient institutions. The most efficient institutions spent more on student services. The expenditures on student services seemed to be funded by tuition revenue, which increased steadily each year in the analysis.

Resource Allocation and Student Success

Ordinary least squares regression models were developed to understand the relationships between resource allocation and student outcomes. Two different models, one for graduation rate and one for part-time retention rate were designed to capture the varied nature of the student population and the outcomes they achieve at HBCUs. The part-time retention rate model was unable to explain a significant amount of variance among HBCUs. The graduation rate model did significantly explain 16.54% of variance among HBCUs, and found the percentage of Pell grant recipients, Other expenditures, and Public Service expenditures to be significantly related to graduation rates.

These findings suggest the support of the high-needs student population comes in many forms. The positive relationship between both Pell Grant recipients and Public Service expenditures suggest high levels of support for the student and the students' families. The negative relationship between the other expenditure requires more research to fully explain. The nature of the other expenditure category as a catch-all for expenditures not coded elsewhere makes deciphering the actual expenditure in this category impossible without further research.

Final Synthesis of Research Findings

Higher education funding policy doesn't acknowledge HBCUs as a unique contributor to the higher education community. This suggests that the larger higher education community and the state legislative body does not view HBCUs as an integral part of higher education. HBCUs and the academic community should make an effort to better communicate the contributions of HBCUs specifically to the African American community and generally to the larger higher education community to policy makers, the public, and to other supporters of higher education. This might begin with a series of

publications and messaging campaigns focused on expanding the changing narrative around HBCUs from deficiency-focused to achievement-focused.

One point of contribution HBCUs could make to the larger higher education community is the as a model for efficient operations. The most efficient HBCUs identified in this work should be investigated further to determine resource allocation decisions driving efficiency. Models of efficiency grounded in HBCUs would serve as an achievement-focused narrative to support the proliferation of HBCUs, and also highlight them as integral to the success of the higher education community.

Resource allocations most directly tied to student outcomes warrant more investigation. Understanding the ways in which HBCUs spend Public Service and Other expenditures differently from other institutions could inform policy and practice. The findings of this research suggest that by expending Public Service dollars to support the surrounding community, HBCUs could be curating the habitus, a key tenet of student access and choice models (Perna, 2006). Further, Public Service expenditures could support the economic development of surrounding communities attributed to HBCUs (Humphreys, 2017). Additional study of this type of expenditure could identify ways HBCUs are supporting students that are unlike the efforts of other institutions.

Future Research

In conclusion, the limited research carefully examining the resource allocation decisions yielding high results at HBCUs deserves additional research. The findings of this series of studies suggest unique contribution of HBCUs to the higher education community, and further research could inform not only the success of HBCUs in the future, but also inform the larger higher education community as it faces continued

resource constraints and increasing expectations of access, affordability, and success.

Historically Black Colleges and Universities have long deserved to be thoughtfully acknowledged for their persistent, remarkable success throughout history and in contemporary society.