Drew University

College of Liberal Arts

A New Look at Shared Governance:

Prisoner's Dilemma or Ultimatum Game?

A Thesis in Economics

By

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Preface

In February of 2013, I was appointed to the Drew2017 Steering Committee. The Drew2017 Steering Committee was the committee that was to implement the Strategic Plan adopted in 2012 as well as the process through which the committee will draw on the best of what Drew is and has been, better define Drew's future and reposition the institution for the continued pursuit of academic excellence. The committee was comprised of the cabinet, faculty members, and one student – me. We were all charged to represent our constituencies, through the lens of university-wide decision making. In other words, when difficult decisions needed to be made, the committee needed to set aside their own interests and think of the best decision for the University as a whole. The task of the committee was to review all academic programs and administrative units. For the academic programs, the committee provided a recommendation. Each program was ranked into one of the four categories: invest, maintain, restructure, or eliminate (which later became divest, because it sounded nicer). The goal of the committee was to develop a three-year budget, provide an administrative unit reorganization of the university and rank the current academic programs into four categories.

From February to late September of that year, the committee became obsessed with *what* the process of reviewing academic programs was going to be. If I remember correctly, the committee argued about the definition of an "academic program" for at least a month. Since the committee did not operate above the political nature of Drew, special interests played their role and kept changing the task of the committee. What I mean by political nature is that the Steering Committee had to deal with relationships, the

history of prior failed budget committees, and the fact that there were community members that did not accept the dire state of Drew's fiscal situation. The special interests I refer to are committee members as well as groups of individuals, like faculty members and Vice Presidents, that were not willing to set aside their own interests and think of the future of the University as a whole. These special interests were able to change the task of the committee three times. At the conclusion of Drew2017, we produced a private final report, a framework to a three-year budget, and not one decision the committee concluded had been made. Through the year and a half timeline, the committee lost a great deal of credibility with the Drew community.

In my mind, the task was simple. Drew had a serious deficit, coupled with falling enrollment. At the time, Drew had an annual operating deficit of roughly eight million dollars in fiscal year 2013 (start of Drew2017) and a projected deficit of twelve million for the following fiscal year (FY14) (end of Drew2017). The committee needed to confirm which academic programs produced revenue for the University and which programs did not. Little did I know that, even with the poor state of the Drew's financial situation, the administration and the faculty could not even agree on the process of the review, let alone agree on how to fix Drew's financial situation. Over the next year and half, the committee met, gathered information, voted, and wrote a final report. The report was supposed to be a public report, but as politics played their course, the final report ended up only being sent to the Interim President and Trustees and passed along to the incoming President. In my opinion, not making our final report public completely

undermined the work of the committee and destroyed any semblance of credibility the committee possessed.

After a year and a half of hard work, I was unhappy with how this process concluded and frequently told my advisor how unhappy I was. While the committee was coming to an end, I was enrolled in an upper-level management course, where the problems of the committee started to make sense. My advisor and professor of the management course, Dr. Jennifer Kohn, encouraged me to complete my semester project on how to manage retention and recruitment of a private, liberal arts institution, much like Drew. I used this management course to begin work on my honors thesis. From here, I worked with Dr. Kohn to develop my research question.

At the conclusion of the Drew2017 in May of 2014, I started writing my honors thesis. My thesis provides a foundation to understand the conflicts between the administration and faculty when there are difficult decisions to be made. The idea for my honors was sparked from my dissatisfaction with how Drew2017 ended and a desire to understand why Drew2017 ended the way it did.

Since this thesis originated from my experience on the Drew2017 Steering Committee and at Drew in general, I wanted to take some time to thank everyone along the way who has positively impacted my education at Drew. To begin, I want to thank Sara Waldron, Frank Merckx, and Michelle Brisson for being an undeniably strong support system when I needed someone to express my frustrations. Next, I want to thank Michael Groener, Dorothy Meaney, and John Muccigrosso, for making my service on Drew2017 enjoyable and for being such great mentors during my tenure at Drew. The

tools I have learned from the three of you cannot be taught in a classroom. I thank you for all your support on Drew2017. Next, I want to thank my honors committee, Dr. Jennifer Kohn, Dr. Patrick McGuinn, Dr. Kenneth Alexo, and Dr. Ryan Hinrichs, for helping through the process of completing an honors thesis. Your insights into the political nature of higher education helped me create a thesis I am proud truly of. Specifically, Dr. Kohn, your transformative teaching techniques and undying support of your students, has made me the student I am today. My success as a student and the completion of my honors thesis would not have been possible without you.

Lastly, I want to thank my parents, Jerry and Christine Jones, because without your encouragement and support, I would not be at Drew. My accomplishments throughout college are attributed to you. I am dedicating my honors thesis to the both of you because I consider this work to be my greatest undergraduate academic accomplishment.

Abstract

I apply game theory to the problem of shared governance at a financially challenged liberal arts institution. I use the Annapolis Group's definition of a liberal arts institution. I also analyze the first year enrollment between fall 2007 and fall 2013, to show that there are enrollment problems for a subset of the Annapolis Group. The specific application of game theory is whether or not to eliminate a Classics program, which is assumed by the faculty to be central to the liberal arts mission, but does not attract specific student demand to cover the cost of the program. The two main assumptions of the thesis are: i) the faculty makes decisions based on whether or not the program up for eliminate is central to the institutions mission and ii) the administration makes their decision based of financial sustainability. Relationships between faculty and administrators are important, but presumed secondary. A contribution of the thesis is a visual representation of the simultaneous game that indicates the inflection point between choosing to eliminate or not. The sequential game shows the importance of first movers, but raises the question of what is a first mover. The final sequential game with assurances illustrates that using the strict neo-classical economic paradigm leads to undesirable outcomes. However, creditable commitments can lead to cooperation. Future research will focus on specific mechanisms to foster creditability and trust between the faculty and the administration.

Table of Contents

I. Chapter One: Introduction

Students who are looking to attend an institution of higher learning are growing skeptical of the value of such degree, especially if the degree is in the liberal arts.[1] There have been a growing number of skeptics, including President Obama, who recently questioned the value of certain liberal arts degrees.[2] In January of 2014, President Obama said, "A lot of young people no longer see the trades and skilled manufacturing as a viable career. But I promise you, folks can make a lot more, potentially, with skilled manufacturing or the trades than they might with an Art History degree."[3]

Not only are students questioning the value of a liberal arts degree, these students are looking at prospective colleges and universities in terms of its return on investment, or ROI. This means that students are now looking at colleges and determining their potential starting salary and earnings. Scott Carlson wrote in the *Chronicle of Higher Education* that students are turning to evaluation metrics like return on investment to see if college is worth the price and possibility of mounting debt.[4] Another article from the *Chronicle of Higher Education* talks about a movement in Tennessee to "precisely quantify the value of a degree."[5] This report attempts to identify the payoff that an individual would

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[1] Supiano, Beckie. "How Liberal-Arts Majors Fare Over the Long Haul." *The Chronicle of Higher Education*. The Chronicle of Higher Education, 22 Jan. 22. Web. 17 Mar. 2015.

[2] Jaschik, Scott. "Obama Becomes Latest Politician to Criticize a Liberal Arts Discipline @insidehighered." Inside High Ed, 31 Jan. 2015. Web. 17 Mar. 2015. 1

[3] Jaschick 1

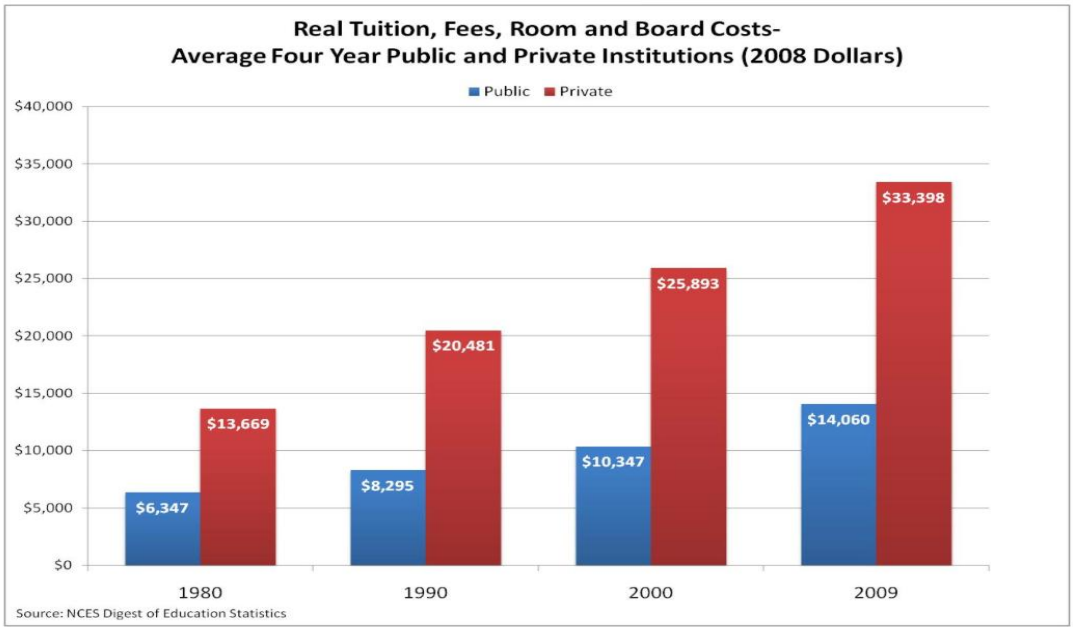
[4] Carlson, Scott. "Is ROI the Right Way to Judge a College Education?" *The Chronicle of Higher Education*. The Chronicle of Higher Education, 13 Apr. 2013. Web. 17 Mar. 2015. 1

[5] Berret, Dan. "All About the Money." *The Chronicle of Higher Education*. The Chronicle of Higher Education. 18 Sept. 2013. Web. 17 Mar. 2015.

receive in any given program.[6] Even the United States Department of Education amended their College Score Card and added each colleges' "ROI ranking."[7]

A reason why students may have started to look at ROI is the rising tuition for both public and private universities. In figure one below, between 1980 and 2009 the average tuition at a public four-year institution went from $6,347 to $14,060, measured in 2008 dollars. For private universities, the price increase was even more drastic between 1980 and 2009; the average tuition went from $13,669 dollars to $33,398, also measured in 2008 dollars.

Figure One



Since tuition at both public and private four-year institutions is increasing, students are starting to wonder if it is worth going to school to get a liberal arts degree at a private,

[6] Berret, Dan. "All About the Money." *The Chronicle of Higher Education*. The Chronicle of Higher Education. 18 Sept. 2013. Web. 17 Mar. 2015.

[7] Carlson 1

liberal arts college, which tend to be more expensive relative to public universities (see figure 1 on page 2). The decision now is whether to choose a liberal arts degree, to be trained to think, or a pre-professional program, to be trained for a job. Since students are starting to look at college as a return on their investment, students are trying to gauge how much money they will make with the program they choose.

Another reason students are becoming skeptical of a the value of a liberal arts degree is the increasing prevalence of reports citing the "worst" college degrees, in terms of post-graduate unemployment rate and median income. For example, Forbes publishes the top ten worst college majors, and the top three are: anthropology, humanities and liberal arts, and social sciences.[8] Later in the report it points to pre-professional programs, like engineering and nursing, as the "best" majors because of the low unemployment rate and high median starting salary.[9]

Since students do not typically make decisions about their future without parental supervision, *Inside Higher Ed* conducted a survey and asked parents whether they thought a liberal arts education or a vocational/technical/professional program would lead to a good job. The results are striking, as about 40 percent of parents surveyed strongly believe that vocational/technical/professional program would lead to a good job, whereas only about 26 percent of parents surveyed strongly agreed that a liberal arts education would lead to a good job.[10]

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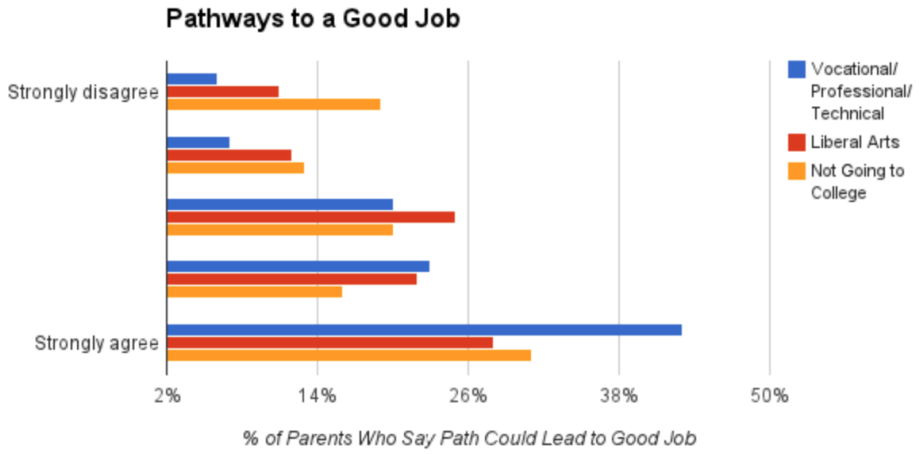
[8] Goudreau, Jenna. "The 10 Worst College Majors." *Forbes*. Forbes, 10 Oct. 2012. Web. 17 Mar. 2015. 1

[9] Goudreau 1

[10] Jaschik, Scott. "Jobs, Value and Affirmative Action: A Survey of Parents About College @insidehighered." *Jobs, Value and Affirmative Action: A Survey of*

Figure Two



In this thesis I examine a curriculum review at a private liberal arts institution between the administration and the faculty using game theory. For the purpose of my research, I am using the Annapolis Group's criteria for a liberal arts institution. The Annapolis Group classifies an institution as liberal arts when the institution stresses

> "the flexibility, creativity and rigor of mind that will serve our graduates all their lives. Liberal arts institutions provide students with a command of their disciplines and broad knowledge of the ideas, discoveries, inventions and cultures that have shaped the world because we know our students are capable of shaping that world themselves"[11] and ii) the institution has "small class sizes, emphasis on individualized instruction and dedicated faculty and staff whose devotion to the learning experience of each student isn't the exception but the rule. Our students master their fields of interest, learn to communicate effectively, succeed as parts of teams, develop a sense of social responsibility and solve problems with analytical thinking."[12]

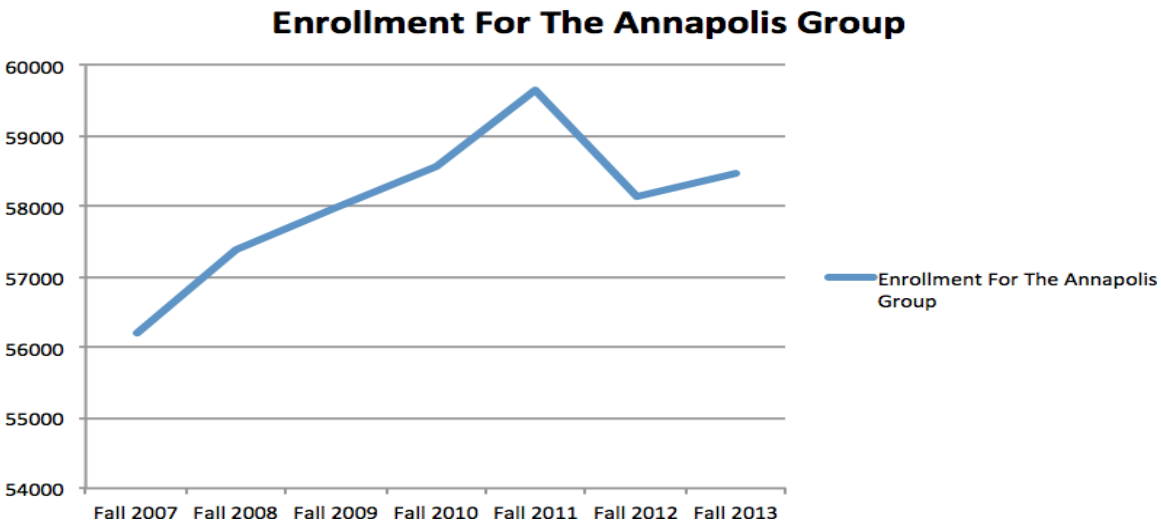
Parents About College @insidehighered. Inside Higher Ed, 20 Mar. 2013. Web. 17 Mar. 2015. 1

[11] "About Liberal Arts Colleges." *Liberal Arts Success*. Annapolis Group, n.d. Web. 17 Mar. 2015.

[12] "About Liberal Arts Colleges." *Liberal Arts Success*. Annapolis Group, n.d. Web. 17 Mar. 2015.

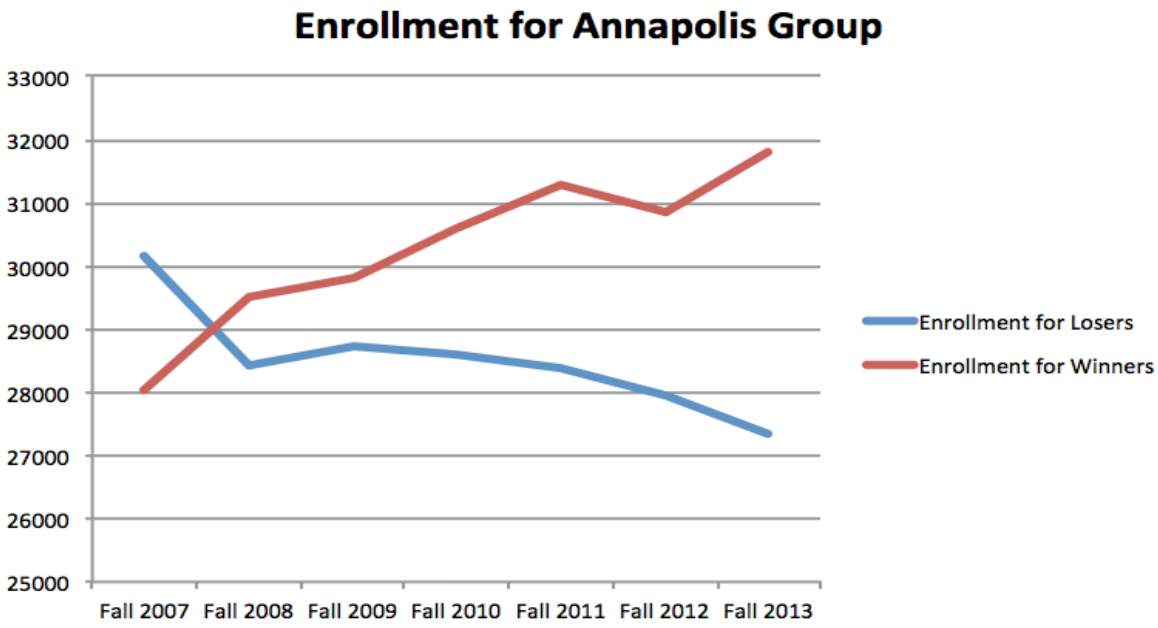
There are 130 liberal arts institutions in the Annapolis Group. Using the Annapolis Group schools, I mapped the enrollment from fall of 2007 to fall of 2013, using data from the Integrated Postsecondary Education Data System (IPEDS), to illustrate how enrollment for these institutions have faired post-2008 financial crisis. In figure three, from fall of 2007 to fall of 2013, enrollment for the Annapolis Group increased from 56,191 students, to 58,457 students.

Figure Three



Enrollment for the Annapolis group as a whole increased, but if you take the difference in freshman enrollment between the fall of 2007 and fall of 2013, and rank the Annapolis by that change, there are clear "winners" and "losers." Figure four illustrates a time series for the top 65 institutions (red trend line) and the bottom 65 institutions (blue trend line). there are institutions where enrollment increased and there are institutions where enrollment decreased.

Figure Four



There are a number of institutions that are in trouble, which is not illustrated in Figure Three. These institutions could be suffering from a multitude of problems. These institutions could be suffering from a declining physical plant, poor endowment performance post-2008 financial crisis (inability to invest into the university), a change in executive leadership, or an outdated curriculum. All of these variables could effect enrollment for liberal arts institutions.

This thesis focuses on the curriculum variable at a private, liberal arts institution, where the institution had identified that updating the curriculum would help combat the falling enrollment. My research question is: Can game theory offer useful insights to manage shared governance of academic program decision making at liberal arts institutions? Shared governance is defined and discussed in the following chapter. My contributions from this thesis include a new visual representation of a simultaneous game and the application of several classic game scenarios to the liberal arts context. This

thesis demonstrates the effect of trust, or lack of trust, on the evolution of dynamic games with parties with incongruent interests.

This thesis has six chapters. Chapter two outlines the role of shared governance at liberal arts institutions and how it has evolved over time. Chapter three is an introduction to game theory, including the games I illustrate. Chapters four, five, and six are the game theory models, each involving a game between the administration and the faculty. Each chapter relaxes the assumptions made, so each chapter provides a more realistic illustration of shared governance during an academic program review. Chapter four is a simultaneous game, chapter five is a sequential game, and chapter six is a sequential game with assurances. To end the thesis, there is a conclusion and a future research section.

I. Chapter Two: Shared Governance

The term *shared governance* describes the structure and process that academic institutions use to "balance between the claims of two different, but equally valid, systems for organizational control and influence."[13] The "two different … systems" that exist in institutions of higher learning are i) the role of the trustees and administration and ii) the role of the faculty.[14] The role of the trustees and administration originated as a legal authority and the role of the faculty evolved over time into a professional authority on matters regarding the curriculum. For this thesis, I focus on the role of the administration and the faculty, because they are the main players in academic program elimination.[15] This chapter provides an overview and history of shared governance and the problems with shared governance when reviewing academic programs.

a. History and Overview

Before the mid 19th century, presidents and governing boards of colleges and universities drew heavily from the clergy and exercised decision-making authority with little input from faculty.[16] The role of the faculty was to maintain "the discipline, build character, and pass on received wisdom to their students." The faculty were not expected to produce new research or knowledge. The faculty were not expected to participate in

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[13] Birnbaum, Robert. "The End of Shared Governance: Looking Ahead or Looking Back." *New Directions for Higher Education* 2004.127 (2004): 5-22. 5

[14] Birnbaum 5

[15] In shared governance, there are many other important players, such as the students, staff, and trustees. For this thesis, I focus on the interactions between the administration and faculty.

[16] Pierce, Susan Resneck. *Governance Reconsidered: How Boards, Presidents, Administrators, and Faculty Can Help Their Colleges Thrive.* 7

the day-to-day operations of the institution.[17] Then, after the Civil War, professors traveled to Germany and soon embraced the German notion that students should have the freedom to learn without interference from the administration. In Germany, faculty members were free to teach and engage in research as they saw fit.[18] This is where the notion of *academic freedom* in American universities was born. Academic freedom is the "freedom of inquiry by faculty members," which is essential to the mission of the academy and allows scholars to have the freedom to teach or communicate ideas or facts without being targeted for repression, job loss, or imprisonment.[19] The desire for academic freedom came at a time when the governance of universities was changing because the composition of boards and administrations became populated with "bankers and businessmen rather than clergy."[20] With academic freedom, professors enjoyed many more benefits such as tenure, which granted professors job security for life, so this meant they could be free to research and produce inquiry as they saw fit.

Tenure and academic freedom led to the increasing role of the faculty in decisions regarding the curriculum and educational practices. Before academic freedom, the administration and trustees would set the curriculum and inform the faculty what was to be taught. The concept of academic freedom sparked the idea that the faculty should control the curriculum of an institution because they are the body responsible for educating the students. This evolution in the role of faculty started when the Trustees and

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[17] Pierce 7
[18] Pierce 7
[19] American Association of University Professors, http://www.aaup.org/issues/academic-freedom
[20] Pierce 8

administration wanted input from the faculty regarding curriculum concerns and questions. President Tappan of the University of Michigan made the first argument for faculty participation in 1858. Tappan proposed "that the faculty should enjoy sovereignty over teaching methods and the curriculum, since scholars' are the only workmen who can build up universities.'"[21]

During the first three decades of the twentieth century, ignited by the academic revolution (G.I. Bill) following World War II, faculty not only gained control of the curriculum but also gained a "strong faculty voice in other education-related matters."[22] President Tappan's white paper regarding the role of faculty in shared governance defined the role of the faculty in shared governance until 1967. Then in 1967, the American Association of University Professors (AAUP), American Council of Education (ACE), and the Association of Governing Boards (AGB) issued a joint statement called the "Statement on Governance of Colleges and Universities, which "formally articulated the faculty role in academic governance for the first time."[23] This joint statement formally described the "essential relationships" needed between the administration and the faculty.

These "essential relationships" between the faculty and the administration are based on two principles that have come to define the term "shared governance."[24] The first principle is of shared governance is that "important areas of action involve at one time or another, the initiating capacity and decision making participation by the reference to the responsibility of each component." In other words, all parties who are involved

[21] Birnbaum 5
[22] Birnbaum 5
[23] Birnbaum 5
[24] Birnbaum 6

with a decision need to be involved in the process from the beginning. For example, eliminating academic programs is a conversation between the administration and faculty because the administration initiates the conversations and the faculty is responsible for the curriculum. The second principle of shared governance is: "the difference in the weight of each voice, from one point to the next, should be the reference to the responsibility of each component for the particular matter at hand."[25] This means that the players involved need to be cognizant of how much responsibility they have on the subject matter at hand. For example, faculty having control over the curriculum with minimal interference from the administration seems natural because the faculty's expertise is in teaching and producing scholarship. These two principles outline that shared governance is a way to make decisions when involving multiple parties that all have a different interaction with the matter at hand, but also dictates that some voices may have greater weight than others. For example, when a staff member is being fired, the faculty will not have a say in the final decision because it is not their responsibility. Conversely, when there is a change to the requirements of the neuroscience major, the administration will not be involved because the curriculum is the faculty's responsibility.

The joint statement not only confirmed the faculty's role in educational matters like faculty status and programs of instruction and research, but also confirmed involvement in areas such as: educational policy, institutional objectives, planning, budgeting and selecting administrators.

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[25] Birnbaum 6

b. Tensions with the shared governance process

There are four fundamental issues that exacerbate the tensions of shared governance within liberal arts universities. Shared governance runs into issues when there are difficult decisions to be made such as program elimination and changing institutional values. The four tensions are: i) to provide a liberal arts education versus pre-professional training, ii) to offer small class sizes or large class sizes to control costs iii) encouraging faculty to participate in a student-focused activities versus rewarding faculty who pursue research to create new knowledge, and lastly, iv) whether or not to position the university as a statewide, national, or international institution.[26]

These issues are currently being debated at most liberal arts universities between faculty and administration in the context of shared governance. Especially because of the shift in public sentiment where higher education is understood to be a private good, meaning the individual is responsible for paying for it. Thus, prospective students are not interested in looking at schools with stickers prices of nearly 60,000 dollars, when a state school can costs as little as 15,000 dollars per year. Resolving these four tensions requires institutional structures and cultures conducive to effective deliberation and decision-making. However, this current debate about the liberal arts is why so many liberal arts institutions are strained, some beyond the breaking point.[27] The economic market conditions coupled with the academy's debates about *what* the liberal arts are is why the process of shared governance frequently leads to "emotional exchanges, personalized

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[26] Leach, William D. "Shared Governance in Higher Education: Structural and Cultural Responses to a Changing National Climate." California State University, Sacramento, Apr. 2008. 4

[27] Leach 4

attacks, and policy gridlock" leading many to question whether or not shared governance is able to respond to the economic and fiscal challenge for most colleges and universities with adequate force and speed.[28]

Liberal arts institutions are typically small in size, with intimate class sizes and a faculty that knows one another personally. In other words, it is a very personal environment. When these institutions need to make difficult decisions like eliminating academic programs, it becomes very difficult to take the "face" of the faculty member off of the program. This is why shared governance is difficult at more personalized institutions. The faculty has a very hard time eliminating academic programs because either their friends or colleagues are a part of that program or its their own program. Eliminating academic programs can essentially destroy the life's work of a faculty member. How can liberal arts institutions adapt the curriculum when they are not able to eliminate the programs that have fallen out of demand? This next section outlines the role of shared governance in academic program elimination.

c. **Shared Governance's role in Program Elimination**

Shared governance plays a pivotal role in program elimination because program elimination is extremely difficult for faculty because they "can lose their jobs and have their life's work interrupted, and the cuts can potentially threaten an institution's core values and alter institutional identities."[29] The other problem with program discontinuance is that it occurs during periods of fiscal constraint and is usually a last

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[28] Leach 4

[29] Eckel, Peter D. "The Role of Shared Governance in Institutional Hard Decisions: Enabler or Antagonist?" *The Review of Higher Education*24.1 (2000): 15-39.17

resort on most campuses.[30] The pressure on the faculty to decide to eliminate certain programs can be overwhelming and have a forced feeling because there are not many alternatives. The difficulty of program termination exacerbates the shared governance mechanisms because faculty must make the decision to close their colleagues' departments and in some cases close their own departments.[31] Program discontinuance involves many factors, which lead to the decision of whether or not to eliminate a program. The factors that lead to program discontinuance are the curriculum decisions for market demand (Does the program have sufficient demand?), the institution's financial well being (Can we afford to run this program?), and institutional strategy (Should we be offering this program?).[32] Since program discontinuance involves decisions from the trustees and administration (financial and institutional planning) and the faculty (curricula), it falls into the "grey area of shared governance and cannot simply be decided independently by faculty, administrators, or trustees.[33] This "gray area" intersection of the faculty and administration is what I apply game theory to. This thesis attempts to gain useful insights by applying game theory to decisions regarding academic programs between the faculty and administration.

d. **Importance and Conclusion**

As stated before, the thesis focuses on the two main actors in shared governance, the faculty and the administration, where the faculty and the administration need to decide on whether to eliminate or not eliminate academic programs from an institution's

[30] Eckel 17
[31] Eckel 18
[32] Eckel 18
[33] Eckel 18

curriculum. Between 1970 and 1985, practical arts programs gained significant traction in the higher education market, so much so that nearly "two in three degrees were awarded in occupational or pre-professional fields."[34] Practical arts programs like Business now account for one-fifth of all undergraduate degrees.

For the purpose of this thesis, the administration believes that updating the curriculum can help make the university more marketable to prospective students. By applying game theory to the process of academic program elimination, I attempt to see if there are useful insights into the process of shared governance when a difficult decision is to be made.

[34] 157

II. Chapter Three: Game Theory

Chapter two provides a history of shared governance and *what* shared governance looks like at a private, liberal arts institution. Chapters 4, 5, 6, use game theory to explore the dynamics of joint decision making between the faculty and the administration. This chapter serves to explain why I chose game theory and what game theory is used for.

Game theory is designed to address situations where the outcome of a person's decision depends not just on what they choose, but also on the choices made by the other people involved. There are three basic "ingredients" of a game that are essential to game theory. First, there needs to be a set of participants, which are commonly referred to as the players of the game.[35] In the context of this thesis, the players are the administration and the faculty.[36] The second ingredient is that each player has a set of options for how to behave; these options are usually referred to as strategies. In the present scenario, the administration and the faculty have two choices: either *eliminate* or *do not eliminate* an academic program from the institution's curriculum. Lastly, each strategy needs to have a payoff associated with it. The payoff is typically expressed as a number. The payoffs used in this thesis are relative and the signs, positive or negative, are illustrative and not absolute. The magnitudes of change in the payoffs as players move from consideration of one strategy to another are what are important. A more positive payoff is understood to

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[35] Easley, David, and Jon Kleinberg. *Networks, Crowds, and Markets: Reasoning about a Highly Connected World*. New York: Cambridge UP, 2010. 158

[36] Please note that thesis simplifies the interaction of shared governance to focus on interactions between the faculty and the administration. Other key players in shared governance are: staff, alumni, and trustees (administration and trustees are assumed to be congruent with one another in this thesis).

have a more advantageous outcome for the player. Conversely, a more negative outcome is understood to have a more detrimental outcome for the player.

The faculty or the administration will choose *eliminate* or *not eliminate* based on three decision criteria. The three decision criteria are:

1. Maximize payoffs
2. Minimize variance (risk)
3. Fairness

The strategy of maximizing payoffs is when each player chooses an outcome (eliminate or do not eliminate) based on the highest payoff achieved for that player. In other words, if the faculty receive a payoff of 5 for do not eliminate and a payoff of -2 for eliminate, the faculty are going to choose do not eliminate. The strategy of minimizing risk is much like minimizing risk in basic personal finance. Individuals want to minimize the risk that they will lose money in the stock market. Different individuals have different preferences of risk. Lastly, fairness is a much more difficult decision criterion, but can be explained by the ultimatum game. The ultimatum game is a game that illustrates the concept of fairness, similar to what chapter six illustrates, where the players involved are looking for a fair outcome, not solely to maximize their payoffs. The rules for the ultimatum game are simple. There are two players that need to agree on how to split a sum of money. One player is the proposer and the other is the responder. The proposer makes an offer. If the responder accepts, the deal goes through. If the responder rejects, neither player get anything. In both cases, the game is over. According to the neoclassical economic paradigm, the rational responder should accept even the smallest positive offer,

since the alternative is both parties getting nothing. [37] Proposers should then be able to keep almost the entire sum of money.

In chapter 5, I first illustrate this game using simultaneous game theory, which provides a basic understanding of what game theory is and how it applies to the context of my thesis. Chapter five explores the results when the administration and faculty make a decision using the first two decision criteria. There are two different types of games: simultaneous or sequential. Chapter 5 focuses on simultaneous moves between the administration and the faculty. A simultaneous move is defined as a move in which the players make a choice only once, and at the same time.[38] In the context of this thesis, this means that the administration and the faculty make the decision to *eliminate* or *not eliminate* an academic program at the same time without knowing what either party is thinking. With simultaneous moves, the faculty and administration are trying to figure out what each player is going to decide *right now*. A key feature of simultaneous games is that the players cannot communicate.

In chapter 6, I illustrate this game using sequential game theory to provide an understanding of what happens at liberal arts institutions when a player can make a first move, but it is still an all or nothing approach, like the simultaneous game. Lastly, in chapter 7, I apply assurances to the sequential game to show what happens when the faculty and administration can signal to each other their intended move. This is where the third decision criteria is discussed. A sequential game is where one player moves first and

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[37] Nowak, Martin A., Karen M. Page, and Karl Sigmund. "Fairness Versus Reason in the Ultimatum Game." *Science* 289.5485 (2000): 1773-775. *JStor*. 1773

[38] Dixit, Avinash K., and Barry Nalebuff. *The Art of Strategy: A Game Theorist's Guide to Success in Business & Life*. New York: W.W. Norton, 2008. 20

then another player respond to their decision. An example of a sequential game is chess: white moves first, then black, then white again until one wins the game, or there is a draw. For this chapter, there are two different sequential games. One is where the administration moves first and the faculty responds, and the second is where the faculty moves first and the administration responds. An important distinction between the simultaneous game and the sequential game is that during a sequential game, "each player must think: if I do this, how will my opponent react?" whereas during a simultaneous game, each player was trying to figure out what each of the players are doing *right now*.[39]

The following assumptions are held throughout the entire thesis. The administration makes their decision primarily through the lens of the university's financial sustainability. Relationships with other administrators and faculty are relevant but presumed secondary. The faculty makes their decision primarily through the lens of whether or not the program is central to the university's liberal arts mission. Relationships with other faculty and administrators are relevant but presumed secondary.

Instead of vaguely referring to an academic program, in chapter 4 and 5, the administration and the faculty will choose *eliminate or do not eliminate* the classics program. I wanted to use an example of a program that has little demand from the students but has intrinsic value to liberal arts institutions. In this thesis, I assume the faculty hold the classics program in high esteem and that, therefore, they are not willing to eliminate the program. But the administration feels the lack of revenue generated by

[39] Dixit and Nalebuff 20

this program is doing more harm to the institution than good, therefore they are willing to eliminate the program. To be clear, I could illustrate the same game by asking the faculty and administration to eliminate or not eliminate the business program from the institution's curriculum. The assumptions would be that the faculty think the business program violates the institution's mission and, therefore are willing to eliminate the program. But since the business program is popular, it produces revenue, so the administration does not want to eliminate the program.

For each of the games there are payoffs associated with what the administration and faculty decide to choose. These payoffs come from an extensive sensitivity analysis completed in order to produce games with a clear separating equilibrium. A separating equilibrium is important to this thesis because I wanted to have a game where there was an inflection point, or a point where the administration or faculty would change their answer. I purposefully created a situation where the faculty would not be constantly opposed to eliminating the classics and the administration would not constantly eliminate the classics program. In the simultaneous game, I created payoff matrices without a dominant Nash equilibrium. A dominant Nash equilibrium is a strategy that one side pursues regardless of the other side's move. In other words, a game without a separating equilibrium or with a dominant Nash equilibrium would not be interesting to explore through the lens of shared governance.

Just like any other model, game theory has strengths and weaknesses. Game theory's strengths are the ability to provide insights into the less-known aspects of situations, especially when there are conflicting interests. Game theory provides a

framework to analyze decision-making and can explain what the optimal strategy is for each player. Game theory's main weaknesses are that all of the variables in a given problem cannot be accounted for. The assumptions made for the game theory model are also a weakness because prior knowledge of payoffs is impractical.

III. Chapter Four: Simultaneous Game

a. Explanation of a Simultaneous Game

The simultaneous game between the administration and the faculty closely relates to the *Prisoner's Dilemma,* a famous example of a simultaneous game. *Law and Order* is a television show that frequently illustrates the Prisoner's Dilemma. An example of a Prisoner's Dilemma game is if two individuals commit a robbery. The detectives bring them in for questioning and separate them into separate rooms so they can ask questions to elicit answers from them, separately. This Prisoner's Dilemma scenario illustrates a two-player, simultaneous-move game where each of the two individuals can *confess* or *not confess* to the crime, without knowing what the other player is going to choose. If the husband and wife could communicate, they would be able to coordinate stories and keep quiet, but since they cannot communicate, they have an incentive to rat each other out. In the context of this thesis, an example of a simultaneous scenario is if the administration and the faculty attended a faculty meeting and put up the classics program for elimination, and then both parties decided whether to eliminate or not, without any debate.

b. Explanation of a Payoff

There are numbers associated for each logically conceivable outcome of the game. These numbers correspond to each available combination of choices for each player of the game. The number associated with each possible outcome is the *payoff* for each player and the outcome associated. For example, if both the faculty and the administration choose to eliminate a program, there is an associated number describing

the payoff for each player. The simultaneous payoff matrix is the next section of this chapter. It is important to state that the payoff associated with each outcome for this simultaneous game is illustrative and not absolute. Below is the payoff matrix between the faculty and administration used in this chapter.

Figure Five

	Faculty	
Admin	**Eliminate**	**Don't Eliminate**
Eliminate	**(4,1)**	**(-4,-6)**
Don't Eliminate	**(-1,-4)**	**(1,6)**

****The payoffs are in (administration, faculty) order.**
**** These numbers are derived from a sensitivity analysis, to achieve a meaningful separating equilibrium.[40]**

c. Explanation of Matrix

The payoff matrix above refers to the simultaneous game between two players, the administration and the faculty. For the simultaneous model, the assumptions are as follows: i) the administration makes their decision primarily through the lens of the university's financial sustainability as well as relationships with other administrators and faculty and ii) the faculty decides to eliminate through the lens of friendship with administrators and faculty and whether or not the program is central to the university's liberal arts mission.

[40] Please refer to appendix A for full illustration of sensitivity analysis

There are two different outcomes for the Classics program, *eliminate or do not eliminate*. There are four different payoff outcomes when the faculty and administration make their choice. The four different outcomes (in administration, faculty order) are: *Eliminate Eliminate, Eliminate Do Not Eliminate, Do Not Eliminate Eliminate, Do Not Eliminate Do Not Eliminate.* For the purpose of this thesis, I am going to focus on the payoffs where the administration and the faculty do not agree because these are the interesting scenarios in terms of shared governance. My goal is how to structure the game to reach a mutually beneficial agreement.

For the upper left box, *eliminate eliminate,* and the lower right box *do not eliminate, do not eliminate* both the administration and the faculty agree to eliminate, or not eliminate, the Classics program. The rationale behind the elimination payoff for the Classics program is as follows. The faculty assumes that the administration's probability to eliminate was high, so they thought it was not worth the conflict, and chose *eliminate*. If the administration can eliminate a program without conflict, the administration's payoff will be greater than the faculty's because the administration is achieving financial sustainability without a conflict. The same rationale can be applied when the administration and faculty agree to not eliminate the Classics program. The administration assumes that the faculty's probability to *not eliminate* was high, so the administration avoided a costly conflict and chose *do not eliminate*. The faculty's payoff will be greater than the administrations because the Classics program is not eliminated and the faculty avoided a conflict with the administration.

Since this is a simultaneous game, decisions are made without communication between players. For the *don't eliminate, eliminate* payoff, there is a misunderstanding of where the faculty thought the administration's probability to eliminate is and vice versa. This is a perfect example of a coordination game, where two parties, like the faculty and the administration, need to coordinate their responses without knowing what each other is going to choose. Another example of a coordination game is when a husband and a wife have to coordinate what movie to see without prior communication. It is assumed that the husband wants to see an action movie and the wife wants to see a romantic comedy, and that the husband and wife would rather see the movie together, rather than alone. If the husband and wife misunderstand what each other want to see, there is a chance that they end up choosing the *action movie, romantic comedy* payoff, where the husband ends up at the romantic comedy and the wife ends up at the action movie.[41]

The upper right and lower left *eliminate, do not eliminate* payoff is essential to thesis because this conflict sets up the next two chapters and, unlike the husband and wife movie example, our game does not simply end with each spouse standing alone outside a movie theater. The explanation of this outcome is simple: the administration wants to eliminate the Classics program because of the negative financial implications on the university and the faculty do not want to eliminate the program because it has intrinsic institutional value and directly correlates with the institution's mission. Regardless of where the administration thought the faculty probability to eliminate was and vice versa. For the purpose of this thesis, this disagreement is assumed between the administration

[41] Easley and Kleinberg 170-71

and faculty. What can the administration do to get the faculty to change their outcome? This question is answered in the following chapters. The next section provides a more detailed understand of the payoff matrix.

d. Explanation of Probability Matrices

Figure Six

When Administration Moves First:

		Administration's Probabilty to Eliminate										
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
	0.00	1.00	0.80	0.60	0.40	0.20	0.00	-0.20	-0.40	-0.60	-0.80	-1.00
	0.10	0.50	0.40	0.30	0.20	0.10	0.00	-0.10	-0.20	-0.30	-0.40	-0.50
	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Faculty's	0.30	-0.50	-0.40	-0.30	-0.20	-0.10	0.00	0.10	0.20	0.30	0.40	0.50
Probabilty	0.40	-1.00	-0.80	-0.60	-0.40	-0.20	0.00	0.20	0.40	0.60	0.80	1.00
to	0.50	-1.50	-1.20	-0.90	-0.60	-0.30	0.00	0.30	0.60	0.90	1.20	1.50
Eliminate	0.60	-2.00	-1.60	-1.20	-0.80	-0.40	0.00	0.40	0.80	1.20	1.60	2.00
	0.70	-2.50	-2.00	-1.50	-1.00	-0.50	0.00	0.50	1.00	1.50	2.00	2.50
	0.80	-3.00	-2.40	-1.80	-1.20	-0.60	0.00	0.60	1.20	1.80	2.40	3.00
	0.90	-3.50	-2.80	-2.10	-1.40	-0.70	0.00	0.70	1.40	2.10	2.80	3.50
	1.00	-4.00	-3.20	-2.40	-1.60	-0.80	0.00	0.80	1.60	2.40	3.20	4.00

Figure Seven

When Faculty Moves First:

		Administration's Probabilty to Eliminate										
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
	0.00	6.00	5.00	4.00	3.00	2.00	1.00	0.00	-1.00	-2.00	-3.00	-4.00
	0.10	4.80	3.97	3.14	2.31	1.48	0.65	-0.18	-1.01	-1.84	-2.67	-3.50
	0.20	3.60	2.94	2.28	1.62	0.96	0.30	-0.36	-1.02	-1.68	-2.34	-3.00
Faculty's	0.30	2.40	1.91	1.42	0.93	0.44	-0.05	-0.54	-1.03	-1.52	-2.01	-2.50
Probabilty	0.40	1.20	0.88	0.56	0.24	-0.08	-0.40	-0.72	-1.04	-1.36	-1.68	-2.00
to	0.50	0.00	-0.15	-0.30	-0.45	-0.60	-0.75	-0.90	-1.05	-1.20	-1.35	-1.50
Eliminate	0.60	-1.20	-1.18	-1.16	-1.14	-1.12	-1.10	-1.08	-1.06	-1.04	-1.02	-1.00
	0.70	-2.40	-2.21	-2.02	-1.83	-1.64	-1.45	-1.26	-1.07	-0.88	-0.69	-0.50
	0.80	-3.60	-3.24	-2.88	-2.52	-2.16	-1.80	-1.44	-1.08	-0.72	-0.36	0.00
	0.90	-4.80	-4.27	-3.74	-3.21	-2.68	-2.15	-1.62	-1.09	-0.56	-0.03	0.50
	1.00	-6.00	-5.30	-4.60	-3.90	-3.20	-2.50	-1.80	-1.10	-0.40	0.30	1.00

For each of the faculty and the administration payoffs above, there is a corresponding payoff matrix based on probabilities for both players to choose eliminate because each player's choice depends on what they think the other player will do. The probability matrix is an eleven by eleven chart, in which the axes are the probabilities of

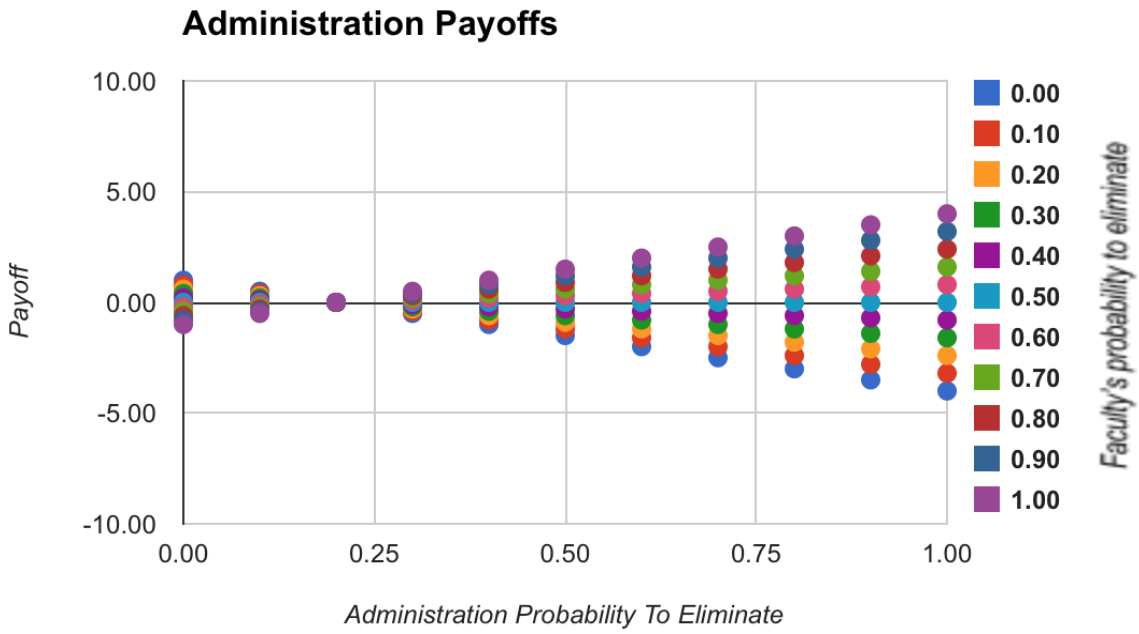
choosing *eliminate*. For both probability matrices, the horizontal axis is the administration's probabilities and the vertical axis is the faculty's probabilities for *eliminate.* Each axis is labeled from 0 to 1, in .10 increments. For readability, the matrixes are color-coded. On the left is the administration's probability payoff, which is blue. The dark blue cells represent positive payoffs for the faculty to eliminate, the light blue cells represent probabilities where the faculty is indifferent to elimination, and the gray cells represent negative payoffs if the faculty choose eliminate. On the right is the faculty's payoff matrix, which is green. The dark green cells represent the positive payoffs for the faculty to eliminate and the light green cells represent the negative probabilities for the faculty to eliminate.

Each cell in the matrix has an underlying expected value equation ($E[x]=\sum x_i * p_i$) that multiplies the payoff by the probabilities, which results in the expected value of the payoff to eliminate. These probability matrices are used as a visual to try and understand where each player has to be at the same time for consensus to occur. For example, for the row probability .5 and the column probability of .4, there is a -.3 payoff for the administration to eliminate. In other words, the administration would not try and eliminate this program because there is a negative payoff associated with it. Why would the administration try and eliminate a program that would not have a positive payoff? Conversely, for the row probability .3 and the column probability 1, there is a .5 payoff. Meaning that given these probabilities, the administration would benefit from eliminating this program and would make that decision based on the positive payoff. The key point for the probability matrices is finding where the faculty and administration are in

agreement and both parties have positive payoffs. When both parties agree for either *eliminate* or *not eliminate*, the payoffs will be positive and there will be consensus.

e. Explanation of the Administration Payoff Graph

Figure Eight



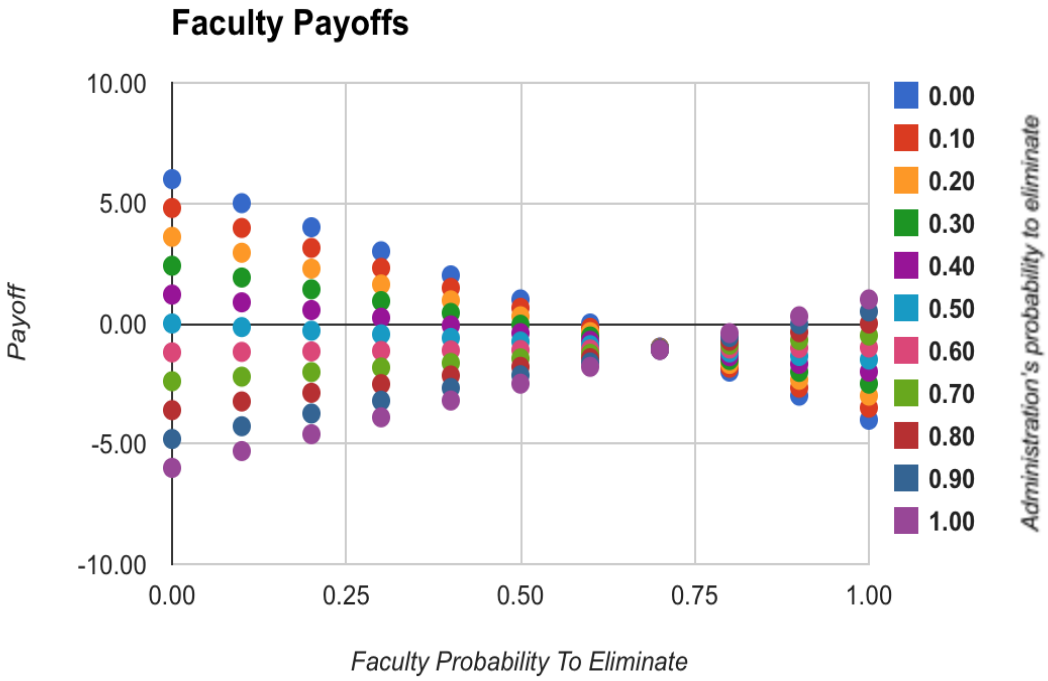
The administration payoffs graph depicts the expected values of the administration's probability to eliminate which is calculated from the previous payoff matrix. The administration's probability to eliminate is on the x-axis. The color-coded probabilities reflect the faculty's probability to eliminate. Each color on this graph depicts a different faculty probability to eliminate, from 0 to 1. When the faculty's probability to eliminate is 60 percent or higher, the administration will choose to eliminate the Classics program because the slope is positive. When the slope is positive for the administration, they will choose to eliminate because increasing the probability to eliminate to 1 increases this payoff. Conversely, this graph depicts a scenario where if the

faculty has a probability of 40 percent or lower to eliminate the Classics program, the administration would choose not eliminate because the slope is negative, and this change in payoff as administration increases probability of eliminate to 1 is negative. If the faculty's probability to eliminate is 50 percent, the administration is indifferent to eliminating the Classics program, as depicted by the blue dotted line, where the slope is zero. For example, if the faculty is 70 percent probable they will eliminate the Classics program, the administration will choose eliminate because the administration will have a positive payoff. But if the faculty was 20 percent probable they would eliminate the classics program, the administration would choose not eliminate because choosing eliminate would have a net negative change in the payoffs.

The graph also illustrates the variance of the potential payoff. Visually, the variance is the distance between the highest and lowest payoff (spread). The variance in the administration payoff graph is interesting because it illustrates a situation as the administration increases their probability of eliminate, their variance, or risk, increases. In other words, if the administration wants to minimize variance, the administration will choose do not eliminate.

f. Explanation of the Faculty Payoff Graph

Figure Nine



The faculty payoffs graph is the expected values of the faculty's probability to eliminate which is calculated from the previous payoff matrix. The faculty's probability to eliminate is on the x-axis. The color-coded probabilities reflect the administration's probability to eliminate. Each color on this graph depicts a different administration probability to eliminate, from 0 to 1. Between the administration's probabilities .60 - 1.0, the faculty has a positive slope; therefore the faculty would choose to eliminate the Classics program because their payoff increases moving from probability 0 to probability of 1 to eliminate. Anything below a 60 percent probability from the administration, the faculty will not choose eliminate because that results in a negative slope. To conclude, if

the administration is very serious about eliminating the Classics program, the faculty will agree with the decision. But as soon as the administration is below 60% probability of elimination, the faculty will not agree with them. The slope of the payoffs for the faculty becomes relatively worse, as depicted in the graph above.

Just like the administration's payoff graph, the variance in faculty's payoff graph is interesting. If the faculty want to minimize variance, they will choose eliminate because the difference between the highest and lowest payoffs is smaller relative to the faculty choosing do not eliminate. Given the assumptions of this thesis, the faculty have much more to lose if they choose to eliminate the Classics program. The variance of the faculty and the administration illustrates a scenario just like the husband and wife movie example, where if both players are not in communication but are trying to minimize risk, the faculty and the administration will choose different outcomes.

g. Conclusion

The purpose of this chapter was to illustrate a game that did not have a dominant strategy or Nash equilibrium. Without a dominant strategy and Nash equilibrium, choice depends on assumed probability of what the other side might do. This chapter illustrated a game where the faculty and the administration was unsure what the other side would choose. Since there is not a dominant strategy, the faculty and the administration need to make decisions based on their risk tolerance and try to understand where each player's probability to eliminate is using the probability matrix. The key point of this chapter is to make strong moves and avoid uncertainty in the player's decisions. The reason this is the important takeaway is because if the faculty or the administration were 100% certain they

wanted to *eliminate* or *not eliminate* a program, the other player agreed. If the players were not as certain, in the 40%, 50%, 60% probability to *eliminate* or *not eliminate*, there was conflict between the players.

The next section of this paper involves sequential game theory, where the administration moves first and the faculty respond and vice versa. The purpose of this first section was to understand the intuition and payoffs behind the administration and the faculty making decisions and how the payoffs affect decisions being made. The next section will focus on how the administration and faculty react once they know other players move. For the sequential game, there is the assumption that the faculty and the administration are making decisions simultaneously. This is not a realistic expectation in higher education. Decisions that involve the administration and the faculty do not involve simultaneous actions; these decisions involve multiple rounds of debate. Sequential movements will focus on how the payoffs change now that the second mover knows the first mover's decision.

IV. Chapter Five: Sequential Game Theory

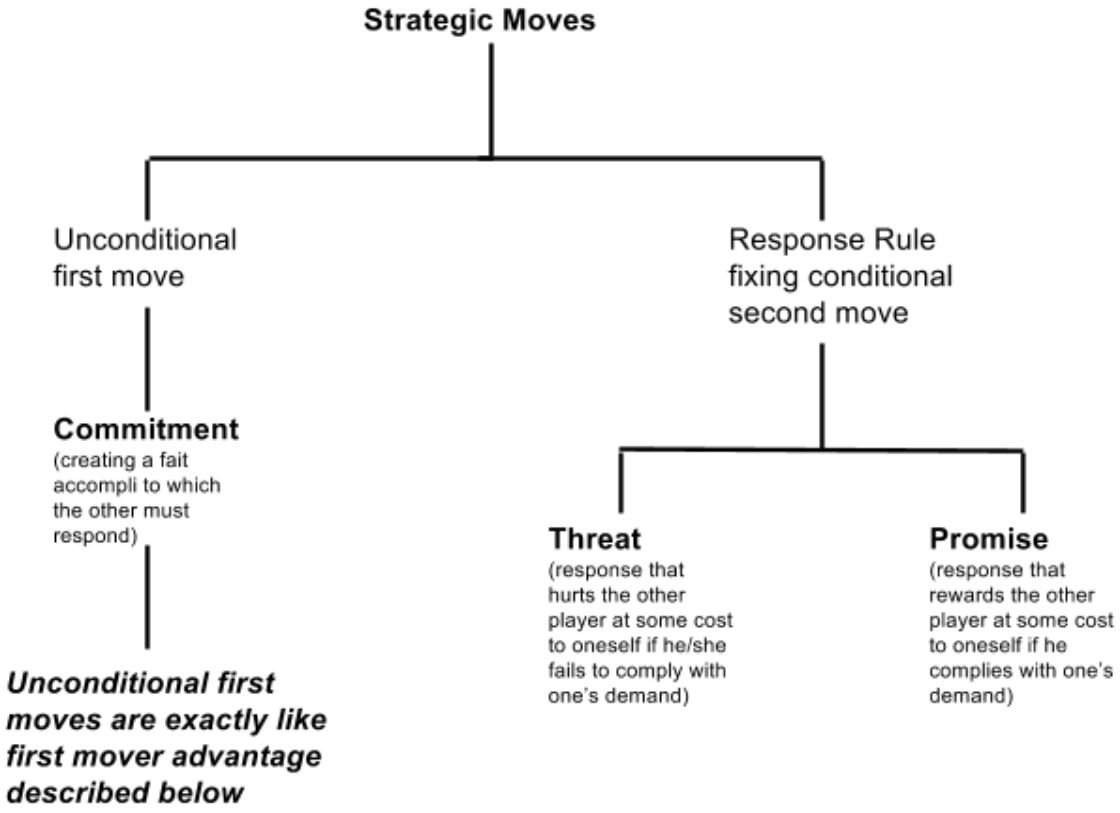
h. Explanation of Sequential Game

In this chapter there are two different sequential games. One is where the administration moves first and the faculty responds, and the second is where the faculty moves first and the administration responds. These games are illustrated in separate payoffs. An important distinction between the simultaneous game and the sequential game is that during a sequential game, "each player must think: if I do this, how will my opponent react?" whereas during a simultaneous game, each player was trying to figure out what each of the players are doing *right now*.[42] There are certain advantages in a sequential game that are not possible in a simultaneous game. The advantages are defined in the next section.

[42] Dixit and Nalebuff 20

i. Quick Reference Guide

Figure Ten



There are two types of strategic moves. This sequential game focuses on unconditional first moves, which are located on the left side of this diagram. The game of chicken is a classic example of an unconditional commitment. The game of chicken originated in the 1950s, when American teenagers would take their cars to the opposite of ends of a street and start driving towards each other. The player that would swerve and prevent a head-on collision would be the "chicken," or loser in this case.[43] Each player wants to try and influence the other to believe that they are not doing to swerve, and one possibility is one

[43] Dixit, Avinash K., and Susan Skeath. *Games of Strategy*. 2nd ed. New York: Norton, 1999. Print.109

player throwing their steering wheel out of the car window as s/he is driving towards the other player. This is an example of an unconditional move because it does not depend on what the other player is doing and once the player throws their steering wheel out of the window, you cannot reverse the decision.

j. Explanation of the First Mover Advantage

First mover advantage exists during sequential games because one player moves before another. First mover advantage "comes from the ability to commit oneself to an advantageous position and to force the other players to adapt to it."[44] I am going to illustrate the administration and faculty's first mover advantage using the previous simultaneous payoff.

k. Illustration of First Mover Advantage when Administration Moves First

Figure Eleven

	Faculty	
Admin	**Eliminate**	**Don't Eliminate**
Eliminate	**(4,1)**	**(-4,-6)**

If the administration is the first mover and chooses to *eliminate* the Classics program (depicted by the orange background fill), the faculty has an opportunity to respond, but since the administration went first, they have locked the faculty into either

[44] Dixit and Skeath 60

agreeing with them (depicted by the orange background fill) or not agreeing with them (depicted by the red background fill). By moving first, the administration eliminates half of the matrix as depicted by the black bottom half of the matrix. If the faculty does not agree with the administration, their payoff (-6) is relatively lower than agreeing with the administration (1). The faculty now has to choose either a payoff of (1) or (-6); and since the faculty want to maximize their payoffs, they choose to *eliminate* the Classics program because the *eliminate* payoff results in a greater benefit. The increase in absolute value of the administrations payoff when the faculty agrees with them (the *eliminate, eliminate* payoff) is a direct result of the first mover advantage.

l. Illustration of First Mover Advantage when Faculty Moves First

Figure Twelve

	Faculty	
Admin		**Don't Eliminate**
Eliminate		**(-4,-6)**
Don't Eliminate		**(1,6)**

Now, if the faculty moves first, they have the same opportunity to lock the administration into a decision they may not otherwise choose. For example, if the faculty chooses *do not eliminate* for the Classics program (depicted by the orange background fill), the faculty locks the administration into either agreeing (also depicted by the orange background fill) or not agreeing with the faculty (depicted by the red background fill). The administration now has choose *do not eliminate* which has a payoff of (1) or

eliminate with a payoff of (-1), they would choose *do not eliminate* because this maximizes their payoff. This example is how the faculty used their first mover advantage to change the outcome of the game in their favor.

m. Explanation of a Payoff

Just like the simultaneous game, there are numbers associated for each logically conceivable outcome of the game that correspond to each available combination of choices of strategies by all the players.[45] The number associated with each possible outcome is the payoff for each player and the magnitude explains the outcome for choosing *eliminate* or *do not eliminate.* For example, for both the faculty and the administration to choose to eliminate a program, there is an associated number describing the payoff for each player. It is important to state that the payoffs associated with each outcome for this sequential game are illustrative and not absolute. The payoffs used in this chapter are relative and the changes in magnitude are what are important. Unlike the simultaneous game, this sequential game will not use negative payoffs. Without loss of generality, the lowest payoff possible is 10. This way, when explaining the changes in magnitude, I can avoid statements like "less negative" or "more negative." Having positive payoffs is simply a stylistic choice for ease of explanation.

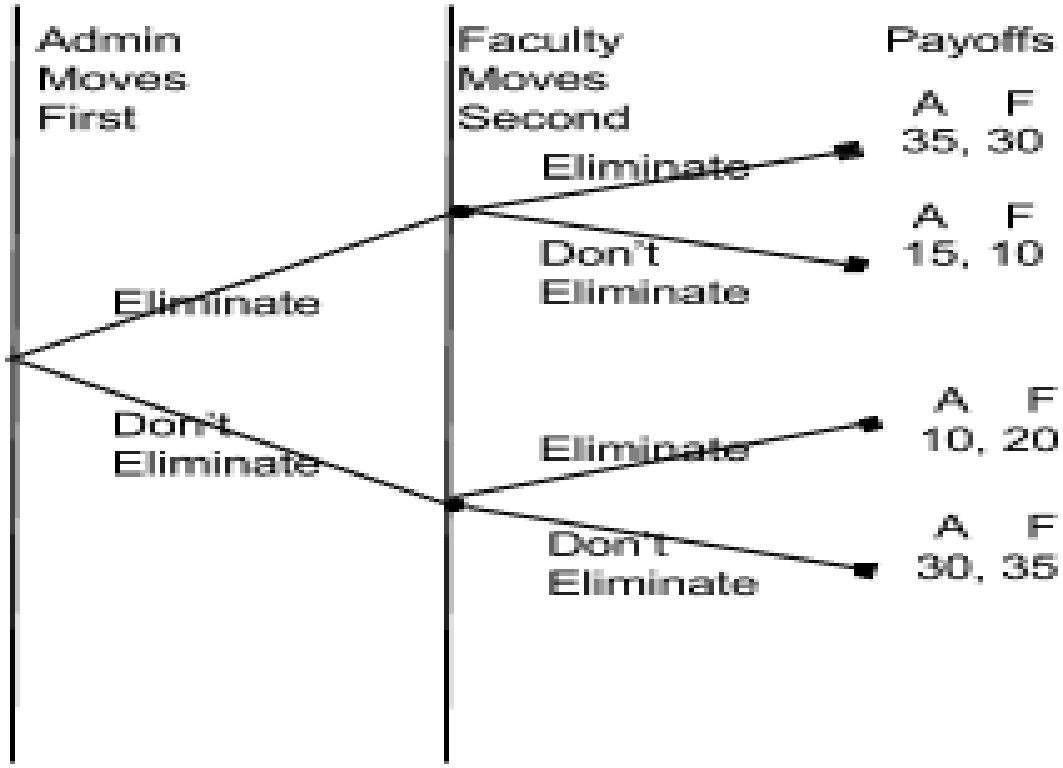
n. Explanation of the Administration's Game Tree

For this chapter, the sequential game can also be illustrated through a *game tree.* A *game tree* is a graphical representation of the corresponding payoff matrix to display

[45] Dixit and Skeath 60

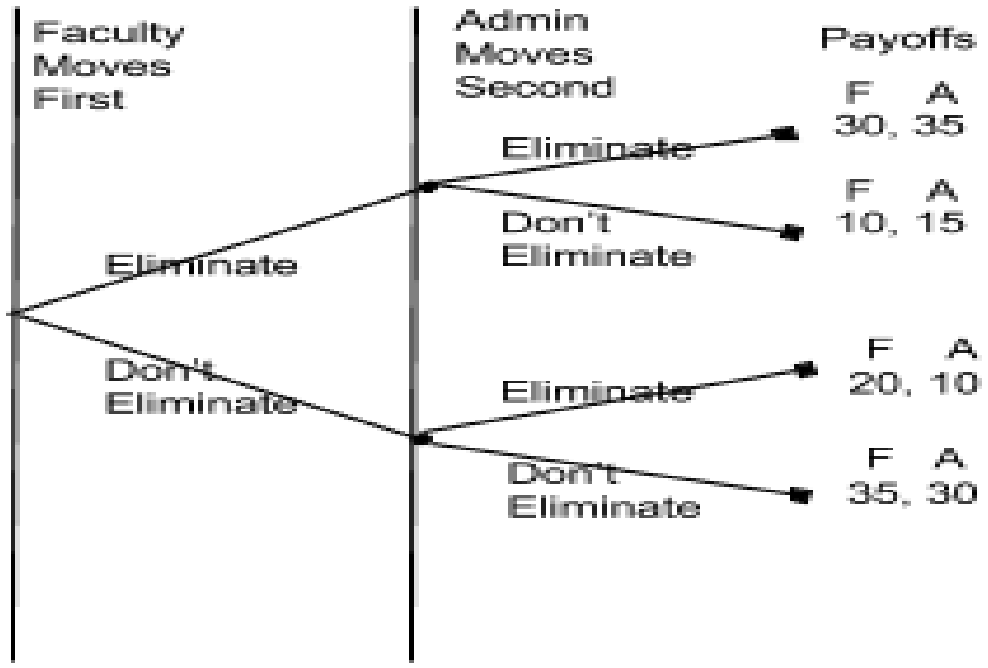
and analyze sequential-move games.[46] A game tree is called the *extensive form* of the game because it shows all aspects of the game: the players, actions, and payoffs.[47] Decisions trees show all the decision points, or nodes, for both players. These trees also include branches to corresponding to other available choices emerging from each node.[48] In the next section you will see a payoff matrix that corresponds with the game trees below.

Figure Thirteen



[46] Dixit and Skeath 46
[47] Dixit and Skeath 46
[48] Dixit and Skeath 46

Figure Fourteen



o. Explanation of Administration's and Faculty's Payoff Matrix

Figure Fifteen

	Faculty	
Admin	**Eliminate**	**Don't Eliminate**
Eliminate	**35, 30**	**15, 10**
Don't Eliminate	**10, 20**	**30, 35**

****The payoffs are in (administration, faculty) order.**
**** These numbers are derived from a sensitivity analysis, as mentioned previously.**

Figure Sixteen

	Faculty	
Admin	**Eliminate**	**Don't Eliminate**
Eliminate	**30, 35**	**10, 15**
Don't Eliminate	**20, 10**	**35, 30**

****The payoffs are in (faculty, administration) order.**
**** These numbers are derived from a sensitivity analysis, as mentioned previously.**

This payoff matrix reflects the payoffs for a sequential game between the administration and the faculty, when the administration is the first mover. This means that the administration moves first and chooses *eliminate* or *not eliminate* and faculty get to respond to their decision. The numbers I am presenting are derived from an extensive sensitivity analysis performed to illustrate a game where the administration has a dominant strategy. As a reminder the assumptions are: i) the administration makes their decision through the lens of the university's financial sustainability and the relationships with other administrators and faculty in the Classics program and ii) the faculty decides to eliminate through the lens of friendship, trust, and whether or not the program is central to the university's mission.

p. Explanation of Payoff when Administration Moves First

Just like the simultaneous game, there are four outcomes between the faculty and administration that are possible. These outcomes are: *Eliminate, Eliminate, Eliminate, Do Not Eliminate, Do Not Eliminate, Eliminate, Do Not Eliminate, Do Not Eliminate.* For the purpose of this thesis, the important payoff is when the administration chooses *eliminate*

and the faculty choose *do not eliminate.* This conflict is a realistic depiction of a scenario between the faculty and administration. In the next chapter, I use the *eliminate, do not eliminate* payoff to illustrate what the administration would have to do to convince the faculty they are serious about elimination. Except for the explanation of the first mover advantage, this sequential payoff has a dominant strategy for the administration. The administration's dominant strategy is to choose *eliminate* which means that no matter what the faculty decide, the administration will choose *eliminate* if they are the first mover. If the faculty is the second mover, they are confined to choosing the payoff with the highest value. Lastly, the (*do not eliminate, eliminate)* payoff is not a logical payoff when the administration moves first. The administration chose *do not eliminate* because of the relationships with faculty in the Classics program and/or does not want a costly conflict with the faculty. The faculty **would not** choose *eliminate* because it is assumed the faculty do not want to eliminate the Classics program. Since this is a sequential game, this payoff *do not eliminate, eliminate* can be avoided from the administration's signal to not eliminate the Classics program.

q. First Mover Advantage Explanation with the Sequential Payoffs

The *Eliminate, Eliminate* and the *Do Not Eliminate, Do Not Eliminate* are both payoffs that are the result of the first mover advantage. The *Eliminate, Eliminate* payoff is a result of the first mover advantage when the administration moves first and chooses *eliminate*. This locks the faculty into choosing *eliminate* with a payoff of 30 or choose *do not eliminate* with a payoff of 10. Since the players seek to maximize their payoffs, the faculty will choose *eliminate*. The *Do Not Eliminate, Do Not Eliminate* is a result of the

first mover advantage when the faculty moves first. The faculty can change the outcome of the game when they move first and choose *do not eliminate* because it forces the administration to either agree (choose do not eliminate) with a payoff of 30 or disagree (choose eliminate) with a payoff of 10. Since the players seek to maximize their payoffs, the administration will choose *do not eliminate*. This means when the faculty move first, they can achieve their desired outcome, which is the *do not eliminate, do not eliminate* payoff.

r. Conclusion

This chapter provided much more insight in how a university would actually make decisions regarding financially sustainability. The first chapter focused on simultaneous decisions, where the faculty and administration make the choice to eliminate or not at the same time. This chapter focused on the administration and faculty making the decision to eliminate or not eliminate in sequential moves, where the faculty or administration moved first and the other moved second. This chapter built upon the conclusion from the simultaneous game, reinforcing how important it is to have strong moves, but this chapter illustrates how important it is for the faculty or the administration to have strong first moves. This conclusion is reinforced by the faculty's first mover advantage when they choose *do not eliminate,* as the administration agree with them because the administration wants to maximize its payoff. The faculty is able to achieve the payoff they want by making a strong first move. In this chapter, having strong first moves resulted in agreement, either *eliminate, eliminate* or *do not eliminate, do not*

eliminate, between both parties; therefore the Classics program would either be eliminated or not eliminated.

In higher education, just because the administration or the faculty have a strong first move, it does not mean that the outcomes derived from the game above will occur. It is not realistic to rely on a strong first move. The next chapter will focus on a sequential game with assurances to provide an even more realistic depiction of how the administration and the faculty make decisions regarding the elimination of academic programs when the players do not agree.

V. Chapter Six: Sequential Game with Assurances

a. Explanation of an Assurance Game

An assurance is a commitment that alters a player's strategy. There are two different assurances: threats and promises. Threats and promises share a common feature: a response rule. The response rule requires a player to take action that they would not take if there were not an assurance in place. Assurances change strategies because they change the probabilities and the payoffs of the game. The cost of threats and promises are illustrated by a change the player's payoffs. Promises cost the promisor (decrease in payoff) and reward the promisee (increase in payoff). Threats cost the player who threatens (decrease in payoff) and has no effect on the player who is being threatened (payoff stays the same).

The story of the frog and the scorpion is a classic example of a sequential assurance game. The story starts with a frog and a scorpion at the bank of the river, trying to devise a plan to cross the river. The scorpion says, "I will climb on your back and you can swim across the river."[49] The frog is afraid that the scorpion will sting him, but the scorpion assures the frog that he will not sting him because that means both of them would drown in the river. The frog is convinced, so he allows the scorpion to climb on his back and they get halfway across, where the scorpion stings the frog. The frog

[49] Miron, Jeffery A. "Lesson 25: Game Theory Applications." *Harvard University*. Harvard University, 2009. 24

screams, "Why did you do that? Now we are both doomed."[50] The scorpion responds, "Alas, … it is in my nature."[51]

The frog and the scorpion game can be related to the dilemma between the faculty and the administration. The administration or the faculty can be viewed as either the frog or the scorpion. For example, both the faculty and the administration want to cross the river of institutional instability. Neither the faculty nor the administration can cross the river, without the help of the other. The important take away from this is that the frog was missing a commitment device, like a promise, which is why the scorpion ended up stinging him. Since there was not a promise in place, the scorpion did not have an incentive to not sting the frog.

In summary, considering assurances allows us to alter the sequential game from chapter 5 to provide a more realistic version of how the administration and the faculty interact during the academic program elimination. Assurances provide a more realistic outcome because in this thesis it is assumed that the faculty and the administration have numerous interactions. Not a one shot, or two shot game, but a continuing game of threats and promises moving from one decision to another. The Classics program is not the end of the game. Having said that, the faculty or the administration need to have credible commitments, in order to believe either player's action.

[50] Miron 24
[51] Miron 24

b. Quick Reference Guide

For the assurance chapter, I focus on conditional moves. A conditional move is defined as a move that require a response from the other players. For a visual representation please refer to figure eight on page 32. This chapter focuses on conditional strategic moves, like threats and promises, between the administration and the faculty.

Conditional moves can also be summarized in the table below. This table below provides threat and promise statements from the faculty and the administration. This table helps illustrate what threats and promises from the faculty and the administration will look like in this chapter.

Figure Seventeen

Threat	.. do what I don't want you to do...	.. don't do what I want you to do...
	...then I will respond with an action which will hurt you (and will also hurt me).	
Promise	.. don't do what I don't want you to do...	.. do what I want you to do....
	...then I will respond with an action which will reward you (and will be costly for me).	

c. Explanation of Commitments

Personal resolutions are a great example of a commitment. For example, you make a resolution to yourself: to wake up early to go to the gym before work. As everyone knows, as soon as the morning comes along, you will prefer to stay in bed longer instead of going to the gym. This is a sequential game between your "resolute nighttime self" against your own "future weak-willed morning self."[52] For this game, the

[52] Dixit and Nalebuff 177

morning self has the advantage of the second move (second mover advantage) because morning self can ultimately change the landscape of this game by choosing to stay in bed instead of getting up. However, since this is a strategic game and both players can make a strategic decision, the nighttime self can create a first mover advantage by setting an alarm clock. The process of nighttime self-setting an alarm clock is intended as a commitment to wake up.[53] The next logical question is, will the alarm clock commitment work? Alarms clocks are equipped with snooze buttons and morning self can capitalize on hitting the snooze button repeatedly.[54] Nighttime self needs to ensure that his/her commitment is "credible". For example, nighttime self can move the alarm clock across the bedroom so when the alarm goes off, morning self has to get up and walk across the room. Forcing morning self to get out of bed makes nighttime self's commitment more credible.

This example is a nice illustration of the two aspects of commitments and credibility: what and how.[55] The "what" is the game-theoretic aspect - seizing the first mover advantage or second mover advantage. The "how" part is the practical aspect or the art - thinking of devices for making strategic moves credible in a specific situation. In the context of this thesis, the faculty and administration will now have devices, like threats and promises, which try to make their moves credible, so each player is inclined to trust their decisions. For example, if the administration wants to eliminate an academic program, they need to make a credible commitment to the faculty in the form of a

[53] Dixit and Nalebuff 178
[54] Dixit and Nalebuff 178
[55] Dixit and Nalebuff 178

promise or threat, so the faculty agrees with them. Since promises and threats change the playoffs for the players involved, the faculty or the administration will be more inclined to agree with a decision that is adverse to their interests.

d. Explanation of Threats and Promises

Threats and promises are complex conditional moves. Threats and promises require the players to fix a *response rule* in advance. This means that a player has to state how they would respond to the other player's move. A *threat* is defined as a response rule that punishes others who fail to act, as you would like them to. A *promise* is an offer to reward other players who act as you would like them to. For example, the faculty can promise the administration to advise more students, which rewards the administration in having to hire less faculty. Mathematically, threats are different from promises. Promises cost the promisor and reward the promisee, reflected by a decrease in the promisor's payoff and an increase in the promissee's payoff. Threats cost the player who threatens, by decreasing their payoff, but does not change the payoff of the player who is being threatened. The cost of threats and promises are illustrated by a change the players payoffs.

e. Explanation of Credibility

Threats and promises will not change players' outcomes if they are not credible. What does it mean for a commitment, promise or threat to be credible? Dixit and Nalebuff (2008) have proposed the "Eightfold Path to Credibility," which outlines eight principles to making threats and promises credible. Dixit and Nalebuff write, "in most

situations, mere verbal promises should not be trusted."[56] For example, if the administration promises the faculty to increase their pay, the faculty may not accept the verbal agreement of the administration.

17th century philosopher Thomas Hobbes talked about the concept of credibility: "The bonds of words are too weak to bridle men's avarice."[57] Dixit and Nalebuff say that these words must be backed up by "appropriate strategic actions if they are to have an effect on the other players' beliefs and actions."[58] One of the main assumptions for my thesis is that the administration's and faculty's objectives are not aligned during academic program elimination and, therefore, either the faculty or the administration cannot solely trust their words -- there needs to credibility to the player's actions.

The administration's and faculty's interests are not aligned, and so there needs to be credibility behind the promise or threat for either player to alter their original decision. When interests are not aligned between players, they are factions. To define what a faction is, I turn to Federalist Number 10, where James Madison wrote, "By a faction I understand a number of citizens, whether amounting to a majority or minority of the whole, *who are united and actuated by some common impulse of passion, or of interest, adverse to the rights of other citizens, or to the permanent and aggregate interests of the community.*"[59] For example, the administration makes their decision primarily through the lens of the university's financial sustainability. Relationships with other

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[56] Dixit and Nalebuff 203
[57] Dixit and Nalebuff 203
[58] Dixit and Nalebuff 203
[59] Madison, James. "Republican Government: James Madison, Federalist, No. 10, 56--65." N.p., 22 Nov. 1787. 1

administrators and faculty are relevant but presumed secondary. The faculty makes their decision primarily through the lens of whether or not the program is central to the university's liberal arts mission. Relationships with other faculty and administrators are relevant but presumed secondary. According to Madison, there are two methods of "curing the mischief of factions."[60] First, remove the faction's causes and second, control the faction's effects. Assurances attempt to control the faction's effects, so if the faculty are adverse to eliminating an academic program, the administration may issue a promise to alter the faculty's payoffs which would incline them to eliminate an academic program. Yet the faculty will only accept the administration's promise if it's credible. Removing the causes of the factions would be difficult because of tenure employment, academic freedom, and the history and culture of institutions.

Using Dixit and Nalebuff's eight principles to making threats or promises credible, I give an example that is relevant to this thesis, because in most situations verbal promises are not trusted.[61]

The first category of principles alters the payoffs of the game to entice players to align interests on a specific matter. This category turns a threat into a warning and a promise into a commitment. The purpose of these principles is to make it more costly to the players involved to break the threat or promise than keep it.

1. Write contracts to back up your resolve.
2. Establish and use a reputation.

[60] Madison 1
[61] Dixit and Nalebuff 203

The second category of principles is used to change the outcome of the game by limiting the player's ability to back out of a commitment. There are three possibilities for this category:

3. Cut off communication.

4. Burn bridges behind you.

5. Leave the outcome beyond your control, or even to chance.

The third category of principles attempts to break down large commitments into smaller ones, because if a large commitment is broken down into smaller ones, the gain from breaking a small commitment may be offset by the loss of the remaining contract.[62]

6. Move in small steps.

Lastly, the fourth category of principles help players maintain the credibility of their commitment through teamwork. These two principles show that teamwork is a way to increase credibility, much more easily than working alone. The two possibilities are:

7. Develop credibility through teamwork

8. Employ mandated agents.

The next section of this chapter explains all eight principles for establishing credibility in player's strategic moves in the context of this thesis. It is important to note that these principles are not discrete.

f. Contracts

A straightforward way of making a commitment credible is using a contract. For example, faculty members at liberal arts institutions have contracts that may include

[62] Dixit and Nalebuff 204

tenure. The American Association of American Professors (AAUP) states that tenure employment begins after a "successful completion of a period of probationary service" where once granted tenure, faculty could be dismissed only for adequate cause or other possible circumstances and only after a hearing before a faculty committee.[63] Tenure employment provides the faculty with a credible commitment because the administration cannot terminate tenured faculty members unless there is "adequate cause."[64] AAUP defines two instances when a institutions can claim adequate cause: i) financial exigency, which is a "severe financial crisis that fundamentally compromises the academic integrity of the institution as a whole and that cannot be alleviated by less drastic means" and ii) the discontinuance of program or department for educational reasons, which is when the institutions stops offering a program, thus the tenured faculty of the department can no longer teach their subject.[65] Tenure employment makes the faculty's assurances credible because they are protected from being fired for not agreeing with the administration. Thus, when the administration initiates an academic program review, the faculty do not have to fear challenging the administration because their employment is guaranteed for life.

To make a contract credible, the contract needs to specify a third party enforcer that does not have any personal interest in whether or not the contract is upheld. In the

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[63] For the entire breakdown of tenure employment, please refer to: http://www.aaup.org/file/RIR%202014.pdf "Recommended Institutional Regulations on Academic Freedom and Tenure." *Recommended Institutional Regulations on Academic Freedom and Tenure*. American Association of University Professors, n.d. 80-83

[64] AAUP 80-83

[65] AAUP 80-83

case of tenure employment, the court is the unbiased third party enforcer. For example, if the administration fires a faculty member and the faculty members believes the firing was unjust, the fired faculty can sue, at which point the institution would have to face the faculty member in court. Judges and juries do not stand to gain anything directly whether one side or the other wins a civil case arising from a contract dispute.[66] The next principle is very important to liberal arts institutions because of their size, where departments and programs are directly ties to faculty members.

g. Reputation and Trust

Reputation is something that takes a while to build, but can very easily and swiftly be destroyed. Elinor Olmstrom is a leader in concept of trust and reciprocity, specifically the impact of reputation and trust in social dilemmas. Olmstrom states, "the more benefits they (a player) have received in the past from other reciprocators (other players), the higher their own initial inclinations will be."[67] In the context of this thesis, the faculty will be more inclined to trust the administration if their past actions have benefited the faculty and vice versa. Conversely, Olmstrom concludes that if a player has faced previous retribution, they will be less likely to trust the other player's reputation.[68]

To understand how a player reacts to another player in a repeated game, you first need to understand that there are links between "the trust that an individual has in others, the investment others make in trustworthy reputations, and the probability of using

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[66] Dixit and Nalebuff 208
[67] Ostrom, Elinor, and James Walker. *Trust and Reciprocity: Interdisciplinary Lessons from Experimental Research*. New York: Russell Sage Foundation, 2003. 49
[68] Ostrom and Walker 49

reciprocity norms."[69] Olmstrom defines reciprocity norms as the ability to respond to positive actions with positive actions and the ability to respond to negative actions with negative actions.[70] In other words, to understand how the faculty or administration might respond to a scenario, you first need to understand if the players trust the others based on their reputation and the probability each player will respond using reciprocity norms. When the faculty and administration use reciprocity norms, there is an incentive to establish and build a reputation performing actions that have a short term cost, but a long-term benefit. Olmstrom explains the concept of short term cost for long term gain as if "trustworthy individuals who trust others with a reputation for being trustworthy can engage in mutually productive social exchanges, even though they may be dilemmas, so long as they can limit their interactions primarily to those others with a reputation for keeping promises."[71]

For example, if both the administration and the faculty have trustworthy reputations, the dilemma of eliminating programs from the curriculum can be turned into a productive social exchange because both the faculty and the administration can *trust* each other's commitments. Social exchanges become productive because trust lowers the cost of commitments through small investments over time. If the faculty and administration have a history of upholding their promises to each other, making decisions adverse to each player's interests becomes a productive social exchange because there is trust.

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[69] Ostrom and Walker 50
[70] Ostrom and Walker 43
[71] Ostrom and Walker 43

Dixit and Nalebuff say that in a once-in-a-lifetime scenario, reputation is most likely not important and has little value for proving commitment.[72] But at universities, the interactions between faculty and the administration are not once-in-a-lifetime scenarios, but interactions that build upon years of history and politics. Just because this thesis is examining one game between the faculty and administration does not mean the administration and the faculty will not draw from the history of previous games, including prior commitments. This means that the administration and the faculty will remember players' past actions and will be more or less likely to trust the credibility of the assurances, if assurances have been dishonored in the past.[73]

To establish or reestablish a reputation, sometimes a public declaration of your commitment works because the player is putting their reputation on the line, for the public to see. For example, if the administration publicly announces their intentions to eliminate programs that are in low demand from students, this commitment becomes costly to renege on because it was publicly announced. For the faculty, an example of a public statement is a resolution passed at a faculty meeting, but the faculty do not hold the resolution, and the faculty loses credibility. If a player reneges on public declaration, the reputation of that player can suffer irreparable damage. For example, in 1998, George H.W. Bush publicly declared: "Read my lips: no new taxes."[74] One year later, the

[72] Dixit and Nalebuff 211
[73] Dixit and Nalebuff 211
[74] Dixit and Nalebuff 212

circumstances of the economy led him to raise taxes, and his breaking this commitment was one of the major reasons he lost the election in 1992.[75]

h. Cutting off communication

Cutting off communication is a successful tactic at making commitments credible because it makes actions truly irreversible. An extreme example of cutting of communication is when a person dies and leaves a last will and testament. Since the person who left the will is deceased, renegotiating the will is virtually impossible.[76] In the context of this thesis, cutting of communication can make commitments credible because if a newly appointed president sends out an email to the faculty saying that he/she is not interested in meeting with the faculty, the president cannot take back the email. More specifically, once the email has been sent from the president, whatever was said in the email cannot be reversed. The newly appointed president has signaled that they are not interested in what the faculty have to say. The downfall of cutting off communication in is that as soon as the president wants to meet with the faculty, the faculty may refuse to show up. The faculty commitment is now credible because the faculty cannot take back the fact they did not show up to the president's meeting. Cutting off communication segues nicely into the next principle.

i. Burning Bridges Behind You

Burning bridges is a successful method of establishing credibility because when a player "burns a bridge" it is an unconditional commitment. William the Conqueror invaded England in 1066 and when he arrived, he burnt all of his ships, thus making an

[75] Dixit and Nalebuff 212
[76] Dixit and Nalebuff 212

unconditional commitment to fight rather than retreat.[77] In the context of this thesis, imagine if the faculty pass a vote of no confidence in the president of an institution. The faculty have signaled that they are unhappy with the work of the president and now the trustees have to decide what decision to make: either back the president or the faculty. A vote of no confidence from the faculty establishes credibility because it backs the trustees of the university into a corner, where the trustees have to honor, or not honor, the faculty's vote of no confidence.

j. Leaving the Outcome to Chance

Leaving the outcome to chance makes threats credible because any one party or person does not persuade the outcome of the decision. An extreme example of leaving the outcome to chance is Russian roulette. One player loads a single bullet into a 6-chamber revolver, the chamber is spun, and the trigger is pulled. The shooter no longer controls the outcome because they are unsure of which chamber is loaded. [78] The shooter is leaving the outcome to chance. An example relevant to this thesis is an institutional-wide review, which puts everything from which soda vendor is used to whether or not the institution should have a classics program, and the outcome to an agreed upon process. This means that if the review calls for the elimination of a senior level cabinet member or an academic program, the decision is not questioned, and the senior level cabinet member steps down and the academic program is eliminated. The possible flaw in leaving the outcome to chance is that if the credibility of these recommendations is not upheld, and

[77] Dixit and Nalebuff 215
[78] Dixit and Nalebuff 218

due to relationships with faculty and the administration, the senior level cabinet member did not have to step down and the academic program was not eliminated.

k. Move in small steps

Since the administration and the faculty have adverse interests, making an agreement in a one-shot, simultaneous setting is unlikely. The problem of commitment can be reduced if the game is broken into a smaller scale. This is why my thesis breaks down the sequential game with assurances into three rounds of play. These rounds of play breakdown the problem of financial unviability into smaller, more manageable steps. Another reason why moving in small steps is advantageous is it allows the administration to build credibility in their assurances. In the context of this thesis, smaller steps from the administration signal willingness for teamwork and participation in shared governance. This leads me to my next point: developing credibility through teamwork.

l. Teamwork

Shared governance implies that decisions involving the input of the faculty and the administration, like the elimination of academic programs, need both parties to work together to find a solution. Teamwork can help the players achieve credible promises and commitments.[79] Teamwork can "employ strong-arm tactics" to force players to keep true to their promises.[80] Consider the dilemma of the front-line of the Roman army advancing against the enemy: if one solider falls back, that soldier increases his chances of survival, while decreasing the success of the attack.[81] This is why Rome made falling back a

[79] Dixit and Nalebuff 219
[80] Dixit and Nalebuff 219
[81] Dixit and Nalebuff 220

capital offense and asked other soldiers to kill any fellow soldier that falls back. If you did not kill a soldier who was falling back, it was also considered a capital offense. The credibility of the threat from the Roman Empire was clear to the front line soldiers. If the administration and the faculty work together to align interests on eliminating or not eliminating an academic program, but either the faculty or administration do not hold true to their promise or threat, there is irreparable damage to the player that reneges. But, if the faculty and the administration work together, this reduces the chance of one player reneging on their promise. Since liberal arts institutions are built on a history of interactions between the faculty and the administration, credibility is key. Just like in the example of the front line Roman soldiers, if there is not any credibility behind the directives from the Empire, the soldiers would have an incentive to fall back. If the administration or the faculty "fall back" on their commitment, the damage to their credibility makes it difficult to participate in shared governance. Teamwork relates back to credibility and trust, each building off of the other. Since decisions in higher education do not occur in a one-shot setting, credibility, teamwork, and trust are essential.

m. Mandated Negotiating Agents

Mandated negotiating agents are successful at making commitments credible because a situation can be improved when someone else is negotiating for you. For example, take a union leader. When the union leader negotiates on behalf of the workers, their position is more rigid, relative to the workers' position if they were negotiating. The union leader is forced to keep his promise, or they may lose support from the supporting

workers.[82] In the context of this thesis, bond-rating agencies, like Moody's and accrediting agencies, like Middle States, can point out deficiencies that the institution would have to act on immediately. In the case of Moody's bond rating agency, they could downgrade the institutions bond rating to junk due to the financial unviability, rendering the institution paralyzed to borrowing new monies to offset cost. Middle States accrediting agency could identify academic programs that do not meet their standards, harming the institution's reputation. Another example of a mandated agent is the external reviews departments complete to benchmark themselves against similar programs: if the conclusion of these external reviews is to invest in certain programs the administration wanted to divest in, the landscape of the conversation between the faculty and the administration is altered because the request is coming from an external source.

The eight principles of credibility illustrate how important the role of credibility and trust is when players with adverse interests are making decisions. The next section of this chapter applies assurances to the previous chapters' sequential game to illustrate a more realistic game between the faculty and the administration.

n. Sequential Game with Assurances and Warnings

a. Explanation of Tree and Payoffs

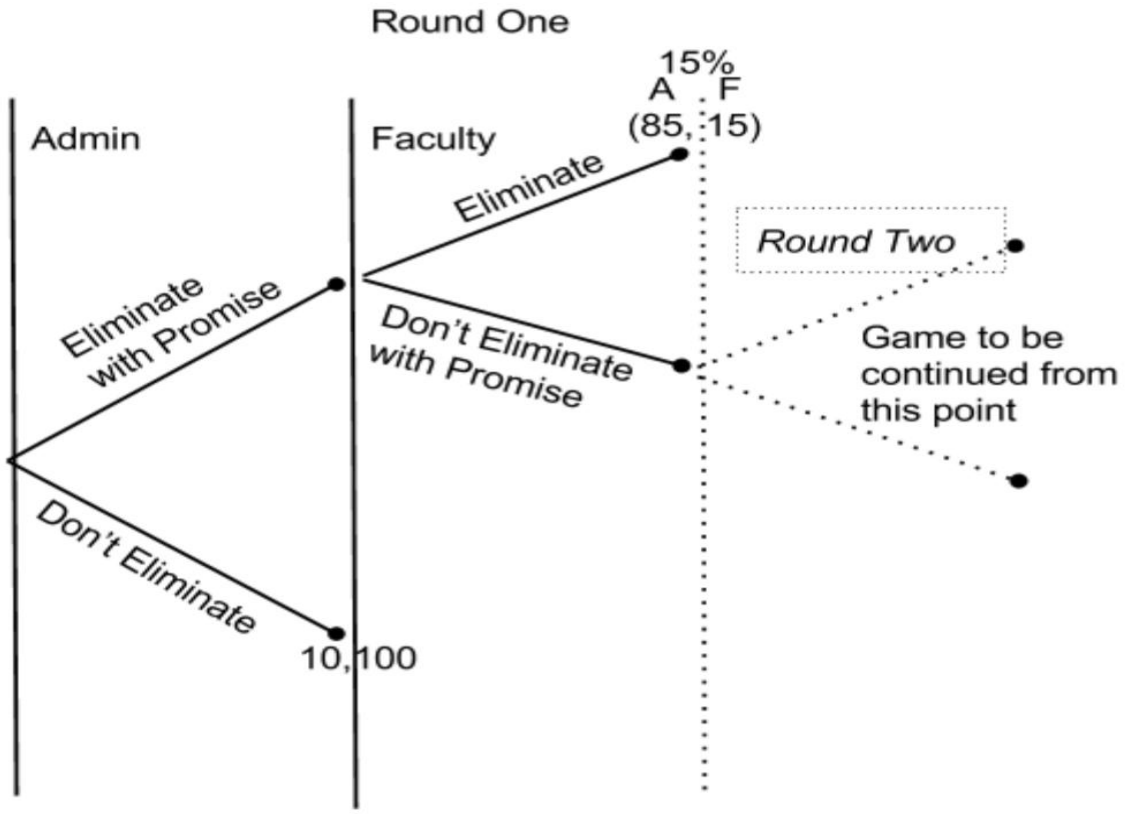
The sequential game with assurances is illustrated through a *game tree*, just like the previous chapter. The magnitude of the payoffs explains the outcome for choosing e*liminate* or *do not eliminate*. Without the loss of generality, all payoffs for this game are positive and 10 is the lowest possible payoff. This way, when explaining the changes in

[82] Dixit and Nalebuff 221

magnitude, I can avoid statements like “less negative” or “more negative.” Having positive payoffs is simply a stylistic choice for ease of explanation. At the start of this game, the faculty and the administration start at a (0,0) payoff. It is important to state that the payoff associated with each outcome for this sequential game is illustrative and not absolute.

b. **Round One of Play**

Figure Eighteen



c. **Explanation of Round One**

Round one is initiated by the administration. As shown above, the administration has two decisions: *eliminate with an assurance* or *do not eliminate*. If the administration

chooses to *not eliminate* an academic program, the game ends because it is assumed the faculty will not contest their decision. If the administration chooses to eliminate, as you can see the graphical representation, the administration also provides an assurance to the faculty. For the first round of play, the administration's assurance is a promise, which is costly to the administration and rewards the faculty, as reflected in the change of each player's payoffs above. The administration promise is to use the savings from the elimination of certain academic programs to increase pay bands for the faculty. If the administration choose *eliminate with an assurance* and the faculty choose eliminate, the game would end because the faculty would accept an increase in pay to align their interests with the administration.

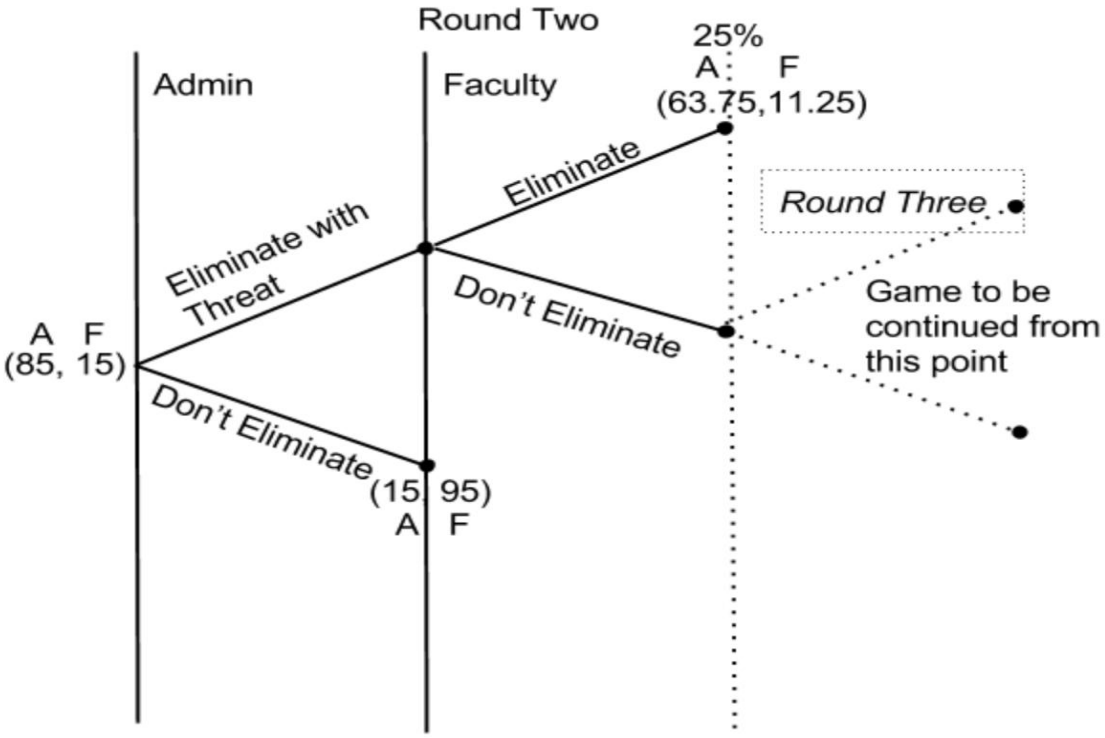
Increasing the pay bands of the faculty is a way to incentivize the faculty to eliminate an academic program, which is assumed to be adverse to the faculty's interests. Since this is a promise, it is a costly assurance to the administration, but rewards the faculty for aligning interests with the administration. This is depicted by the payoffs in the game tree. After the round of play where the faculty agrees to eliminate the program, the assurance was costly to the administration, which is why after the faculty agrees to eliminate an academic program; the payoffs are 85 for the administration and 15 for the faculty. This reflects the cost of the assurance to the administration and the reward to the faculty.

If the faculty decided to choose *do not eliminate with an assurance*, the game continues and the faculty decided to respond with a promise to the administration. The faculty chose to *do not eliminate with an* assurance because the faculty did not believe

the administration's promise was credible and the change in the pay-off was not big enough. Since the faculty is aware that the prime goal of the administrations is financial solvency, the faculty promises to increase their course load from 3:2 to 3:3. The faculty acknowledges the need to save money but they think teaching one extra course a year is a far better compromise than eliminating academic programs from the curriculum. This is why the faculty choose *do not eliminate with an assurance*, the faculty think increasing their course load is better than eliminating academic programs. The faculty chose to *not eliminate with an assurance* because they felt that their payoff for choosing *eliminate* was not worth the costs. The second round of play is triggered for two reasons. First, the faculty may not believe the administration will increase the pay bands; therefore they do find the assurance to be credible. Second, the faculty thinks the assurances are credible, but they do not think the administration's assurance is costly enough.

d. **Round Two**

Figure Nineteen



e. **Explanation of Round Two**

The second round of play is triggered when the faculty chooses to *not eliminate with an assurance* causing a disagreement. In this graphical representation, the administration now gets to respond to the faculty's choice of *do not eliminate* with an assurance. The administration has two choices: to agree with the faculty's decision and accept their assurance (chose *do not eliminate*), which would end the game, or if the administration does not think the faculty will actually increase their course load or increasing their course load is costly enough, the administration will choose *eliminate* and provide an assurance to the faculty.

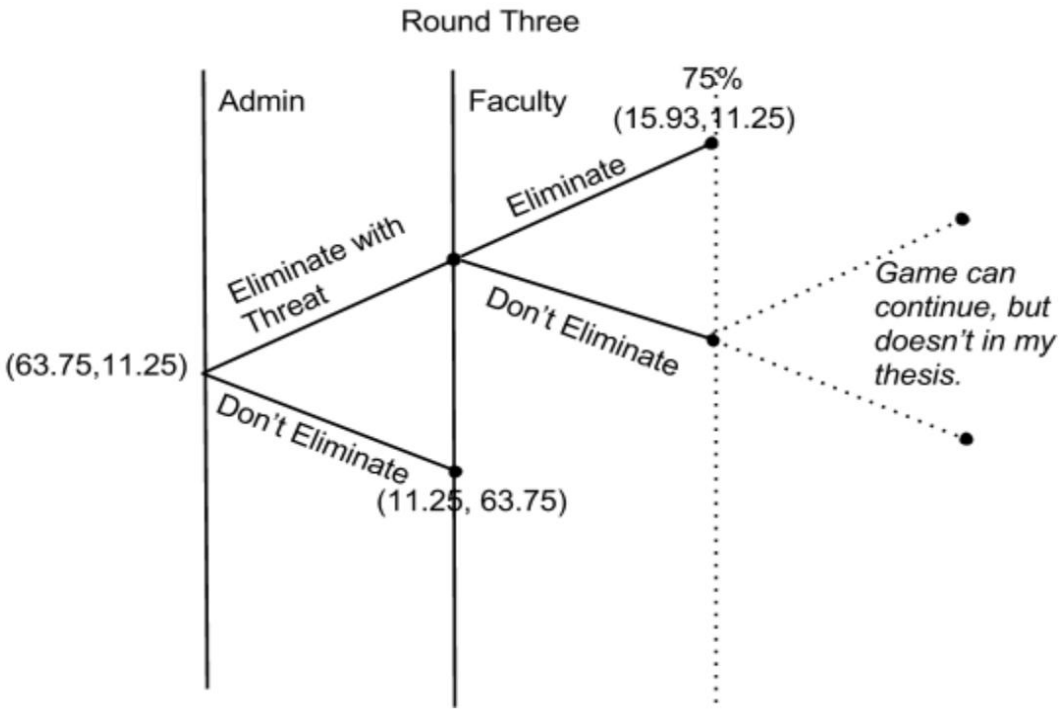
In this second round of play, the administration increases the stakes of the game. This is denoted by the cost of the assurances increasing from 15% to 25%. In the second round of play, the administration chooses to threaten the faculty. The administration's threat is to initiate a curriculum review and any programs that fall under X mark will be eliminated from the university's curriculum to help bring the university to a financially viable position. The starting payoff for round two is 85 for the administration and 15 for the faculty. Since this is a sequential game, I am starting with the ending payoff for the last round of play. In this game, the administration cannot recuperate the lost cost of the previous promise because the administration made a conditional move. The starting payoff for round two is the same as the ending payoff for round one. Thus, if the faculty accepts the threat and eliminates programs that fall under X mark in the program review, the cost of the threat is incurred by the administration which is why there are payoff changes from 85 to 63.75, 25 percent of their prior payoff. Since program reviews require time and teamwork, it *costs* the administration more relative to making a decision unilaterally. The administration is trying to illustrate how credible their commitments are by increasing the cost.

The faculty also has the decision to reject the administration threat for two reasons. First, the faculty can reject the administration threat because the reputation of the administration leads the faculty to think the administration will not follow through and actually eliminate the programs from the curriculum because of the contractual nature of employment that ensures position for tenured faculty. Second, the faculty can reject the

administration's threat because the ending payoffs do not make sense for the faculty to agree with the administration.

f. **Illustration of Round Three**

Figure Twenty



g. **Explanation of Round Three of Play**

Above is the graphical representation of the third and final round of play for my thesis. Just like before, this round of play is triggered when the administration and the faculty do not align interests. Specifically, this round of play was triggered because of the lack of credibility in the administration's threat to eliminate academic programs that fell below a certain standard as defined by the administration during the curriculum review. The faculty was so confident that the administration was going to hold to their

commitment that the faculty did not even offer an assurance, they simply chose *do not eliminate*. The past history of the administration's actions led the faculty to not believe the administration's threat was credible.

Since it is a new round of play, the administration has the opportunity to respond to the faculty's decision of do not eliminate. Just like the second round of the play, the administration increases the costs of the assurances. In this round of play, the costs of the assurances are now 75% from the starting payoff of 63.75 for the administration and 11.25 for the faculty. To show the faculty the credibility of the next threat, the administration chooses to threaten financial exigency, which is very costly threat to the administration. The American Association of American Professors (AAUP) defines financial exigency as "an imminent financial crisis, which threatens the survival of the institution as a whole."[83] This means that the administration believes that if they do not reach an agreement to eliminate the certain academic offerings, the administration will have to declare financial exigency and forcefully eliminate these programs and accompanying tenured faculty. The administration believes there is no other way to bring the university back to a financially viable position.

The faculty is now able to respond to the administration's threat of financial exigency. As you can see, the payoffs associated with the faculty agreeing with the administration in agreeing in eliminating the academic programs are: 15.93 for the administration and 11.25 for the faculty. Relatively speaking, out of the three rounds of

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[83] "Financial Exigency, Academic Governance, and Related Matters." *Financial Exigency, Academic Governance, and Related Matters*. American Association of University Professors, n.d. 1

play, this round the playing field is practically level. This shows how *costly* the threat of financial exigency is to the administration. Since the payoffs for the faculty agreeing to eliminate the academic offerings are close to the administrations, the faculty is inclined to agree with the administration because it avoids financial exigency, which has the ability to destroy the fabric of the institution. The faculty is resistant to eliminating academic programs, but not so much so as, to destroy the foundation of the institution.

h. **Conclusion**

The sequential game with assurances paints a depressing view of decision-making in liberal arts institutions. In this game, the administration had to threaten financial exigency for the faculty to agree with them. According to the neoclassical economic paradigm, individuals will act rationally and seek to maximize his/her utility, and in this case, payoffs.[84] If the neoclassical paradigm were true, this assurance game would have stopped after round one because the administration promised to the faculty a salary increase, which is something the faculty did not have before. The faculty would have agreed with the administration because of the promise to increase pay, which increased the faculty's payoff. As illustrated above in round one, the faculty did not agree with the administration. In fact, the faculty did not agree with administration until the third round of play when the administration's payoff was 15.93 and the faculty's payoff was 11.25. The faculty agreed because they felt a payoff of (15.93,11.25) is a level playing field, whereas in the first two rounds of play the administration's payoff was too high relative

[84] Please refer to: http://www.investopedia.com/terms/n/neoclassical.asp for more on the neoclassical economic paradigm. "Neoclassical Economics Definition Investopedia." *Investopedia*. N.p., 17 May 2006.

to the faculty's payoff. The faculty were looking for a fair playing field where there was similar punishment to the administration.

Using the ultimatum game from Chapter 4, the reality of this game is quite contrary to the neoclassical economic paradigm. According to Nowak, Page, and Sigmund (2000) the majority of proposers offer 40% to 50% of the total sum, and about half of all responders reject offers below 30% of the total sum.[85] How does this relate to this thesis? In the sequential game with assurances, the game continues after round one, after the faculty get more than what they currently have (increase in salary), speaks to the possibility of fairness being involved in the decision criteria. The irrational human emphasis on a "fair division" suggests that players have preferences, which do not depend solely on payoffs.[86] In the ultimatum game, the responders are willing to punish proposers by rejecting their offer if the proposer offers a small share of the total sum of money. The same logic applies to the assurance game illustrated in this chapter. The faculty rejects offers where the administration receives more benefit relative to the faculty, even though the faculty may receive a benefit they did not have before.

How did these new preferences come into play? One possible solution to this question is that humans are accustomed to repeated interactions. When Nowak, Page, and Sigmund (2000) repeated the ultimatum game, they concluded it has the same effect of price haggling where the fair splits are more likely to occur.[87] Nowak, Page, and Sigmund (2000) also introduced the possibility that players can obtain information about

[85] Nowak, Page, and Sigmund 1773
[86] Nowak, Page, and Sigmund 1773
[87] Nowak, Page, and Sigmund 1773

previous encounters. This now means that players need to be cognizant of their reputation: if the player accepts low offers, this may become their reputation and the next proposer may think again before offering a high offer. As soon as the player's past reputations were introduced into the game, the fairness strategy prevailed. [88] This means that when there is past history and players need to make a decision; the players are more likely to seek a fair outcome.

My sequential game with assurances mimics a very similar conclusion as the ultimatum game. Without trust and credibility, the faculty are more likely to continue the game because of the concept of fairness. Even though the administration provides a salary increase in the first round, the faculty do not believe that the round one ending payoffs of (95,15) in administration, faculty order, levels the playing field, like financially exigency does in round three where the payoffs are (15.93,11.25).

[88] Nowak, Page, and Sigmund 1773

VI. Conclusion

The purpose of this thesis was to use game theory to help understand the dynamic between the faculty and staff at a small, private liberal arts institution. Chapter one and two discuss the economic environment of higher education and the role of shared governance at small institutions. Since writing these chapters, Sweet Briar College's Board of Trustees announced that it is closing its doors in the fall. An article in *Inside HigherEd,* shed light on the economic situation of higher education, where Scott Jashnick wrote,

> The news stunned many in higher education, who assumed that a college like Sweet Briar wouldn't go under. And the announcement set off debates on whether the Sweet Briar board was courageous -- or too quick to give up. Some experts predicted that the demise of Sweet Briar might prompt other boards to take a tougher assessment of their institutions' own vulnerabilities.

Sweet Briar's announcement raises the stakes on a new era of decision making for private liberal arts universities. This thesis considered whether or not to close an academic program, now some schools are deciding whether or not to close the institution.

In Chapter four, five and six, I used game theory to illustrate the interactions between the faculty and administration undergoing a curriculum review. Applying game theory has produced a foundation to understand how important the role of trust and credibility is between the administration and faculty. Ostrom defines trust as an "intention to accept vulnerability based upon positive expectations of the intentions of the behavior of another."[89] If the faculty and the administration do not trust each other, the end result is drastic measures taken from both parties. For example, the administration

[89] Ostrom 6

may declare financial exigency or the faculty may conduct a vote of no confidence in the institution's president. In other words, without trust and credible communication there are less desirable outcomes.

In Chapter four, the simultaneous game illustrated where each player needs to be in order to get the desired result. The first contribution of this thesis appeared in chapter four as well. The visual representation of the payoff matrix provides a visual to the reader where the slope determines what the player will choose. The simultaneous chapter also introduced the role of variance as a possible decision criterion. In chapter five, the sequential game showed the advantages of the first mover benefit for both the faculty and administration. This chapter also relaxed the assumptions to illustrate a scenario where one player moves before another, whereas the simultaneous chapter both players moved at the same time. Lastly, in chapter six, the decision criterion of fairness was introduced, and illustrated by a repeated game where the faculty did not alter its decision until the payoffs were similar relative to the administration.

In light of this thesis and my experience, this thesis has given me insights to the Drew2017 process. The biggest insight to the Drew2017 process is that the faculty did not perceive the academic program review as fair because the administration was not affected by the elimination of academic programs. In other words, the payoff for the faculty was far greater than the payoff for the administration, in terms of eliminating academic programs. The next insight to the Drew2017 process from my research is that I viewed this process as an objective exercise, where I had to rank the academic programs into four different categories, where any compromise would be accepted, in order to

make Drew a financially viable institution. In reality, the faculty would not accept just any compromise because they may not perceive all compromises as "fair," since eliminating or restructuring academic programs had little effect on the administration.

After completing this thesis, I now understand that since the administration had less to lose than the faculty, the compromises needed to be better, where it would cost the administration more and cost the faculty less. The main reason the faculty did not view Drew2017 as a fair process is because the committee ranked every academic program into four categories (invest, maintain, restructure, divest), but the committee did not rank the administrative units (offices reporting to the cabinet) into the four categories. By not making the process parallel for the administration and the faculty, the committee eroded the fairness of the process, which in turn eroded the credibility of the Drew2017 process.

Now understanding the role of trust and credibility between players, I would now view the faculty's actions during Drew2017 through a different lens with a better understanding of their decisions. During the Drew2017 process, I constantly undervalued their payoffs, so I was less understanding of their conflicts and decisions during the process. At the inception of Drew2017, it was a "right-sizing" exercise, to make Drew leave inside it's means as well as identify programs that were strong and program that were not strong. The charge of the committee voted on by the Board of Trustees (BoTs) was perceived as a first strong move. Drew was financially unviable, the committee needed to figure out what Drew did well and what Drew did not do well. However, I saw first hand, the direct impact of personality and personnel politics change the objective of the exercise. Specifically, the work of the committee changed from a blueprint of action

with strong backing from the Interim President of BoTs, to a mere suggestion to the incoming President who's opinions and interests were unknown.

The change in mission meant the final report of the committee was no longer public. By making the report private, the payoffs changed, the stakes of the committee lowered, and the creditability of the Drew2017 process dissolved. In terms of this thesis, there were no overlapping positive payoffs that would warrant an agreement between the faculty and administration.

VII. Future Research

One of the contributions to the field of game theory is the visual representation in Chapter four. Future research would be to publicize the visual representation to find a venue to share the visual representation with others. The next steps for this thesis would be to start developing a model of how to build trust and credibility at an institution that uses shared governance. When the players do not have the history of keeping promises, or trust, aligning interests between players do not end with the desired result; it ends with the nuclear option.

I want to apply my research to Ostom's (2010) eight design principals:

1. Define clear group boundaries.
2. Match rules governing use of common goods to local needs and conditions.
3. Ensure that those affected by the rules can participate in modifying the rules.
4. Make sure the rule-making rights of community members are respected by outside authorities.
5. Develop a system, carried out by community members, for monitoring members' behavior.
6. Use graduated sanctions for rule violators.
7. Provide accessible, low-cost means for dispute resolution.
8. Build responsibility for governing the common resource in nested tiers from the lowest level up to the entire interconnected system.

To establish trust and credibility, using the above guidelines, is one way to address the relationship between the faculty and the administration at a liberal arts institutions. Using Ostrom's guidelines is a way to clearly define the process and players involved in shared governance as well as provide an incentive structure to fully participate and build trust and credibility between players. If there is trust between the administration and faculty, the nuclear option is not the outcome, and the game illustrated in chapter six could have stopped after the first or second round, instead of ending when the administration threatened financial exigency.

Ostrom (2010, page 434) wrote, "We need to ask how diverse polycentric institutions help or hinder the innovativeness, learning, adapting, trustworthiness, levels of cooperation of participants, and the achievement of more effective, equitable, and sustainable outcomes at multiple scales." Using the framework Ostrom has developed for trust and credibility, but adapting her research through the lens of shared governance at institutions of higher learning, is the next step for this research. Ostrom (2010, page 642) wrote, "A core effort is developing a more general theory of individual choice that recognizes the central role of trust in coping with social dilemmas…One size fits all policies are not effective." In order for the faculty and the administration to agree on a decision when interests are not aligned, there needs to be trust between the players. In order for the faculty and administration to agree on a decision, there need to be a fair division of costs to both players, as shown by the Ultimatum game. As noted in Chapter six, players will not take a small share of the total sum of money, and in this instance, the faculty did not take the promise of increased salary because the faculty felt the

administration did not have as much to lose relative to the faculty. The faculty waited until the playing field was practically level (payoffs were similar (15.93,11.25) in administration, faculty order), to agree with the administration. So, how is trust and credibility built at a private, liberal arts institutions? Ostrom (2010) provides eight guidelines to manage in a polycentric governance structure, like, shared governance processes at liberal arts institutions. Below are the eight guidelines:

Appendix A

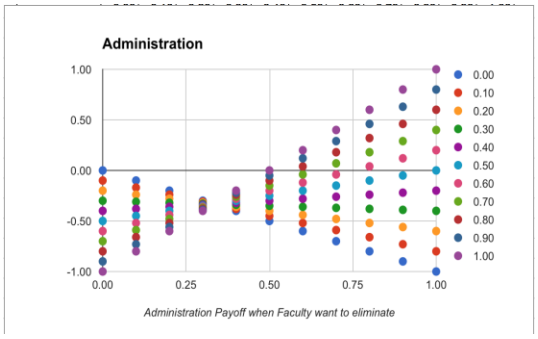
- Here is a game where the faculty would only chose eliminate, a game that is not interesting to my research.

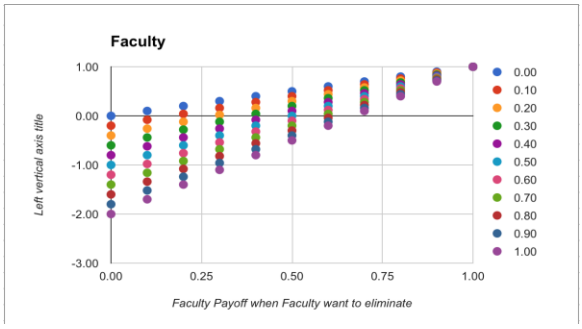
Administration:

	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
0.00	0.00	-0.10	-0.20	-0.30	-0.40	-0.50	-0.60	-0.70	-0.80	-0.90	-1.00
0.10	-0.10	-0.17	-0.24	-0.31	-0.38	-0.45	-0.52	-0.59	-0.66	-0.73	-0.80
0.20	-0.20	-0.24	-0.28	-0.32	-0.36	-0.40	-0.44	-0.48	-0.52	-0.56	-0.60
0.30	-0.30	-0.31	-0.32	-0.33	-0.34	-0.35	-0.36	-0.37	-0.38	-0.39	-0.40
0.40	-0.40	-0.38	-0.36	-0.34	-0.32	-0.30	-0.28	-0.26	-0.24	-0.22	-0.20
0.50	-0.50	-0.45	-0.40	-0.35	-0.30	-0.25	-0.20	-0.15	-0.10	-0.05	0.00
0.60	-0.60	-0.52	-0.44	-0.36	-0.28	-0.20	-0.12	-0.04	0.04	0.12	0.20
0.70	-0.70	-0.59	-0.48	-0.37	-0.26	-0.15	-0.04	0.07	0.18	0.29	0.40
0.80	-0.80	-0.66	-0.52	-0.38	-0.24	-0.10	0.04	0.18	0.32	0.46	0.60
0.90	-0.90	-0.73	-0.56	-0.39	-0.22	-0.05	0.12	0.29	0.46	0.63	0.80
1.00	-1.00	-0.80	-0.60	-0.40	-0.20	0.00	0.20	0.40	0.60	0.80	1.00

Faculty:

	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
0.00	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
0.10	-0.20	-0.08	0.04	0.16	0.28	0.40	0.52	0.64	0.76	0.88	1.00
0.20	-0.40	-0.26	-0.12	0.02	0.16	0.30	0.44	0.58	0.72	0.86	1.00
0.30	-0.60	-0.44	-0.28	-0.12	0.04	0.20	0.36	0.52	0.68	0.84	1.00
0.40	-0.80	-0.62	-0.44	-0.26	-0.08	0.10	0.28	0.46	0.64	0.82	1.00
0.50	-1.00	-0.80	-0.60	-0.40	-0.20	0.00	0.20	0.40	0.60	0.80	1.00
0.60	-1.20	-0.98	-0.76	-0.54	-0.32	-0.10	0.12	0.34	0.56	0.78	1.00
0.70	-1.40	-1.16	-0.92	-0.68	-0.44	-0.20	0.04	0.28	0.52	0.76	1.00
0.80	-1.60	-1.34	-1.08	-0.82	-0.56	-0.30	-0.04	0.22	0.48	0.74	1.00
0.90	-1.80	-1.52	-1.24	-0.96	-0.68	-0.40	-0.12	0.16	0.44	0.72	1.00
1.00	-2.00	-1.70	-1.40	-1.10	-0.80	-0.50	-0.20	0.10	0.40	0.70	1.00





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