Measuring entrepreneurship in the academic heartland

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MEASURING ENTREPRENEURSHIP IN THE ACADEMIC HEARTLAND

by

Jonathan S. Gagliardi

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Measuring Entrepreneurship In the Academic Heartland

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Jonathan S. Gagliardi

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ABSTRACT

As a result of turbulent conditions, institutions are changing the way they operate. Research that illustrates the growing importance of activities on the edges of institutions is an important part of portraying entrepreneurship accurately; the growth of areas like intellectual property, applied research, fundraising, and increased university partnerships with public and private sectors are vital to the sustainability of postsecondary institutions. However, these activities alone are only part of what Clark (1998) has described as the *Entrepreneurial University*. To holistically portray organizational transformations, the core of the academy—academic disciplines, teaching, and educating—must be examined for patterns of adaptation and change (Mars & Aguilar, 2010; Clark, 1998; Becher & Trowler, 2001). However, the diverse and ambiguous nature of higher education and entrepreneurship make measuring such a phenomenon challenging (Cohen & March, 1986). This makes defining entrepreneurship clearly and contextually difficult, and may partially explain the scarcity of measures that capture entrepreneurial activity within the core academic function; educating people (Mars & Aguilar, 2010).

This quantitative, longitudinal study analyzed how institutions may differentially engage in academic entrepreneurship between 2004-05 and 2008-09. Measurements based on the change in the number of unique degree and certificate fields conferred by an institution were created to represent entrepreneurship. These measures were developed based on the historic parallels between institutional change in academic units and disciplines, and evolving societal and economic demands (Thelin, 2004; Brint, 2005; Bok, 2003; Drucker, 1985). Following quantitative analysis, these measures were analyzed for patterns in fields of study.
This study concluded that schools with a balance of professional, and arts and sciences programs were most likely to demonstrate academic entrepreneurship. Research oriented institutions changed their degree and certificate conferrals more so than masters or baccalaureate colleges. Private, not-for-profit colleges and universities were more engaged in academic entrepreneurship than their public counterparts. Additionally, larger institutions demonstrate higher levels of entrepreneurship in the academic heartland than smaller ones.

Additional analysis revealed patterns in the types of programs being added and disbanded that mirror market demands (based on a comparison to occupational projections provided by the Bureau of Labor Statistics). Furthermore, these newly created measures of academic entrepreneurship provide insight into innovative activity outside of research and development.

Institutions of higher education are being asked to increase access, affordability, and quality, but they are also expected to do so with dwindling state and public subsidy, growing student price burdens, and slashes to critical programs. These harsh realities require that institutions evolve in many ways to meet the varied expectations and demands placed upon them. The goal of this study was to examine how institutions practice entrepreneurship as a response to this increasingly volatile environment.
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Martha, and Francesca, I’m so happy that we have all been through this together. Without you, I would not have finished. You have both inspired me to reach higher.
DEDICATION

How do you measure the impact of parents on their children? Econometricians might tell you food, shelter, clothing, and access to an education are reliable metrics; a teacher may emphasize reading at an early age. A child psychologist might delve into the nuances of positive feedback, and human interaction.

Allow me to offer that as tangible as these things may be, they can never truly account for the influence that dedicated parents have. Measuring things has its place, but some things will never be quantified, nor should they be.

I’m lucky enough to have parents who have entertained my endless curiosity, and guided me through my own successes and failures. They have taught me to stand strong on my convictions, work hard, love my family, and to always hold my desire to learn close to my heart. To this day, their hopes and dreams for me dwarf my own most unimaginable aspirations. I couldn’t ask for two more loving, and committed parents.

To my Mother, Jo Ann, and to my Father, Anthony, thank you for all you have done for me. I dedicate this dissertation to you.
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CHAPTER I
INTRODUCTION

Entrepreneurship is a part of higher education regardless of its promising, or perilous nature. “No better text for a history of entrepreneurship could be found than the creation and development of the modern university, and especially the modern American university (Drucker, 1985, p. 23).” Postsecondary institutions in the United States have historically responded to the needs and demands of society by evolving in innovative ways. Institutions are again changing the way they operate; this time, as a result of turbulent conditions best described by increasing costs, decreasing subsidy, and growing demand for the services institutions provide.

Research that illustrates the growing importance of activities on the edges of institutions has provided an important portrayal of entrepreneurship. Growth in areas like intellectual property, applied research, fundraising, and increased university partnerships with private businesses and government agencies are vital to the financial wherewithal of most colleges and universities (Duderstadt, 2009; Etzkowitz, 1998). However, these activities are only part of what Clark (1998) has described as the entrepreneurial university. To holistically portray organizational transformations, the core of the academy—academic disciplines, teaching, and educating—must be examined for patterns of adaptation and change.

However, measuring academic entrepreneurship is no easy endeavor, and numerous obstacles exist. The nexus of entrepreneurship is change and innovation. Such a malleable concept becomes more difficult to define when the diversity of the American system of postsecondary education is taken into consideration. The varied nature of postsecondary institutions in the United States leads to new, and diverse opportunities for
growth (Anderson, 2001). Additionally, inherent ambiguities in institutional missions and values, and the polarizing nature of the role of entrepreneurship in higher education create tensions that skew the discourse (Cohen & March, 1985; Mars & Metcalfe, 2009). This makes clearly and contextually defining entrepreneurship difficult and frustrating, which may partially explain the scarcity of measures designed to capture entrepreneurial activity (Mars & Aguilar, 2010). Research on entrepreneurship in higher education has become scattered, lacking a general direction (Shane & Venkantaraman, 2000).

Adding to this difficult and confusing task, institutions are likely to behave entrepreneurially in different ways based on their unique institutional characteristics (Anderson, 2001; Slaughter & Rhoades, 2004; Lane & Brown, 2004). There are many different forms of relationships between the stakeholders of the private sector, government, and higher education, known as the triple-helix (Etzkowitz, 1998). In a 2005 analysis of the modern nature of curricular change, Brint concluded that institutions are indeed adapting and evolving to award more applied and occupational degrees. Characteristics including Carnegie Classification, sector, enrollment size, selectivity, institutional age, status, and region were all significant determinants of the nature of an institution’s curriculum. This study also provided evidence of the role institutional characteristics may play in determining how organizations adapt.

Despite the recognition that institutions engage with their external environments differently, literature focuses primarily on, “the exchange of funding and research between a corporation and a university, or variations of this exchange (Anderson, 2001, p. 244).” Up until now, few studies have explored the meaning and nature of acknowledged entrepreneurial differences that exist between institutions.
The purpose of this study was to understand how institutions might evolve differently based on new measures of entrepreneurship in the academic heartland. To accomplish this, measurements that accurately capture adaptation within academic units and disciplines were created. Data from the National Center for Educational Statistics (NCES) was used to tabulate changes in the number of unique degree or certificate conferral fields (known as Classification of Instructional Program (CIP) codes) between 2004-05 and 2008-09. Changes in conferral fields were chosen to measure academic entrepreneurship because of their historic parallels with evolving social, political, and economic demands (Rudolph, 1977; Thelin, 2004; Brint, 2005; Bok, 2003; Drucker, 1985). Following the creation of these measures, institutional categorization and classification frameworks\(^1\) were used to mimic the diverse nature of postsecondary institutions in the United States. Ultimately, these traits were used to better understand academic entrepreneurship, and its nature.

**Background**

Recent studies on the topic of entrepreneurship in higher education have emphasized the relationships between the innovative behaviors of institutions (Clark, 1998; Deem, 2005), changes in economic policy (Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004), and increased research and development (Bok, 2003; Rahal & Rabelo, 2006). In addition, scholars have sought to understand how the linkages between high level college administrators, and government and private officials impact an institution’s entrepreneurial behavior (Slaughter & Rhoades, 2004; Etzkowitz & Leydesdorf, 2000;  

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\(^{1}\) These include: Carnegie Classification Basic, Carnegie Classification Undergraduate Instructional Program Profile, Institution Sector, Carnegie Classification Undergraduate Profile, Region, Degree of Urbanicity, Land-Grant Status, and Institution Size.
Nelles & Vorley, 2008). Such examples of entrepreneurship emphasize the increasingly diverse peripheries of institutions, highlighting new areas of potential opportunities (Clark, 1998; Slaughter & Leslie, 1997). Changes in policy have provided gateways to new revenue streams. One key example is the Bayh-Dole Act of 1980, which allowed institutions to retain the rights to federally funded research and development, and the subsequent commercialization of intellectual property (Berman, 2008). This policy has led to a wellspring of university-based patents, copyrights, and revenues since it was passed. Prior to this act, there were fewer than 250 patents issued to institutions. Since it was passed, 3,933 patents have been issued, 4,516 licenses, and a total of 25,979 active licenses and new options have been issued; this has lead to revenues totaling 1.31 billion dollars for institutions (Rahal & Rabelo, 2006). While impressive, the potential trappings of research only reflect a small portion of the entrepreneurial activities in higher education, which also happen to be outside the core function of most institutions (Bok, 2003).

Chart 1—which is based on data from the National Center for Science and Engineering Statistics (NCSES)—illustrates the concentration of research and development expenditures at institutions classified as Research Universities—Very High Research Activity, Baccalaureate Colleges—Arts and Sciences, and Master’s Colleges—Medium Programs between 2000 and 2009. There is a clear difference in the amount of research and development expenditures based on institutional type; helping to shed light on the reality that for many institutions, research is not a core function (Slaughter & Rhoades, 2004). Institutions without a research mission seek out other methods of entrepreneurship; specifically, by adapting and evolving their academic units (Bok, 2003;
Duderstadt, 2009). Changes in the academic heartland—defined for the intents and purposes of this study through a series of metrics that measure the change in the number of new and disbanded conferral fields—such as adding educational programs in response to client interests, stakeholder demands, and economic needs constitutes an alternative form of innovation to research and development (Clark, 1998; Brint, 2005).

Innovation and growth on the peripheries of institutions that include research, and revenues from intellectual property provide important illustrations of how malleable postsecondary institutions can be. Some entrepreneurial activity does occur outside the core of the academy. However, studies tend to focus on this without considering changes that occur within the core academic functions of the university, or as Clark (1998) terms it, the academic heartland. There has been far less attention paid to entrepreneurship within these core academic functions, despite evidence that such academic innovation has long been a part of our system of postsecondary education (Thelin, 2004; Rudolph, 1977).

Examples of academic entrepreneurship are numerous (Rudolph, 1977; Thelin, 2004; Brint, 2005). According to Rudolph (1976), “the curriculum was fragile, yet flexible, and it was in constant motion (p. 245).” Reasons for this included, “the rise of science, the death of Greek, the emergence of professions, the ascendancy of an ambitious middle class, and the resounding victory of intellect over piety (Rudolph, 1977, p. 245).” These shifts in curriculum have traditionally occurred in concert with sea change in higher education, and in society. For example, the creation of technical colleges was in part a response to a growing need for applied and technical professionals, and the dawn of the industrial revolution. Later, the Morrill Land Grant Act (1862) led to
the creation of new colleges and universities that offered courses and engaged in research areas of growing national needs. These institutions provided broader access to an education for geographically dispersed citizens in applied subjects like agriculture, science, and engineering. The tradition of academic entrepreneurship within higher education continues today. Institutions are now shifting their programmatic offerings from liberal to practical arts in responses to environmental demands (Brint, 2005). The continuous evolutions of disciplines, majors, and programmatic offerings have paralleled economic, social, and political changes (Thelin, 2004; Duderstadt, 2009).

These examples academic entrepreneurship have always stirred debate. Shortly following the creation of technical colleges, the Yale Report of 1828 denounced the idea of specifying a discipline of study, claiming that, “Our object is not to teach that which is peculiar to any one of the professions; but to lay the foundation which is common to all (Yale Report, 1828).” Today, the same rationale—that a well-rounded, traditional education in liberal arts and general studies prepares students to be productive and active members of society—is at the heart of the argument against more applied or occupationally related programs (Brint, 2005). Capturing changes in the field of awarded degrees or certificates can provide insight into the entrepreneurial activity of an institution (Bok, 2003). Yet, there has not been any systematic national study of how frequently academic institutions add or disband degree programs.

Whether someone would describe an entrepreneurial university as opportunistic or imperiled largely depends on perspective. As new highways for growth are opening, others are turning into a bottleneck. Decreasing public funding, economic recession, increased competition, and more diverse stakeholder pressures are putting institutions at
risk of being marginalized (Oh, 2003; Christensen & Soares, 2011). The historic trends that illustrate how institutions adapt to changing social, political, and economic demands are championed by some as a demonstration of the elasticity of the American higher education system (Drucker, 1985). Detractors of such organizational transformations believe that new operating models have relegated traditional academic principles—long considered to be the ethos of postsecondary education—to the back seat. Instead of focusing on the academic core, postsecondary institutions are being accused of embracing anything that would increase market-share, or generate more revenues (Drucker, 1985; Clark, 1998; Duderstadt, 2009).

In addition to navigating the risks and rewards of this new environment, efforts by institutions to become more entrepreneurial have been a lightning rod for criticism. Skeptics consider these institutional changes to be too profitable and business-like, and contrary to the traditional academic nature of public and private, not-for-profit institutions. This has contributed to the perception that entrepreneurship is an unwanted influence on the academy (Bok, 2003; Birnbaum, 2001). This perception has long been present in higher education; Thorstein Veblen (1918) alluded to the emergence of business practices in higher education when he wrote, “Critics of the present regime agree that the colleges of the land are in great part so placed as to be thrown into competition by force of circumstances, both as to the acquisition of funds, and as to the enrollment of students (p. 65).” Proponents claim that entrepreneurship is just another step in the evolution of a higher education system that epitomizes innovation (Drucker, 1985). This debate has led to an ideological gridlock regarding how institutions should respond to a changing environment (Mars & Metcalfe, 2009). It may be receiving so
much attention because little clarity exists regarding the meaning, and context of entrepreneurship in higher education.

The organizational changes described as entrepreneurship have been well chronicled by scholars (Drucker, 1985; Clark, 1998). Paradigms that examine the “Entrepreneurial University,” while different to varying degrees, share common themes. These include: the diversification of funding; the expansion of development to include new units outside of traditional academic activities; a strengthened administrative core to manage growth; a commitment to the traditional academic purposes and values (what Clark (1998) refers to as the academic heartland), and a culture of entrepreneurship throughout the organization.

**Problem Statement**

This criticism of entrepreneurship may stem from a lack of understanding of what it truly means. In higher education, the notion of entrepreneurship is, “widely regarded in the academy as suspect, if not downright disreputable (Bok, 2003, p. 18).” Barriers exist that hamper the broadened understanding of entrepreneurship. For example, differences exist in the fundamental application and definition of entrepreneurship by economists in comparison to other fields. “Rather than explaining and predicting a unique set of empirical phenomena, entrepreneurship has become a broad label under which a hodgepodge of research is housed (Shane & Venkantaraman, 2000, p. 217).” Due to its broad use, the study of entrepreneurship in various disciplines is often dismissed as vague, and impractical.

According to Kirzner (1997), entrepreneurship is based on a series of competitive advantages, value judgments, and educated guesses. However, determining what is
entrepreneurial can be subjective considering the term entrepreneurship entails is loosely-defined. Schumpeter (1947) notes that the very nature of entrepreneurship is one of constant imbalance. Additionally, the notion of entrepreneurship is centered on change (Say, 1855; Weber, 1950). Defining, and measuring something with such a subjective, flexible, and ambiguous nature is inherently difficult.

The study of entrepreneurship has grown to span many disciplines, and provided numerous themes, applications, explanations, and research. Research that is intended to describe or measure entrepreneurship has yet to contextually structure the actions of institutions. Typical lines of inquiry frame entrepreneurship within one of the following three questions. These include, “(1) why, when, and how opportunities for the creation of goods and services come into existence; (2) why, when, and how some people and not others discover and exploit these opportunities; and (3) why, when, and how different modes of action are used to exploit entrepreneurial opportunities (Shane & Venkataram, 2000, p. 218).”

Thus far, attempts to explore entrepreneurship in the context of higher education have been limited despite the recognition that innovation occurs in broad ways (Anderson, 2001). While these lines of inquiry have contributed immensely to understanding entrepreneurship, they may lack clarity (Mars & Metcalfe, 2009). The murky environment that higher education institutions exist in has been described as, “organized anarchy (Cohen & March, 1986, p. 203),” and may share some of the blame for the incomplete application of entrepreneurship. Ambiguities exist in organizational

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2 This study uses the first question to frame what entrepreneurship in the academic heartland is. The second question is used to analyze the variance in these new measurements, which are designed with the third question in mind.
missions and values; these lead to varying entrepreneurial responses, which may broaden what the term entrepreneurship means to different institutions (Cohen & March, 1986; Shane & Venkataram 2000; Lane, 2007). The diverse and confusing nature of the entrepreneurial activities by institutions has a polarizing effect, which may have the potential to dilute the quality of discourse (Bok, 2003). Mars & Metcalfe (2009) articulated this, stating that their rationale behind addressing entrepreneurship was a result of, “growing frustration about the polarization evident in the scholarly research on entrepreneurial activity in the academy (Mars & Metcalfe, 2009, p. 2).” The call for a greater understanding of entrepreneurship is growing louder.

Establishing a holistic context and definition for entrepreneurship in higher education is important. Existing studies have yielded insight into the increasingly intertwined relationships, and blurred sector boundaries that have occurred as a result of a more global, knowledge-based economy (Etzkowitz & Leydesdorf, 2000; Nelles & Vorley, 2008). However, a shortcoming of the attempts to research entrepreneurship in higher education, is that such efforts traditionally focus, “almost exclusively on examining market-oriented phenomena, failing to take into consideration in their analyses many other non-market oriented activities, such as student and faculty activism, instruction, and the design of curriculum (Mars & Aguilar, 2010, p. 2).” Analysis of adaptation and change in the academic heartland must be undertaken to fully understand entrepreneurship.

**Purpose of This Study**

The purpose of this study is to measure entrepreneurship in the academic heartland, and to understand how institutions may differentially engage in such
behaviors. One of the reasons why there is little empirical research about entrepreneurship in the academic core is the difficulty in measuring such activity. There are no metrics that compare to those used in measuring research activity (e.g., patent production, research dollars generated, business spinoff etc.). To fill this gap, metrics that capture entrepreneurial activity within academic units and disciplines had to be created. Measurements of academic entrepreneurship were created by tabulating the changes in the number of unique degree conferral fields conferred by each institution between 2004-05 and 2008-09. To do this, both the number of newly conferred unique degree fields, and disbanded conferral fields in the studied time frame were tabulated. The field of study was used as an indicator of academic entrepreneurship, as changes in degree conferral fields have historically aligned with changes in economies, policies, and societal demands (Rudolph, 1977; Thelin, 2004; Brint, 2005; Bok, 2003). According to Bok (2003),

“The world of commerce and industry affects the curriculum in even more striking ways through the jobs it provides and the salaries it offers; witness the growth of undergraduate business majors, the rise of computer science departments, and the generous compensation offered to professors of management and economics, compared to that paid to colleges in literature and philosophy (p. 7).”

While not an exact measure of entrepreneurship, changes in academic program offerings provide a close representation of the degree to which faculty alter academic programs. Available longitudinal data can provide trend data about whether such activity is increasing, decreasing, or remaining stagnant.

Using data available from the National Center for Educational Statistics (NCES), information that catalogs the field of study of a degree or certificate conferral was collected. This data is represented in Classification of Instructional Program (CIP)
Codes. Five measures were created that quantify the change in the number of unique degree conferral fields, including: the net change in unique degree conferral fields, the percentage change in unique degree conferral fields, the absolute value change in unique degree conferral fields, net entrepreneurship, and total entrepreneurship between 2004-05 and 2008-09.

The calculation of these measures was followed by an analysis of the type of newly created, and disbanded degree and certificate conferral fields that make these measures up. This analysis served numerous purposes, including: 1) providing a descriptive overview of the changes occurring in the academic heartland, and 2) adding validity to how entrepreneurship in the academic heartland was operationalized by determining if changes in new and disbanded CIP code conferrals align with shifting patterns of demand for specific skills and training.

Research Questions

This study was based on the overarching research question: How does entrepreneurship in the academic heartland vary based on institutional characteristics? The following three sub-questions drove the design of this study:

1) Do relationships exist between Carnegie Classification-Basic, Institution Sector, Carnegie Classification-Undergraduate Instructional Program Profile, and entrepreneurship in the academic heartland, which was measured by the change in the amount of unique CIP code conferrals between academic years 2004-05 and 2008-09?

2) Do relationships exist between net entrepreneurship and total entrepreneurship between 2004-05, and 2008-09, and Carnegie Classification-Basic, Institution Sector,
and Carnegie Classification-Undergraduate Instructional Program Profile between 2004-05, and 2008-09?

3) Do patterns exist between the type of new and discontinued degree fields that are conferred between 2004-05, and 2008-09?

Significance of This Study

By addressing these questions, this study reaches beyond past research in a variety of ways. It 1) provides a clear, contextual understanding of academic entrepreneurship, and how it varies based on institutional characteristics, 2) does so in such a way that focuses on the act of change within academic units and disciplines, or as this study terms it, entrepreneurship in the academic heartland, 3) accomplishes this using a robust methodology in comparison to previous measurements of entrepreneurship, and 4) Will work to strengthen metrics that seek to measure organizational change and innovation.

Scope of Study

In this study, the primary purpose was to measure entrepreneurship in the academic heartland, so that it could be determined if and how diverse types of institutions demonstrate such behavior differently. This study was limited to institutions that, according to 2010 classifications, were public, 4-year and above, and private, not-for-profit, 4-year and above institutions that belonged to one of three subgroups in Carnegie Classification-Basic: Research Universities-Very High Research Activity, Masters Colleges-Medium Programs, and Baccalaureate Colleges-Arts and Sciences. As a result, a total of 535 institutions were studied so as to determine the entrepreneurial nature of institutions within the academic heartland.
In addition to time restrictions, *private, for-profit institutions* were excluded from this study because they are oriented to market conditions differently than public institutions (Hansmann, 1980; Kinser, 2007). *Associate degree granting institutions* were also excluded from this study, due differences in funding sources, and unique environmental factors (Levin, 2001).

**Definition of Terms: Entrepreneurship**

According to Schumpeter:

“We have seen that the function of entrepreneurs is to *reform* or revolutionize the pattern of production by exploiting an invention, or more generally, an untried technological possibility for *producing a new commodity or producing an old one in a new way*[^3^], by opening up a new source of supply of materials or a new outlet for products, by reorganizing an industry and so on (Schumpeter, 1947, p. 132).”

Drucker adds that, “Entrepreneurship is thus a distinct feature whether of an individual or an institution (Drucker, 1985, p. 25).” These underlying themes of adaptation and change provide the basis for defining entrepreneurship.

According to Schumpeter’s theory of creative destruction, negative change can also be viewed as a part of a cyclical process of entrepreneurship that creates new market standards through adaptation and innovation (Schumpeter, 1947). This may require reducing or dropping organizational components that do not have a place in a changing market. Both positive and negative changes are described as being core elements of entrepreneurship theory. As a result, both added and disbanded conferral fields are considered a form of academic entrepreneurship. For the intents and purposed of this study, entrepreneurship can best be defined as the addition, or disbandment of unique fields of study in which degrees or certificates are conferred.

[^3^]: Emphasis added.
Definition of Terms: The Academic Heartland

The notion of the academic heartland comes from Clark (1998), who refers to it as something central to the core values and missions of institutions. Clark frames entrepreneurial action within the context of this heartland. Becher and Trowler (2001) describe the center of the institutional landscape as the academic units and disciplines. Those who debate the merits of entrepreneurship point to the migration away from traditional academic values as a potential peril of entrepreneurship in higher education (Slaughter & Rhoades, 2004; Slaughter & Leslie, 1997; Clark, 1998).

“Members of the university who resist commercial influences have several concerns. They fear that money and efficiency may gradually come to have too dominant a place in academic decision making and that the verdict of the market will supplant the judgment of scholars in deciding what to teach and who to appoint (Bok, 2003, p. 19).”

The concern regarding how entrepreneurial efforts can be framed within the core mission, and values of an institution is central to successful adaptation by such an organization. For the purposes of this study, the academic heartland is defined as the greater body of academic units or disciplines. As a result, entrepreneurship in the academic heartland was defined as the addition and dissolution of unique conferral fields, and is measured by the number of added and dissolved unique fields of study in which degrees or certificates are conferred between 2004-05 and 2008-09.

The measurements of entrepreneurship were designed to reflect adaptation or change within academic units or disciplines.

“Academics find they must, for example, not only generate new courses; they must cost them, determine and stimulate markets for them, evolve new ways of delivering them and ensure they can stand up to hard external scrutiny. The stress on old assumptions about the nature and organisation of work are becoming more difficult to resist across the world (Henkel, 1997, p. 139).”
Classification of Instructional Program code variables were chosen to measure this because of their ability to illustrate how disciplines may be adapting over time (Becher & Trowler, 2001).

**Limitations**

There are limitations that must be considered. The standard by which institutions report data pertaining to degree conferrals can differ greatly. Some institutions may detail each and every separate degree conferral, whereas others may choose to categorize slightly different academic programs under an umbrella code. This does present issues that may not be addressed when reporting data, and need to be taken into consideration when interpreting the findings of this study. Personnel changes, or changing institutional reporting policies could lead to changes—which may also be sudden—that alter the specificity of reporting. This may lead to a distortion in the degree of academic entrepreneurship detected in this study.

In addition, the possibility exists that institutions could use creating new conferrals as a way to circumvent changing or eliminating old ones; allowing for the avoidance of additional steps that can be laborious in nature. This could leave old programs that should be disbanded in the data, which could skew the calculations of academic entrepreneurship. Measures, such as identifying disbanded conferral fields as those that do not appear for the last two years of the study, were employed to limit this effect. These measures are also based on the use of 2004-05 as a benchmark for new conferral fields. It also assumes programs are disbanded if they are not conferred by an institution in the last two years of analysis (2007-08 and 2008-09).
Many of these issues stem from unstandardized reporting of conferral fields that vary greatly depending on the institution. This may lead to slight anomalies that could inflate or deflate the entrepreneurship metrics that were calculated using CIP data. It is worth noting that these measures are intended to reveal patterns of entrepreneurship on a national-level. Numerous rationales exist for how to report major fields of conferral, and the findings of this study should be interpreted with these cautionary statements in mind.

Reporting standards may also impact the reliability of patent data. Some institutions use several different organizations to report patents and copyrights. While steps were undertaken to account for all parents and copyrights, it cannot be guaranteed that all have been. The subsequent chapter provides a more comprehensive review of the relevant literature regarding entrepreneurship, its role in higher education, and how it may manifest within the academic heartland of institutions. Following that chapter, a description of the research methods and data used for this study is provided.
CHAPTER II
LITERATURE REVIEW

Changing economic models have led to fundamental alterations in the organizational structure of higher education institutions in the United States (Slaughter & Leslie, 1997). The scholarly literature on academic capitalism describes the context that leads to institutional change. Entrepreneurship is used to describe the attempts made by institutions to become more responsive to a rapidly changing environment. These environmental changes include the shift to a knowledge-centric, and neoliberal economy that emphasizes the transformation of publicly created knowledge into commercial activity (Slaughter & Leslie, 1997; Etzkowitz & Leydesdorff, 2000). Institutions are using these new opportunities that arise from this knowledge economy to support their academic purpose. This is accomplished through program and revenue growth within both academic and non-academic institutional functions (Clark, 1998).

These efforts to change are supported by connecting academic and non-academic units through teams of decision makers, and by infusing a culture of innovation across all layers of the organizational hierarchy (Clark, 1998; Slaughter & Leslie, 1997; Deem, 2001; Slaughter & Rhoades, 2004). Institutions that react to changing social, political, and economic realities do so by leveraging their unique characteristics, and identities to create competitive advantages that have the potential to become sustainable ones (Clark, 1998; Lane & Brown, 2004).

The catalysts and corresponding organizational changes that constitute entrepreneurship are well chronicled in the scholarly research concerning higher education. Blurred sector boundaries between education, government, and private enterprises—known as the triple-helix (Etzkowitz, 1998)—have created a high demand
for the outputs of postsecondary institutions (Etzkowitz & Leydesdorf, 2000; Olssen & Peters, 2005). These intersections have led to greater opportunities for revenue growth. They have also shifted institutional efforts—in some cases—away from the core academic mission and values of the institution; balancing the need for more diverse revenue streams, and the fundamental academic identity at the heart of a postsecondary institution has become increasingly difficult (Wall & Emery, 2010; Bok, 2003). Entrepreneurial activities, considered by some to be ‘management fads’ that should only be virtually adopted, can have implications on every level of the academy (Birnbaum, 2000). “Given the push for faculty to seek financially profitable activities, many are concerned that undergraduate instruction is taking a back seat (Lee & Rhoades, 2004, p. 741).” Concerns over the academic integrity of institutional activities provide a useful system of checks and balances, helping to ensure that entrepreneurial behaviors seek to enhance the academic heartland (Clark, 1998).

Transformations that grow the quality and value of the core institutional function—education—and financial efforts do not need to be mutually exclusive (Clark, 1998; Bok, 2003; Slaughter & Rhoades, 2004). Where the issue lies, is in the articulation of institutional priorities. Mission statements and institutional budgets, if properly aligned, should emphasize the same priorities and goals. Unfortunately, translating often ambiguous, flowery missions and strategic plans into dollar signs, and vice versa is difficult. Such a task can create tensions that divide the stakeholders of a given campus (Cohen & March, 1986; Mars & Metcalfe, 2009).

Walking the tightrope of peripheral growth, financial prudence, and academic priorities can be symbiotic needn’t be so ominous. The seeds of an innovative culture
can lead to a more unified campus if they are planted and cultivated through a coalition of units Clark, 1998). Institutions can support academics by strategically prioritizing peripheral units and research that leverages an institutions academic strength. Such growth becomes cyclical; it eventually improves all of the functions involved, which leads to more growth (Clark, 1998; Slaughter & Leslie, 1997; Duderstadt, 2009). Observations of such symbiotic changes include the development of more applied and technical fields, and fields that are broad, general, and multi-disciplinary in scope (Brint, 2005). These programs are in high demand—students want actionable knowledge that leads to a career; companies want qualified labor and research, and oversight agents want to see productivity—and help institutions optimize their resources (Christensen & Soares, 2011; Lane, 2007). Changes in the nature of programmatic offerings have long mirrored social, political, and economic demands, and may be the original form of entrepreneurship in the American system of postsecondary education (Thelin, 2004; Rudolph, 1977). Despite being native to higher education, research that explores adaptation and change within the academic heartland is scattered, and lacks presence in comparison to literature dedicated to research and funding (Mars & Metcalf, 2009).

The purpose of this study is to measure entrepreneurship in the academic heartland and the relationship of such change to different institutional characteristics. Clark refers to a strengthened academic heartland in his entrepreneurial paradigm (Clark, 1998). This portion frames actions throughout the organization within the context of core academic values. The metaphor of the heartland speaks to the broader landscape of higher education that is undergoing change. To accomplish this, new variables that measure academic entrepreneurship were designed to account for new and disbanded
degree and certificate conferral fields between 2004-05, and 2008-09. These variables were used to determine if institutions with different characteristics have diverse levels of entrepreneurial activity.

**What Trends Are Occurring In the Field?**

The infusion of market-based organizational behaviors into universities has provided opportunities and uncertainty amidst environmental change (Wall & Emery, 2010; Bok, 2003). While it is agreed that institutions are changing rapidly in a murkier environment, the nature of that change is debated among scholars. The changes in institutional activities stem from, “Changing patterns of resource dependency in universities, which force academics to search out new sources of money (Deem, 2001, p. 12).” Concurrently, institutions are, “Pushed and pulled by enlarging, interacting streams of demand, and universities are pressured to change their curricula (Clark, 1998, p. xiii).” The landscape surrounding our postsecondary institutions is undergoing a transformation.

Universities (2001): common themes arise in these paradigms that include: a diversified funding base, a strengthened administrative core, expanded programs, a stimulated academic enterprise, and a culture of innovation throughout all levels of the organization. The environmental context for organizational change includes new market pressures, traditional funding shortages, and new opportunities for growth incentivize more aggressive institutional posturing.

While sharing similar themes, the paradigms of academic capitalism and entrepreneurial universities are different. “The differences lie partially in the processes of intellectual property formation (Slaughter & Rhoades, 2004, p. 80),” as well as the focus of each work. The Entrepreneurial University examines the organizational adaptations that occur in response to new demands and opportunities, whereas Academic Capitalism examines the market-opportunities that exist, as well as the changing nature of the academic to a state sponsored entrepreneur (Clark, 1998; Slaughter & Leslie, 1997; Rhoades & Slaughter, 2004; Deem, 2001). “All seem to be concerned in some way with changes to academic institutions and practices, and all identify the origins of these in various largely external factors, directly or indirectly linked to international developments and/or globalization (Deem, 2001, p. 13).” This leads to the underlying notion that institutions are being calibrated to become centers of economic activity on regional, national, and global scales (Etzkowitz & Leydesdorff, 2000; Deem, 2001; Vorley & Nelles, 2008).

Each institution is unique, and it leads to significant variation in how entrepreneurship is practiced. Institutions interact and capitalize on new opportunities in diverse ways (Clark, 1998; Lane & Brown, 2004; Vorley & Nelles, 2008). Deem (2001),
defined academic capitalism as, “A *situation* in which the academic staff of publicly-funded universities operate in an increasingly competitive environment, deploying their academic capital, which may comprise teaching, research, consultancy skills or other applications of forms of academic knowledge (Deem, 2001, p.14).” This is further expounded on by Slaughter & Rhoades (2004), who observe the growth of networks between higher education administrators and their external environments, while also detailing the environmental context that is changing the relationship between the academic institutions, and other sectors. It should be noted, that Deem’s definition of Academic Capitalism emphasizes publicly funded institutions; such a distinction will not be made in this study. Private, not-for-profit institutions face similar environmental pressures that require entrepreneurial responses (Drucker, 1985).

This alteration of institutional behavior is partially due to the emergence of a knowledge economy that has placed institutions closer to the center of economic growth and activity (Olssen & Peters, 2005). Efforts to become more entrepreneurial have led postsecondary institutions to use their resources in ways that lead to new opportunities (Robertson & Keeling, 2008). Shifts in policy, demand, economic stability, and expectations have led to more frequent changes that stem from opportunity recognition (Clark, 1998; Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004).

In addition, both federal and state funding sources have been significantly reduced. This “devolution of government assistance and reduction (Zietlow, 2001),” has negatively affected a variety of not-for-profit sectors that rely on government grants, 

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4 The impact of the knowledge economy has global implications, but it also has its place on a regional scale. This can be attributed in part to the role that human capital plays in the development of innovation in specific geographic regions (Yeo, 2010).
including higher education institutions (Zietlow, 2001). “In 1980, state and local appropriations provided just fewer than half the revenues received by public colleges and universities. By 2000, this had declined to 35% (Heller, 2006, p. 102).” Moreover, the number of new institutional models—and the resulting competition—has grown rapidly (Hanna, 1998). This competition may provide institutions with challenges and opportunities that can lead to increases in status, or marginalization (Powell & Smith, 2002; Trow, 1985).

Decreasing support is balanced to a degree by increasing economic dependence on higher education. By 2018, “Approximately two-thirds of all employment will require some college education or better (Carnevale et al., 2010, p. 14).” This is just one example the influence of postsecondary education on the successful development of a globalized, knowledge-oriented economy (Olssen & Peters, 2005; Etzkowitz, 1998). As a result, external agents are attempting to influence higher education. “Targets and performance criteria are increasingly applied from outside the academic role that diminish the sense in which the academic—their teaching and research—are autonomous (Olssen & Peters, 2005, p. 326).” This has led to emphasis on outcomes, and accountability, resulting in greater pressure being applied to higher education institutions, which may compromise organizational and individual autonomy (Lane, 2007).

Legislation, such as the Bayh-Dole Act (1980) has created incentives for institutions to develop intellectual property. Patents and copyrights eventually lead to the commercialization of knowledge, and they have become important sources of revenue.
generation for some institutions (Berman, 2008). Schools with the capacity to take advantage of these policies have parlayed their research infrastructures into new opportunities. These opportunities ultimately lead to greater financial stability, and enhanced prestige (Rahal & Rabelo, 2006; Slaughter & Leslie, 1997). Industry and government have become increasingly reliant on postsecondary institutions for these innovative ideas. This dependence may favor research-focused institutions, as the new opportunities that stem from research and development may not be available to institutions that focus on adding value through education (Etzkowitz & Dzisah, 2008; Bush, 1945; Christensen & Soares, 2011). This advantage was recognized years before tech transfer, innovation, and entrepreneurship became prolific parts of higher education. Vannevar Bush (1945) stated, “Publicly and privately supported colleges and universities and the endowed research institutes must furnish both the new scientific knowledge and the trained research workers. These institutions are uniquely qualified by tradition and their special characteristics to carry on basic research.” This has led to greater economic opportunity in research, which may infringe upon academic freedom and scholarly objectivity for the sake of economic stability (Olssen & Peters, 2005).

New funding opportunities have vast potential, but the stakeholder pressures and attached strings are in tension with the academic heartland (Bok, 2003; Wall & Emery, 2010). Increased organizational and individual participation in entrepreneurship has been the subject of debate. The primary concern is that the academic mission of an institution

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5 It should be noted that while the Bayh-Dole Act (1980) is widely attributed as the catalyst to institutional commercialization of knowledge, the beginnings of technology transfer could be traced to actions that took place in the 1960’s (Berman, 2008).

6 These institutions have pre-existing scaffolding that can move towards a more research driven enterprise that may result in greater slack revenue (Hospers, 2005; Trow, 1984).
may be compromised, while threatening instructional commitments (Lee & Rhoades, 2004). Institutions may become paralyzed due to the paradoxical nature of their environment—schools are being asked to increase access, and improve quality, but to do so with less subsidy, and a greater emphasis on outcomes—that leads to confusion and greater ambiguity (Mars & Metcalfe, 2009; Christensen & Soares, 2011). In addition to confusion, increased competitions from disruptive for-profit educational models bring frenzy, leaving many institutions to scramble for new and innovative approaches (Kinser, 2007; Christensen & Soares, 2011).

**Capitalism, Entrepreneurship, & Social Entrepreneurship**

Weber said regarding capitalism, “the forms of organization and general structure which are peculiar to our economic order, this spirit of capitalism might be understandable, as has been said, purely as a result of adaptation (Parsons; Weber, 1950, p. 72).” He further adds that the pursuit of money was essential to, “that (Capitalist) system, so intimately bound up with the conditions of survival in the economic struggle for existence, that there can today no longer be any question of a necessary connection of that acquisitive manner of life with any single weltanschauung (Parsons; Weber, 1950, p. 72).” There is synergy between this concept, and the context of academic capitalism; Slaughter & Rhoades (2004) posited that “profit-oriented activities (p. 11),” were now central to the efforts of institutions to adapt and increase revenues. This was postulated in the wake of an environment characterized by new opportunity structures, and the blurring of academic and market driven motivations faced by institutions as described in Slaughter & Leslie’s work (1997).

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7 Weltanschauung is defined by Webster’s dictionary as: a comprehensive conception or apprehension of the world especially from a specific standpoint (Merriam-Webster, 2008).
Institutions then attempt to capitalize on these new market dynamics through adaptation and innovation. Schumpeter defines entrepreneurship within the context of innovating, making something new, or doing something current in a new way in an attempt to improve revenues and the financial stability of an organization (1947). Drucker further advances the application and context of entrepreneurship. “J.B. Say described entrepreneurialism as the shift of, ‘economic resources out of an area of lower and into an area of higher productivity and greater yield (1985, p. 21).’” This included the application of managerial techniques, determining the value of an innovation to clients, and implementing it in a profitable manner (Drucker, 1985). From a business perspective, entrepreneurship is something associated with higher yields, innovation, value-addition, and profit (Hanna, 1998). However, the not-for-profit sector has its own unique circumstances that warrant its own entrepreneurial construct, which includes the academic missions and values of postsecondary institutions.

The idea of innovation for greater financial gain is fitting for businesses, but it may not be appropriate for not-for-profit, or public institutions. According to Mars and Metcalfe (2009), entrepreneurship within the context of higher education is the, “process of creating and implementing innovation-based solutions and responses to economic or societal problems and gaps (p. 2).” How the need for funding is bridged with the academic mission and not-for-profit orientations of institutions, is complex. The practice of social entrepreneurship—the idea of innovating for the sake of a common mission—

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8 Clark’s *Entrepreneurial University* demonstrates that institutions change asymmetrically, creating a need to hybridize organizational models. These include a stronger, centralized steering core (Clark, 1998) that resembles a Weberian bureaucracy, allowing for fast responses to environmental changes. At the same time, institutions attempt to maintain some degree of loosely-coupled systems that allow for some degree of unit-autonomy and environmental analysis (Weick, 1976). This variability helps to preserve core academic functions by making it difficult to pass these potentially hazardous fads into all pieces of an organization (Mintzberg, 1978).
allows institutions to evolve in ways that enhance academic values (Washburn, 2005; Mars & Metcalfe, 2009). Regardless of whether these strategies are perceived in a positive or a negative light, the idea of adaptation is a pillar of higher education.

**Entrepreneurship In Higher Education**

The entrepreneurial phenomenon is not new to higher education institutions; adaptation has been a hallmark of colleges and universities in the United States (Drucker, 1985; Thelin, 2004). Institutions change in order to maintain academic quality, and autonomy, and to satisfy growing demands that are projected onto institutions by actors in the triple-helix (Weber, 1950; Nelles & Vorley, 2010). As a result of increasing expectations, agents of oversight have prioritized accountability, and efficiency in return for funding (Lane, 2007).9

How entrepreneurship manifests can include: outcomes-based assessments, broader research agendas, and new fringe units that use the core competencies of the institution in effective ways (Clark, 1998; Bresciani, 2006). By migrating away from traditional organizational models, institutions are attempting to take advantage of new opportunities (Zietlow, 2001). As sector boundaries are blurred, an organizational orientation is created that, “inserts a hierarchical mode of authority by which the market and state pressures are instituted (Olssen, & Peters, 2005, p. 325).” This indirect relationship between government and higher education can lead to a highly regulated environment, which may act as a deterrent to innovative behaviors (Findlow, 2008).10

Institutions adopt both for-profit, and not-for-profit models—known as a mixed-model

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9 As Lane (2007) notes, the institution acts as a state agent, through which an incongruent relationship exists.

10 According to Findlow (2008), bureaucracy, skepticism, and mistrust can all arise due to the pressure that accountability brings, which may act as a retardant to innovation.
organization—to maintain legitimacy by taking strategic risks. This allows institutions to use their unique strengths to create opportunities for growth (Dees, 2003; Slaughter & Rhoades, 2004).11

Contrasting Perspectives

These efforts to increase and broaden financial resources can impact organizational viability by providing institutions with greater malleability, enhanced prestige, and an ability to compete in an increasingly diverse educational marketplace (Clark, 1998; Slaughter & Rhoades, 2004; Deem, 2001). Some literature suggests that such revenue-oriented pursuits can dilute the strength of academic programs at the undergraduate level by drawing resources away from academia, and funneling them into research and graduate studies (Christensen & Soares, 2011; Nelles & Vorley, 2010). While the demand for research has increased, so too has the need for continuing education, which has provided institutions with an opportunity to remodel their services with more client-centered approaches (Bok, 2003).

Those who view entrepreneurship as practical and essential cite economic realities, new opportunities between sectors, and environmental change; these conditions have always been present, and have resulted in innovation on the part of institutions in the past (Slaughter & Leslie, 1997). As these cross-sector relationships continue to develop, institutions are exposed to many opportunities for change (Slaughter & Rhoades, 2004). Barnett (2005) describes the entrepreneur as a go-between who attempts to move an idea, or entity between two points. The entrepreneur willingly stakes capital,

11 This is supported by literature that focuses on public-institutions and their efforts to increase revenues through the adoption of entrepreneurial behaviors that reflect their for-profit counterparts (Economist, 2005). As Birnbaum (2000) notes, this can result in the adoption of management fads that may actually be ineffective or detrimental to the overall mission of institutions.
reputation, and prestige in a venture. Both organizations, and individual actors within organizations can be considered entrepreneurial, and both hope to gain from these strategic ventures (Barnett, 2005).

There are also major critiques of entrepreneurship in higher education. At the institutional level, universities risk capital in an attempt to gain from their investment (Barnett, 2005). Bourdieu explains that universities can stake social, intellectual, or economic capital in an attempt to grow (Lane, 2000; Bourdieu, 1988). The emergence of opportunity structures between public and private sectors have led to intellectual capital risks, which is one potential pitfall of entrepreneurship in higher education (Barnett, 2005). Critics caution against that by framing the risk of intellectual capital within the context of gaining market position and revenues, institutions are liberated from prioritizing their academic cores, and traditional societal duties (Barnett, 2005).

At the organizational level, the increasing presence of entrepreneurship in the university can be understood as, "emphasizing the utility of higher education to national economic activity on the part of the faculty and institutions (Slaughter & Leslie, 1997, p. 33)." In addition, the origins of entrepreneurial behaviors can be explained in part as responses to the contraction of financial resources. "Resource dependency theory suggests that, as unrestricted monies for higher education constrict, institutions within a national system will change their resource-seeking patterns to compete for new, more competitively based funds (Slaughter & Leslie, 1997, p. 65)." As greater pressure from more stakeholders is exerted, competition, and demands increase. Furthermore, the ability of external stakeholders to shape an institution grows as institutions seek out new outside funds for financial stability (Lane, 2007). Such activities, and their connection to
the intellectual capital of an institution can be harmful to the institution’s academic focus (Lee & Rhoades, 2004; Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004).

Knowledge commercialization is one sign of a major confluence between the interests of postsecondary institutions, the private sector, and government at both the federal and state levels. Higher education scholars observe these new opportunities for financial viability with pensiveness because they hold the potential to distort the traditional purposes and priorities championed by not-for-profit and public higher education institutions. These priorities include: education for the sake of the public good, scholarly objectivity, the pursuit of knowledge, and the prioritization of academic needs over potential revenue generation (Clark, 1998; Bok, 2003; Mars & Metcalfe, 2009). They may conflict with the ethos of capitalism, which emphasizes revenue generation, shareholder profit, and efficiency (Weber, 1950; Schumpeter, 1947; Kinser, 2007).

Due to the cyclical nature of entrepreneurship in higher education, institutions build upon previous cycles; this is similar to how companies reset the market standard through organizational change and innovation (Schumpeter, 1947; Drucker, 1985). Previous growth and reorganization can lead to future transformations. Inter-disciplinary connections between departments are established as a means to reposition and grow entire institutions. For example, Rensselaer Polytechnic Institute appointed George Low as President in 1976. Shortly thereafter, he sought to change the school from its teaching orientation, to a research institution that tackled its objectives from diverse perspectives. Rensselaer, which was historically an engineering-teaching-oriented college, was

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12 This is due to neo-liberalism that frequently commodifies public goods to satisfy private interests. This leads to private and government sectors influencing knowledge creators like institutions in both latent and manifest ways (Olssen & Peters, 2005; Lane, 2007).
transformed into a research-based school through collaboration with industry, and multi-disciplinary programs.\textsuperscript{13} By the end of Low’s first decade, the institution new research mission had been legitimized. This was accomplished at Rensselaer and other schools largely by the creation of centers that transcended disciplinary boundaries (Etzkowitz & Kemelgor, 1998).\textsuperscript{14} Later, the presidency of Dr. Shirley Anne Jackson built upon Low’s tenure, with the construction of the Experimental Media and Performing Arts Center (EMPAC), and new interdisciplinary majors such as Game Simulation, Arts and Sciences, which according to Rensselaer, was the first such program offered by a university (Jackson, 2008).

Stakeholders who wish to make our system of postsecondary education more responsive to demand streams have incentivized institutions to behave in more market-driven ways. For example, the U.S. government has facilitated such behaviors by creating policies that shrink subsidy in some areas and that promote new revenue opportunities in others, such as intellectual property (Bok, 2003). By restricting the flow of capital in one area, and widening it in others, stakeholders can influence the ways that institutions operate (Lee & Rhoades, 2004; Pfeffer & Salancik, 1978). This can lead to greater accountability, and more translational and economically beneficial research; External stakeholders—and some institutions—highly covet this type of applied research due to the potential economic gain it represents (Lee & Rhoades, 2004; Bok, 2003).

\textsuperscript{13} Low came to the school with an agenda that would increase industrial ties and rely less on campus based research for funding, to become a center for servicing industry, and to shift the campus from teaching to research (Etzkowitz & Kemelgor, 1998).

\textsuperscript{14} One of Low’s successor’s, Dr. Shirley Anne Jackson instituted a 1.4 billion dollar capital campaign, $600 million dollars in construction projects, and an emphasis on interdisciplinary programs within a ten year time frame that was described by Dr. Jared Cohon, President of Carnegie Mellon when he stated, “Change at Rensselaer in the last five years has occurred with a scope and swiftness that may be without precedent in the recent history of American higher education (Burgeois, 2008).”
However, even if policy levers, or capital allocations allow external stakeholders to influence the level, and nature of entrepreneurship, such forces can negatively affect an institution by shifting it’s core away from educating (Bok, 2003).

**How Are Schools Entrepreneurial In Different Ways?**

Academic capitalism and subsequent entrepreneurial action are largely constructed within the context of changing technology-transfer policies, diminished funding, and increased university collaboration with private industry and government. This is observed most notably through the increase in knowledge commercialization leading to greater revenue generation (Etzkowitz & Leydesdorff, 1998). The knowledge economy has provided fertile ground for institutions with high levels of research activity. However, those institutions are few and far between, and there are many schools that lack the requisite research capacity to compete; they must be entrepreneurial in other ways.

Schools that lack the research capacity or techno-science backgrounds may have resource advantages due to endowments, age, or the type of education they offer (Trow, 1984). From a cultural cognitive perspective, these schools will have also had more time to adopt industry standards that lead to greater isomorphism and less diversity (Meyer & Rowan, 1977). Schools with a much lower focus on research and graduate degrees are faced with increasing dependencies on prestige, student caliber, and the tuition dollars that are linked to creating more robust academic environments (Claar & Scott, 2007). Institutions that are considered prestigious and student focused may parlay that into programs that are innovative in their content, or delivery. Growth in demand can be linked to the notion of the lifelong learner, and the proliferation of information communication technology. Together, these have deconstructed the geo-chronological
barriers of higher education. This has led to a broadening of existing demand streams, and the creation of new ones. This may result in the growth of institutional capabilities to meet these new demands (Oh, 2003).

Enhancing instruction, advisement, and other student-oriented services that improve the academic environment are just some examples of entrepreneurial action in the academic heartland (Delucchi, 1997). More students and the destabilization of traditional revenue streams have contributed to more student-centered and market-driven approaches (Bok, 2003; Slaughter & Rhoades, 2004). Some institutions accomplish this by tailoring their programmatic offerings towards occupational fields that satisfy demands for employable skill sets (DiConti, 2004; Brint, 2005; BLS, 2010). Others utilize a growing interest in more multi-disciplinary fields (Kelderman, 2010).

The degree of the intersections between an institution’s revenue sources, and its academic mission can play a significant role in the extent of entrepreneurship that is demonstrated by the organization. More uncertain social, political, and economic conditions have compromised the stability of many institutions (Clark, 1998). A state of crisis may arise due to difficulties experienced when trying to couple financial needs with academic values (Bok, 2003). Without bridging these two distinct elements, institutions may fail to recognize and act upon opportunities (Mars & Aguilar, 2010).

Some schools try to augment their entrepreneurial activities by shining light on quality, and go to great efforts to increase graduation rates and selectivity. Each of these can enhance prestige, and may ultimately help to draw more students. This can have the effect of making an institution more tuition dependent, which may insulate them from slashes in subsidy or unanticipated drops in endowment assets. However, such measures
of effectiveness and prestige can be easily distorted without the underpinnings of growth in the academic heartland (Dill & Soo, 2005).

A more traditional way to practice entrepreneurship is by evolving the programs and curriculums offered to reflect the current and future needs of society, while preserving the academic core (Thelin, 2004; Rudolph, 1977). By changing what it offers, an institution can enhance revenue, and preserve intellectual capital through adaptation (Delucchi, 1997; Brint, 2005). For entrepreneurship to take hold throughout the institution, the academic portion of the organization must demonstrate a willingness to accept a more balanced and responsive structure. If changes are proposed that support the academic mission, consensus and coalition are more likely to be attained. Academics and administrators that work together to preserve the academic identity through strategic growth—in both peripheral and core areas of the institution—can build a more entrepreneurial organization (Clark, 1998).

Academic entrepreneurship is evident in curricular foci. According to Brint (2005), “One of the most important changes in American higher education over the last 30 years has been the gradual shrinking of the old arts and sciences core of undergraduate education and the expansion of occupational and professional programs (p. 151).” This quantitative study analyzed changing trends in institutional curriculum; it revealed a steady rise in practical arts and occupational fields, and a decline in traditional arts and sciences programs. It was also discovered that these changes could be significantly explained by institutional characteristics, including Carnegie Classification. The findings revealed that research-oriented institutions and baccalaureate institutions that were oriented towards arts and sciences were likely to award degrees in related fields.
Masters colleges and non-selective baccalaureate colleges were more likely to confer degrees in applied and technical fields. Larger institutions were more likely to award occupational degrees in comparison to smaller schools; furthermore, schools with lower average SAT/ACT scores awarded more occupational programs than those with higher SAT/ACT profiles. Public institutions were more occupationally oriented than private institutions (Brint, 2005).

Selectivity was inversely related to the number of occupationally oriented degrees. Region significantly influenced institutional degree conferrals; it was found that schools from New England, the West Coast, and the Mid-Atlantic had lower concentrations of occupational conferral's than did other regions of the country. The older an institution was, the less associated with occupational degree conferrals it became. This study provided strong illustrations of the organizational diversity of institutions in the United States, and it also offered insight into how institutions are evolving differently (Brint, 2005).

The Academic Heartland

The “academic heartland” alludes to the bedrock of public, and not-for-profit institutions in the United States. Successful entrepreneurship is undertaken within, and in the context of improving this academic core (Clark, 1998). Without being anchored to this core, the discourse regarding entrepreneurship in higher education is inherently flawed. Framing institutional action without consideration of its core academic elements, and relying instead on detailing the proliferation of “for-profit” behaviors fails to provide a holistic context (Mars & Aguilar, 2010). This limits how the discourse of entrepreneurship in higher education can grow.
The broader landscape of higher education is undergoing change, and so too, are the academic units. As the walls between sectors, disciplines, and academic communities continue to blur, institutions are changing (Etzkowitz, 1998; Becher & Trowler, 2001). The academic units and disciplines, which are considered by many to be at the core, or center of educational institutions, are key facilitators of entrepreneurship. This idea of the, “heartland,” can be best understood as the continued prioritization of the core academic units and mission in higher education institutions. These academic units still constitute the central or most important part of the academy, despite shifts in institutional actions that may indicate otherwise (Clark, 1998; Becher & Trowler, 2001).

Both the central academic mission, and the peripheral units that are theoretically designed to support it are undergoing transformations; it’s important to observe those changes from multiple perspectives in order to understand them, and to aid in the development of more effective entrepreneurial strategies (Clark, 1998; Slaughter & Rhoades, 2004; Deem, 2005). Such strategies will likely require an expansion of what academic units consider vital to their efforts, which may include a movement beyond research and teaching in their traditional forms. Leveraging these to change pedagogy, strengthen opportunity structures, and to “transfer knowledge to the external community (Gjerding, et. al, 2006, p. 85)” may help preserve the academic core of the institution, which has been threatened by greater financial constraints that have resulted from reduced funding (Slaughter & Leslie, 1997).

Gaining support for entrepreneurship within the academic ranks of the institution is important; it builds consensus, and helps drive positive changes (Clark, 1998). This is due to a large degree of influence that academic units exert over the organization
(Gjerding, et. al, 2006). The paradigms of the entrepreneurial university and academic capitalism describe a variety of activities that take place between sectors, and peripheral units of academic organizations, (Clark, 1998; Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004). Many of these activities and changes are in response to a more turbulent environment that prioritizes knowledge production, and revenue generation (Becher, Trowler, 2001; Slaughter & Rhoades, 2004). Whether or not an institution undergoes a successful transition is largely dictated by whether or not, “The core academic units have adopted an entrepreneurial ethos (Gjerding, et. al, 2006, p. 85).” This collective support can contribute to a culture that fosters academic vitality and financial growth (Clark, 1998; Slaughter & Rhoades, 2004; Gjerding, et. al, 2006; Etzkowitz & Leydesdorf, 2000).

**Institutional Competition and Curriculum Changes**

Academic Capitalism has reignited the debate over curricular changes, but the discourse between proponents of classical curriculums versus advocates of progressive change has existed for almost two centuries. The debate can be traced back at least as far as Thomas Jefferson, who attempted to transform William and Mary into a university by embracing non-traditional disciplines in the 1770’s. This eventually led to his later developed “experimental curriculum (Thelin, 2004; Pak, 2008, p. 30).” George Tickner advocated for making classical-languages an elective, as opposed to a requirement (Pak, 2008). Opponents of change used the 1828 Yale Report (1828) to argue in favor of a classical program of study instead of modernized and professionalized programs (Pak, 2008). During the 1880’s, professors of established liberal arts disciplines at the University of Pennsylvania rejected proposals to invite new departments like history,
government, & economics into their ranks; they would later joining the newly founded Wharton School (Thelin, 2004).

While a different context has emerged for the evolution of curriculum, the fundamental arguments for and against changes to it remain the same. Some believe that more professional and applied programs better equip students to succeed, and help to provide the skilled labor necessary for economic growth. Others in favor of a more traditional, liberal arts education believe that such a program creates well-rounded students who contribute to society in diverse ways. Some believe that liberal arts do not prepare students for professional careers. Other studies suggest that students do not see the value of having a broad knowledge base despite its potential benefits (Diconti, 2004). This, and a continued movement towards outcomes has led to an increase in the number of practical-arts, and occupationally oriented programs. This market-driven shift is a reaction to labor demands, growing influences to produce employable, value-adding skills, and external oversight agents that emphasize outcomes and efficiency (Brint, 2005; Carnevale, Smith, & Strohl, 2010; Lane, 2007).

This shift towards offerings that emphasize employable skill sets, or the market shapes causes institutions to, “risk its key resource, its intellectual capital (Barnett, 2005, p. 53).” Some members of an institution may believe that any unnecessary risk of intellectual and academic capital is not worthwhile (Bok, 2003). Administrators who plan to take such risks must proceed with caution; a failure to respect and include faculty can have grave consequences due to a hyper-competitive environment. According to Barnett (2005), institutions can alienate faculty by asking them to create or design market-sensitive courses. Internal and external stakeholders must proceed with such
attempts with a high degree of caution, even though change is evident. This migration of academic programs towards applied fields has been pronounced enough to warrant changes in the Carnegie Classification Frameworks; which distinguish between liberal arts, and the reality of curriculum and pedagogy.

“Although the criteria for subcategories are unchanged from the 2000 edition, we have discontinued the use of the “Liberal Arts” terminology in favor of a term that more transparently describes the classification criteria. (Both “liberal arts college” and “liberal arts education” signify more than undergraduates’ major field concentration.) (Carnegie Classification Descriptions).”

Striking a balance, or melding programmatic offerings between career education and general studies demonstrates that institutions are working to blur disciplinary boundaries just as those between sectors have been blurred. The emergence of cross-disciplinary fields are intended to satisfy the need for specialized pre-professional education with traditional general studies, but how institutions will reconcile actual disciplines, and conferrals remains largely unsettled (DiConti, 2004). The integration of liberal arts into science and technology fields and vice versa, the growing importance of research, and the emergence of applied experiences are just some currently existing recommendations for the evolution of pedagogy and curriculums. Incorporating research into education would seemingly benefit more with a focus on such activities. However, studies have found that traditionally liberal arts colleges provide their undergraduates with equal, if not greater opportunity for research (Hu, Kuh & Gayles, 2007). This signals that institutions are adapting to a certain degree, without losing their full institutional identities; despite the lowering of traditional barriers between disciplines for a more modernized academic heartland (Bourdieu, 1988; Trow, 1984).

Institutions with disciplines in science, technology, applied, and professional
fields are well positioned to use the current social, political, and economic conditions to build economic, political, and intellectual capital (Marginson, 2007). Since the publication of the *Endless Frontier*, a predisposition has emerged to emphasize and reward the research activities of institutions—with techno-science backgrounds—due to their ability to participate in and produce scientific, and commercializable research and development. These activities continue to garner a growing share of investments into higher education. “Publicly and privately supported colleges and universities and endowed research institutes (Bush, 1945),” provided the most fertile ground for fast and effective innovation and new scientific knowledge (Laffollette, 1994). Today, research institutions have become a primary conduit for innovation in a neoliberal economy that has worked to create lower walls between its various sectors (Olssen & Peters, 2005).

The number of staff members at Organizational Research Units in 100 American Universities revealed an enormous disparity between STEM (Science, Technology, Engineering, & Mathematics) fields, and social science and humanities fields (Etzkowitz & Kemelgor, 1998).¹⁵ The embedded tendency to reward research and conferment of degrees in particular fields has incentivized research production (Bok, 2003).

For other institutions more entrenched in traditional disciplines, evolving programmatic offerings does pose risks to the capital and status such programs bring (Brint, 2005). However, institutions with more traditional programs are making efforts to create greater numbers of interdisciplinary research centers in higher education, which also involves the hybridization of programmatic offerings (Kelderman, 2010). This has

¹⁵ A total of 53 social scientists, and 15 humanities personnel were staffed within Organizational Research Units, in comparison to 645 Agricultural, 129 Engineering, and 108 Medical or Dentistry employees.
led to the emergence of new fields that are asymmetrical in nature, and that focus on the intersections of various sciences. These fields possess the ability to, “Innovate in all domains of social and economic life (Etzkowitz & Leydesdorf, 2000, p. 208).” This popularization of more generalized, multi-disciplinary fields does present opportunities for innovation and change. There may be higher intellectual capital risks; for these institutions, creating courses that connect content with its real world application is a pivotal part of avoiding marginalization or loss of capital (Diconti, 2004). This risk may be higher for institutions with more traditional curriculums, as opposed to schools with applied and technical programs (Marginson, 2007; Lane, 2000; Bourdieu, 1988; Trow, 1984). These varying degrees of risk lead to different types of entrepreneurial posturing by institutions. The following chapter will detail the methods used to measure and analyze patterns in entrepreneurship in the academic heartland. It contains a description of the study; including the methodology, and identification of independent, control, and dependent variables.
CHAPTER III: METHODOLOGY

Description of the Research Design

While research on entrepreneurship in higher education is growing, there have yet to be empirical measurements of such activity in the core academic functions of institutions (Shane & Venkataraman, 2000; Mars & Metcalfe, 2009). If entrepreneurship exists in the academic heartland, it is likely that increases and decreases in academic programs reflect it (Clark, 1998; Bok, 2003; Thelin, 2004; Brint, 2005). The purpose of this study is to measure entrepreneurship in the academic heartland, and to understand how different types of institutions demonstrate such behavior differently.

A multivariate, longitudinal, quantitative analysis was undertaken to measure entrepreneurship in the academic heartland. This led to the development of new metrics that captured adaptation and change. Much of the activity within the academic heartland (e.g., curriculum design, teaching skills, and learning outcomes) is difficult to measure and compare in a national context. To study this change, it was necessary to find metrics of a national scope, and that allowed for inferences about entrepreneurial activity in the academic heartland. In order to accomplish this, entrepreneurship in the academic heartland was measured using secondary source data—specifically, classification of instructional program (CIP) codes—that were collected utilizing the Integrated Postsecondary Data Analysis System (IPEDS), which was provided by the National Center for Educational Statistics (NCES). These CIP codes—which are a taxonomic scheme of codes that represent a field of study that a degree or certificate was conferred in—were collected in order to tabulate the number of unique new and discontinued conferral fields awarded by each institution between the academic years 2004-05 and
Five measurements of the change in conferral fields were calculated using CIP code data. The new variables included the net, absolute value, and percentage change in unique CIP code conferral fields; these variables were based on the difference between 2004-05 and 2008-09, and allow for broader patterns to be revealed. The variables net and total entrepreneurship were also created, which take into account year-to-year changes from 2004-05 through 2008-09. Analyses secondary to this study used data derived from the United States Patent and Trademark Office (USPTO), and the Bureau of Labor Statistics (BLS).

Table 1 provides a metric that illustrates how new and discontinued CIP code conferral fields were defined for this study. Table 2 illustrates how each new measure of academic entrepreneurship was calculated using CIP code conferral fields. A new CIP code conferral field is one that did not appear in the first year of analysis (2004-05), and is considered new during the first year it occurs. This is an important limitation to note, as 2004-05 was used as a benchmark year. Programs that were not awarded are assumed to be new the first year it appears during the time frame studied. A disbanded CIP code conferral field is one that appeared in any or all of the first three academic years that were analyzed (2004-05, 2005-06, and 2006-07) that was not reported in both of the last two years studied (2007-08, and 2008-09). Left as is, the definitions of new and disbanded conferral fields would allow for the possibility of fields that are simultaneously new, and discontinued. These programs—a total of 336—were flagged, and removed to produce measures that more accurately reflect changes in academic programs.
To determine if institutions demonstrated differences in academic entrepreneurship based on their unique characteristics, a variety of classification frameworks were used. These included institution size, sector, land-grant status, region, and degree of urbanicity. Additional Carnegie Classifications were used in this study—these include the basic classification, undergraduate instructional program profile, and undergraduate profile—provide a framework to help illustrate institutional diversity in the United States postsecondary education system. The Carnegie Foundation has created 6 different classifications; each being designed to provide a diverse picture of institutions. The following section defines these three frameworks.

**Carnegie Classification Basic**

The basic classification framework was designed to separate institutions based on the number, and type of degrees conferred. For the purposes of this study, three subgroups were analyzed. These included: Research Universities-Very High Research Activity, Masters Colleges-Medium Programs, and Baccalaureate Colleges Arts and Sciences (Classification Descriptions, 2010).

**Research Universities-Very High Research Activity** institutions are classified as such based on number of characteristics. An institution must award more than 20 doctoral degrees (non-professional and first-professional terminal degrees are not included). *Level of Research Activity* is another key feature, which is based on two indexes of research activity; one is based on aggregate level of research, and the other on per-capita research activity. Research institutions are classified as Very High Research Activity, if they scored highly on either research index. Institutions were considered **Master’s Colleges** if they awarded fewer than 20 doctorates (as defined above), and
more than 50 master’s degrees. They were considered Medium Program schools if they awarded between 100-199 Master’s degrees (Classification Descriptions, 2010).

If a minimum of 10% of the degrees or certificates conferred by an institution were at the baccalaureate level, fewer than 50 Master’s degrees were awarded, and the school was not a Tribal or Special-Focus institution, then it was classified as a

**Baccalaureate College.** To be considered Arts and Sciences, IPEDS data concerning degree conferrals—the same CIP codes used in this study—were used to map the concentration of arts and sciences degrees versus professions degrees (Classification Descriptions, 2010).

**Carnegie Classification Undergraduate Instructional Program Profile**

This framework emphasizes the orientation of the undergraduate education being provided by the institution because it is considered to be a core function of the academy. This profile is based on three pieces of information: the level of undergraduate degree awarded (associates or baccalaureate), the proportion of degrees that were in arts and sciences related fields versus professions focused fields, and how closely the fields in which undergraduate and graduate degree fields mirror one another. The Carnegie Foundation has distinguished between the concentration of Arts and Sciences and professional fields for over 20 years. For the purposes of this study, the 2 Undergraduate Instructional Program profiles that are Associates-oriented were excluded (due to community colleges being excluded from this study). This left 6 Instructional Program Profiles that were arts and sciences focused, 3 that were balanced in the concentration of arts and sciences and professions programs, and 6 categories of professions-focused
programs. To consolidate, these were condensed into three categories: arts and sciences focused, balanced, and professions focused (Classification Descriptions, 2010).

For a program to be considered **Arts and Sciences focused**, at least 60% of the bachelor’s degree majors were in the arts and sciences fields. **Balanced** institutions had between 41-59% of all bachelor’s degrees awarded in each field. **Professions** focused schools had at least 60% of all bachelor’s degrees awarded in fields such as business, education, engineering, health, and social work (Classification Descriptions, 2010).

**Carnegie Classification Undergraduate Profile**

According to the Carnegie Foundation, the Undergraduate Profile classification framework is based on three characteristics: the proportion of undergraduate students who are attending part or full-time; achievement characteristics of first-year, first-time students; and the proportion of entering students who transfer in from another institution. This was done in an attempt to differentiate between undergraduate student populations, and how schools may serve them. The four subgroups that are used to describe two-year colleges were excluded because community colleges were not included in this analysis (Classification Descriptions, 2010).

The remaining categories were divided into 3 groups based on percentage of full-time enrollment. Institutions were classified as **Medium Full-Time** if the percentage of full-time enrolled students was between 60-79% of the undergraduate student population. Schools were classified as **Full-Time** if the proportion of the undergraduate student population enrolled full-time was over 80%. A third group was created that included institutions that were not classified, and not applicable (Classification Descriptions, 2010).
Table 1: Guide, New & Discontinued CIP Code Conferrals 2004-05 Thru 2008-09

<table>
<thead>
<tr>
<th></th>
<th>Present in 04-05?</th>
<th>Present in 05-06?</th>
<th>Present in 06-07?</th>
<th>Present in 07-08?</th>
<th>Present in 08-09?</th>
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<tbody>
<tr>
<td>New Programs in 05-06</td>
<td>N</td>
<td>Y</td>
<td>NA*</td>
<td>NA*</td>
<td>NA*</td>
</tr>
<tr>
<td>New Programs in 06-07</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>NA*</td>
<td>NA*</td>
</tr>
<tr>
<td>New Programs in 07-08</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>NA*</td>
</tr>
<tr>
<td>New Programs in 08-09</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Discontinued CIP code</td>
<td>Y**</td>
<td>Y**</td>
<td>Y**</td>
<td>N</td>
<td>N</td>
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<tr>
<td>conferrals</td>
<td></td>
<td></td>
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</tbody>
</table>

* Not applicable as the first year a program appears is the year it is designated as new.

**In order for a CIP code to be considered 'Discontinued' it must appear in one, two, or all of these years. A total of 336 programs were removed for appearing as both new, and disbanded.
<table>
<thead>
<tr>
<th>Variable Name</th>
<th>How it is Tabulated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Net Change</strong></td>
<td>The net change is calculated by subtracting the total number of unique CIP code conferrals in 2004-05 from the total number of unique CIP code conferrals in 2008-09.</td>
</tr>
<tr>
<td><strong>Percentage Change</strong></td>
<td>This variable is calculated by subtracting the total number of unique CIP code conferrals in 2004-05 from the number of unique CIP code conferrals in 2008-09. This difference is then divided by the number of unique CIP Code conferrals in 2004-05, and multiplied by 100 to determine the percentage change.</td>
</tr>
<tr>
<td><strong>Absolute Value Change</strong></td>
<td>To calculate this variable, the total number of unique CIP code conferrals from 2004-05 was subtracted from the total number of unique CIP code conferrals in 2008-09. The absolute value of this difference was then determined.</td>
</tr>
<tr>
<td><strong>Net Entrepreneurship</strong>*</td>
<td>In each academic year (except 04-05 due to its use as a benchmark year), the number of new unique CIP code conferrals was calculated and added together. After this calculation, that sum was subtracted by the number of disbanded CIP code conferrals (those which were not awarded in years 08 or 09 after being previously awarded) to create the difference, which is net entrepreneurship.</td>
</tr>
<tr>
<td><strong>Total Entrepreneurship</strong>*</td>
<td>In each academic year (except 04-05 due to its use as a benchmark year), the number of new unique CIP code conferrals was calculated and added together. After this calculation, the number of disbanded CIP code conferrals (those which were not awarded in years 06 or 07 after being previously awarded) was calculated. Then the absolute value of both these calculations was added together to create total entrepreneurship.</td>
</tr>
</tbody>
</table>

* In these variables, programs that appeared as both new and disbanded were removed using filters to provide more accurate measures of programmatic change. To create the most accurate measures of academic entrepreneurship, 336 programs were removed from the calculation of these variables.
These variables were constructed to measure entrepreneurship in the academic heartland, so that the following research questions and hypotheses could be explored:

**Question 1**

1) *Do relationships exist between Carnegie Classification-Basic, Institution Sector, Carnegie Classification-Undergraduate Instructional Program Profile, and entrepreneurship in the academic heartland, which was measured by the change in the amount of unique CIP code conferral fields between academic years 2004-05 and 2008-09?*

This question is based on the hypothesis that the Institutional classification and categorization frameworks *Carnegie Classification-Basic, Institution Sector,* and *Carnegie Classification-Undergraduate Instructional Program Profile* do help explain the variance in the total net, absolute value, and percentage change in unique CIP code conferral fields between 2004-05, and 2008-09.

**Hypotheses, Question 1**

1a) *Carnegie Classification-Basic subgroups do impact the net, percentage, and absolute value change in unique CIP Code conferral fields between 2004-05, and 2008-09. It is hypothesized that institutions that are classified as Research Universities, Very High Activity, will demonstrate greater positive change in the net, percentage, and absolute value change in unique CIP code conferral fields in comparison to institutions that are classified as Masters colleges-Medium Programs, and Baccalaureate Colleges-Arts & Sciences.*

1b) *Institution Sector does impact the net, percentage, and absolute value change in unique CIP code conferral fields between 2004-05, and 2008-09. Institutions that are*
classified as *Private, Not-For-Profit, 4-Year and Above* will demonstrate greater positive change than institutions that are classified as *Public, 4-Year and Above*.

Tuition and fees continue to rise at both public and private institutions; however, public institutions have lower tuitions that are rising at a slower pace in comparison to private institutions—due to higher levels of public subsidy.\(^\text{16}\) This has led to a growing price burden that naturally steers students towards less expensive, public institutions (Farrell, 2005). Public institutions generally have larger enrollment sizes, which may enable these institutions to rely on perceived value rather than innovation in academic programs (Claar & Scott, 2007; Brint, 2005). This could create a competitive disadvantage for private institutions—due to increasing divide between the cost of a public and private higher education—that may be difficult for private institutions to overcome. The average net cost for public institutions increased 5% between 2003-2004, whereas it increased 10% at private, four-year colleges (Farrell, 2005). Due to disadvantages when it comes to tuition and net price, private institutions may be more active in their use of fields of study in order to be more market responsive. Moreover, there are fewer layers of bureaucracy present in private, not-for-profit institutions versus public colleges and universities (Altbach *et al.*, 2010; Brint, 2005). This provides the basis for the hypothesis that private, not-for-profit institutions would demonstrate greater academic entrepreneurship between 2004-05, and 2008-09.

1c) Carnegie Classification-Instructional Program Profiles do impact the net, percentage, and absolute value change in unique CIP code conferral fields between

\(^{16}\) In the 2005-6 academic year, average tuition and fees at four-year public colleges rose by $365, to $5,491, per year…and tuition and fees at four-year private nonprofit institutions rose by $1,190, to an average of $29,026 (Farrell, 2005, p. A1).
Institutions with Instructional program profiles that are
*Professions-focused* will demonstrate more positive change in the net, percentage, and absolute value change in unique CIP code conferral fields than institutions with instructional program profiles that are *Arts and Sciences-Focused, or Balanced in Arts and Sciences* and *Professions-degree focus*.

Brint’s (2005) quantitative analysis found that selective, baccalaureate colleges and institutions with strong academic profiles would be more likely to support arts and sciences. This may be attributed to a variety of factors, one of which is institutional status (Trow, 1984). Institutions that have attained greater levels of capital and prestige may be more risk averse, as they may be unwilling to risk what has already been earned (Marginson, 2007; Brint, 2005; Trow; 1985). This led to the hypothesis that research oriented institutions were more likely to be more entrepreneurial, as they was more likely to cater to stakeholder demands that influence the creation of professional programs (Ehrenberg, 2007).

**Question 2**

2) *Do relationships exist between net entrepreneurship, total entrepreneurship between 2004-05, and 2008-09, and Carnegie Classification-Basic, Institution Sector, and Carnegie Classification-Undergraduate Instructional Program Profile?* This question is based on the hypothesis that Institutional classification and categorization frameworks *Carnegie Classification-Basic, Institution Sector, and Carnegie Classification-Undergraduate Instructional Program Profile* do help explain the variance in net and total entrepreneurship between 2004-05, and 2008-09.
Hypotheses, Question 2

2a) Carnegie Classification-Basic subgroups do impact net and total entrepreneurship between 2004-05, and 2008-09. It is hypothesized that institutions that are classified as *Research Universities-Very High Activity*, will demonstrate greater positive change in net and total entrepreneurship in comparison to institutions that are classified as *Masters colleges-Medium Programs*, and *Baccalaureate Colleges-Arts & Sciences*.

2b) Institution Sector does impact net and total entrepreneurship between 2004-05, and 2008-09. Institutions that are classified as Private, Not-For-Profit, 4-Year and Above will demonstrate greater positive change in net and total entrepreneurship than institutions that are classified as Public, 4-Year and Above.

*Private, not-for-profit institutions* could possess greater organizational freedom due to less oversight, smaller bureaucracy, and less financial support from the state in comparison to *public institutions* (Lane & Brown, 2004; Heller, 2006). This may push *private, not-for-profit* institutions to adapt and change to market demands faster than their *public* counterparts, because they may be more reliant on adaptation and innovation in areas that can be potentially commoditized. As a result, *private, not-for-profit institutions* are hypothesized to demonstrate greater levels of net, and total entrepreneurship between 2004-05 and 2008-09.

2c) Carnegie Classification-Instructional Program Profiles do impact net and total entrepreneurship between 2004-05, and 2008-09. Institutions with Instructional program profiles that are *Professions-focused* will demonstrate more positive change in net and
total entrepreneurship than institutions with instructional program profiles that are *Arts and Sciences-Focused*, or *Balanced in Arts and Sciences and Professions* degree focus.

Institutions are shifting their programmatic offerings to reflect growing and changing labor demands from actors within the triple-helix (Etzkowitz & Leydesdorf, 2000; Brint, 2005). More applied programs are usually supported by institutions that are more inclusive, and which have weaker academic profiles. This could lead to institutions that are more *research-oriented*, and less traditional in their academic profiles to demonstrate greater degrees of change in net and absolute values of entrepreneurship (Trow, 1984; Marginson, 2007; Brint, 2005). This leads to the hypotheses that institutions that are *Research-oriented*, and who have more *professions oriented program-profiles* will see greater change in net and total entrepreneurship between 2004-05, and 2008-09.

3) *Do patterns exist between the type of new and discontinued degree fields with conferrals between 2004-05, and 2008-09?* This question is based on the hypothesis that there are patterns that exist in the type of new and discontinued degree and certificate conferral fields between 2004-05, and 2008-09.

3a) Patterns exist in the type of new and discontinued degree and certificate conferral fields between 2004-05, and 2008-09. Institutions examined in this study will demonstrate a tendency to add and discontinue more occupational and applied programs.

Research regarding the shift from practical to liberal arts found that selective, baccalaureate-granting institutions, and institutions with strong academic profiles provided, “the core of support for the arts and sciences, while nonselective baccalaureate granting institutions, master’s granting institutions, and other institutions with weaker
academic profiles are the core of support for occupational-professional education (Brint, 2005, p. 170).” Factors that include status and prestige may influence this (Trow, 1984). As a result, internal institutional factors, such as faculty and disciplines, may preserve traditional degrees, while resisting the addition of new ones (Thelin, 2004; Townsend, 2009).

In addition, institutions with more capital and prestige may be less willing to adapt and risk losing capital and status that may already have been earned (Marginson, 2007; Brint, 2005; Trow; 1985). This may make more traditional, arts and sciences oriented institutions less likely to add or drop programs. This leads to the hypothesis that programs that are more occupational and applied in scope will be more likely to be added and dropped. They may be more sensitive to demands, and could change faster. This could be due to less longevity and prestige in comparison to more traditional programs, which requires such institutions to be more responsive.

**Description of Population**

Using the 2010 Integrated Postsecondary Data Survey “EZ” group tool18, a total of 535 institutions were selected for analysis in this study. The criteria for selection were designed to allow for the analysis of diverse institutions. Public, 4-year and above, and private, not-for-profit, 4-year and above institutions that were classified within one of three different Carnegie Classification-Basic subgroups, which included: Research

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17 The year chosen to select these institutions was 2010.

18 According the NCES supplied IPEDS user manual, the EZ group tool is a selection tool that “Allows you to quickly create an Institution Group based on one or more frequently used criteria such as sector of institution, geographic location, or specialized educational mission (e.g. Historically Black College or University, Tribal College, etc.) (IPEDS User Manual, 9).”
Specific schools that were excluded from this study included for-profit institutions, and two-year institutions. This is because these organizations encounter vastly different environments, or have organizational models that inherently differ from public, or not-for-profit private institutions. According to Hansmann (1980), not-for-profit organizations are unable to distribute profits to those who run the organization. While these organizations are able to offer fair compensation for labor, they are unable to distribute net earnings or accounting surpluses to organizational leaders. Instead, “Net earnings, if any, must be retained and devoted entirely to financing further production of the services that the organization was formed to provide (Hansmann, 1980, p. 835).” For this reason, for-profit institutions were excluded; they are able their use profit-based decision procedures to dictate organizational actions. This happens within the context of vastly different social, political, and economic conditions when compared to their not-for-profit competitors (Kinser, 2007).

Associate-degree granting institutions were omitted from this study. Community colleges are experiencing, “Increasingly aggressive competition from for-profit institutions, many of which are specifically targeting students attending 2-year schools, and are threatening the existence of the community college (Abelman & Dalessandro, 2008, p. 307).” In one study, significant differences were found between the types of mission and vision statements of 2- and 4-year schools. Additionally, the linguistic components of these statements suggest that community colleges are more explicit about their objectives, which were found to be, “More in line with the vision statements of
proprietary schools, which push market-driven outcomes or emphasize the prospects for employment over academic preparation (Ableman & Dalessandro, 2008, p. 321).” This distinct organizational nature led to their exclusion from this study (Levin, 2001; Downey et al., 2006).

**Independent Variables**

A variety of independent variables were chosen because of their potential ability to offer explanation for the variance in the new measures of academic entrepreneurship. These included *Carnegie Classification-Basic, Institution Sector, and Carnegie Classification-Undergraduate Instructional Program Profile*.

*Carnegie Classification-Basic* was used as an independent variable for this study. Recently modified in 2005, the alterations to the Carnegie Classification Frameworks are better able to account for the variance in learning and engagement outcomes (McCormick, *et. al.*, 2009).19 Within those different classifications, three subgroups were chosen, which include Baccalaureate Colleges-Arts and Sciences, Masters Colleges and Institutions-Medium Programs, and Research Universities-Very High Research Activity. These three were chosen to examine if research oriented institutions were more effective at offering a greater diversity of academic programs that can engage students in a knowledge economy than schools with traditional academic programs. The Boyer Commission report (1998) espoused the position that research-oriented universities, “are uniquely positioned to offer an undergraduate education that takes advantage of the immense resources of their research and graduate programs (Katkin, 2003, p. 24)”

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19 The new basic classification was able to account for 20-30% of the variance in student learning and engagement. This greater accuracy is attributed to the timing of observation of the underlying classification criteria (McCormick, *et.al.*, 2009, p.160).
Institutional sector was also chosen as an independent variable, because private schools tend to be less constrained by organizational structure and are able to maneuver in a more nimble fashion than public institutions. This greater degree of freedom enables private institutions to create opportunities faster than public schools due to a, “Demand absorbing,” nature (Altbach, et. al., 2010, p. 34). In addition, public institutions may have to deal with higher levels of bureaucracy, influence, and pressure from external stakeholders such as oversight committees (Lane, 2007). This may hinder the ability of institutions to adapt in a manner timely enough to compete or create a sustainable advantage in comparison to private institutions.

Carnegie Classification-Instructional Program Profile was chosen as an independent variable due to its ability to reflect general trends in academic program changes. This classification framework separates institutions using the concentration of arts and sciences degrees vs. professional oriented degrees, and the degree of graduate program coexistence within the institution. By including this as an independent variable, significant findings could reveal differences between traditional arts and sciences programs, and more professional, applied programs. While not identical, this could mirror changes that Brint (2005) describes as a shift from liberal to practical arts.

Control Variables

Following the selection of independent variables, numerous control variables were selected. These variables were used in this study because they may also impact the nature and degree of academic entrepreneurship.

Carnegie Classification-Undergraduate Profile were chosen as a control variable
for its potential to enhance the ability of this study by reflecting student engagement and learning outcomes across a variety of institutions (McCormick, et. al., 2009). In addition to the new Classifications enhanced ability to predict engagement and learning outcomes, they allow for a broader understanding of what influences academic entrepreneurship (Pulley, 2005). These classifications provide for greater incisiveness when looking to compare groups of institutions, which is ideal for this study (McCormick et al., 2009). The additional information these frameworks provide regarding selectivity, inclusivity, concentrations of part-time versus full-time students, and research versus degree focus helps to explain potential variances in the change in the amount of degree conferrals. For example, selectivity can impact the primary disciplines of study that an institution offers (Brint, 2005).

Enrollment size was also chosen, as schools with high student populations have more human capital that could potentially attract private and government interests. This may ultimately increase the opportunities to create relationships between the stakeholders involved in the triple-helix, and subsequently, the entrepreneurial activities of a particular institution (Audretsch, 2005). Additionally, it can further enhance an institutions ability to cultivate student-actors in the knowledge economy (Mars, Slaughter & Rhoades, 2008). Campus size measurements based on enrollment can provide functional measures

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20 In addition to the new basic classification was able to account for 20-30% of the variance in student learning and engagement, the new classification variables helped to account for 25-45% of the variation (McCormick, et al., 2009).

21 The new Classification frameworks offer the ability to add greater analytical depth to institutional research. “There are 7 enrollment types, 13 designations for undergraduate-student profile, 17 types each of undergraduate instructional programs and size-and-setting profiles, and 18 designations for graduate instructional programs (Pulley, 2005).” As a result, 186,624 different combinations can be attained using the new CC classifications (Pulley, 2005).

22 Classification frameworks are inherently limited in their ability to reveal more sophisticated methodological approaches to more institution specific questions (McCormick et al., 2009).
that could reflect more diverse programs (Brint, 2005).

*Region and degree of urbanicity* were chosen as control variables. Localized factors can play a pivotal role in changing the behaviors of institutions due to access to cultural (new ideas, innovative thought), social (more diverse populations of students), intellectual, and economic capital (Marginson, 2007; Deem, 2001). Access to these forms of capital, and a presence at the crossroads of local, regional, and global economies may provide some institutions with greater entrepreneurial opportunities in comparison to those that are more isolated from population-dense areas. This may lead to more adaptable organizations, from management structure to academic programs (Deem 2001; Brint, 2005).

In addition, the *land-grant status* of an institution was chosen as a control variable. Land grant institutions are, “a well-recognized subset of institutions uniquely oriented toward applying knowledge to address directly social and economic problems (Cote & Cote, 1993, p. 55),” and as a result, are more likely to be focused on specific degree types based on their applied content (Cote & Cote, 1993; Brint, 2005). These control variables were chosen due to their ability to influence the dependent variables, as well as provide insight into what Lane and Brown (2004) refer to as an institutions, “fahrvergnügen (Lane & Brown, 2004, p. 100),” which is a schools own unique identity, culture, and characteristics.

The following graphs contain distribution and frequency information for the Independent and dependent variables.
Chart 2: Frequencies, CC-Basic

% Frequencies, CC-Basic

- Research Universities-Very High Research Activity: 50%
- Masters Colleges-Medium Programs: 18%
- Baccalaureate Colleges-Arts & Sciences: 32%

Frequencies, CC-Basic

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Research Universities-Very High Research Activity</th>
<th>Masters Colleges-Medium Programs</th>
<th>Baccalaureate Colleges-Arts &amp; Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>96</td>
<td></td>
<td>169</td>
<td>270</td>
</tr>
</tbody>
</table>
Chart 3: Frequencies, Institution Sector

- Public, 4-Year & Above: 31%
- Private, Not-For-Profit: 69%

Bar Graph:
- Public, 4-Year & Above: 165
- Private, Not-For-Profit: 370

Legend:
- Blue: Number of Institutions

- Blue: Public, 4-Year & Above
- Green: Private, Not-For-Profit
Chart 4: Frequencies, CC Undergraduate Instructional Program Profile

Frequencies: CCUIP

- Category: 1%
- Arts & Sciences Focused: 17%
- Balanced: 32%
- Professions Focused: 51%
- Not Classified: 1%

Frequencies: CC-UIP

- Category: 90
- Arts & Sciences Focused: 271
- Balanced: 171
- Professions Focused: 90
- Not Classified: 3
Patent Data

Following regression analysis, the number of patents assigned to each institution between 2002-03, and 2006-07 were tabulated. This was done to see if correlations exist between new measurements of academic entrepreneurship—calculated between 2004-05 and 2008-09—and the number of patents assigned to an institution from 2002-03 thru 2006-07. Beginning in the 1980s, legislation influenced the development of greater inter-sector collaboration; this significantly impacted the nature of entrepreneurship in higher education. “University administrators and faculty members were well aware that strengthened intellectual property protection made patentable knowledge more valuable (Slaughter & Rhoades, 2004, p. 7).” In addition, it has led to increasing competition for institutional status between disciplines, while fostering greater collaboration in order to satisfy new market demands that have arisen due to blurred sector boundaries, which could influence programmatic offerings (Trow, 1984; Brint 2005; Etzkowitz & Leydesdorf, 2000). This was accomplished to determine whether or not more traditionally used indicators of entrepreneurship—intellectual property, and research—and academic entrepreneurship were complementary or redundant. The section below details the collection of patent data from the USPTO.

Data regarding the number of patents for each institution was collected from patft.uspto.gov. This data is made available from the United States Patent and Trademark Office (USPTO), which is an agency of the U.S. Department of Commerce. There, advanced searches were ran for each institution using a specific query function that is as follows: AN/"BOSTON UNIVERSITY" AND ISD/8/1/2002->8/1/2007 AND IC/“BOSTON”, where AN means Assignee name, ISD refers to the issue date, and IC refers
to the Inventor City. For each of the 535 institutions being analyzed in this study, the number of patents filed between August 1\textsuperscript{st}, 2002, and July 31\textsuperscript{st}, 2007. These dates were chosen based on CIP reporting guidelines that account for degrees awarded between the academic years 2002-03 and 2006-07, which begin in August for each reporting year (Classification of Instructional Programs: 2000 Edition).\textsuperscript{23}

To ensure accurate patent assignment data, the USPTO listing of University Assignees was consulted.\textsuperscript{24} In some circumstances, multiple institutions were included under one umbrella agency. For example, All SUNY patents are filed under the Research Foundation of SUNY. To sort through this data, each patent was reviewed, and the patent was assigned to each institution based on the locality of the inventor. So, for example, if a patent was filed under the Research Foundation of SUNY, and the inventor city is in Buffalo, the patent is assigned to SUNY Buffalo. If the locality is unclear based on the inventor city, the listed inventor’s home institution is searched for, and the patent is assigned based on the findings of this search.

\textbf{Colinearity}

Colinearity occurs when there is a near-perfect or perfect relationship between some or all independent and control variables being used in a statistical model (Edwards, 1979). It means there may be a degree of repetitiveness between the independent and control variables chosen for the study. In order to create the most effective analysis of entrepreneurship in the academic heartland, the interactions between the independent and control variables needs to be analyzed to determine if colinearity exists. Pearson’s

\textsuperscript{23} Assistant Vice President for Institution Research, Planning, and Effectiveness, interview by author, Albany, NY, February 17 2011.

\textsuperscript{24} This can be found at: http://www.uspto.gov/web/offices/ac/ido/oeip/taf/univ/total_counts/univ_ct_list_2008.htm.
correlation test was utilized to examine the relationships between the independent and control variables. This correlation technique is, “a measure of the relationship between two variables while controlling the effect one or more additional variables has on both (Field, 2005, p. 740).” According to Kennedy (1985) colinearity becomes a problem if the correlation coefficient is above .9 at a statistically significant level. The correlation measurements revealed no correlation between independent and control variables above the .9 level. Please see Appendix A for more detailed correlation analyses.

**Dependent Variables**

The paradigm of the entrepreneurial university is structured around the ability of an institution to participate in social entrepreneurship (Mars & Metcalfe, 2009). Entrepreneurship has been ingrained into institutions for the most of the history of higher education in the United States (Drucker, 1985). While entrepreneurship may be clearly observable in higher education, its definition has for the most part, been elusive (Mars & Aguilar, 2010). This study represents an exploration of how entrepreneurship manifests itself in the academic realm of educational institutions.

While considering potential indicators of entrepreneurship in the academic heartland, numerous options were considered. Enrollment management statistics, graduation rates, and changes in core revenues and academic-oriented were expenses abandoned due to their ability to be manipulated in ways that may hyperbolize or create the illusion of improvement or even dilution of input and output quality (Dill & Soo, 2005; Ehrenberg, 2007; Hebel, 2007; Farrell, 2005).25

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25 For example private institutions may be matching their larger increases in tuition with larger investment into the academic enterprise in comparison to public institutions; who may not need to do so because of higher levels of inclusivity (Ehrenberg, 2007; Hebel, 2007; Farrell, 2005).
Change in fields of degree or certificate conferrals is an unused metric by which entrepreneurship may be measured (Mars & Aguilar, 2010). It is also a historical indicator of institutional adaptation to changing environments (Thelin, 2004; Brint, 2005; Yale Report, 1828). This led to the idea that CIP code conferral fields may be usable to measure entrepreneurship. Prior to adopting these codes, an investigation into their usefulness, and reliability was undertaken. Interviews were conducted with members of the National Center for Educational Statistics, which revealed that CIP codes are not a regulatory tool; thus, inconsistencies in individual and institutional reporting may arise. Still, CIP codes are the most detailed taxonomy of the degrees and certificates conferred by institutions at the national level, and could be used—if done carefully—to reveal macro patterns in adaptation and change (Interview, Bell).

Other interviews were conducted; one with an Assistant Vice President of Institutional Research (AVP) at a large public university that was classified as a Research University-Very High Research Activity, and another with the Registrar at a Private, Research University-Very High Activity. These interviews were conducted in order to understand the use of CIP codes at the individual-institutional level. The interview with the AVP revealed that for this particular system of public institutions, each individual institution’s Office of Institutional Research did not report CIP code conferrals to the National Center for Educational Statistics (NCES). Instead, a curriculum code detailing each degree conferral was reported to the central administrative governing board.

This statewide, central administrative unit uses a computer program that matches up a single institution’s program codes for which the degree is awarded with a crosswalk table. This crosswalk table contains the institutions identification code, and a curriculum
code assigned by the states higher education system administration. It is then used to convert the curriculum codes to the CIP code that most closely corresponds to the curricular content. In the event that a program and its curriculum changes in such a manner that requires reclassification or a new code altogether, the Office of Institutional Research, the Registrar’s Office, and upward to the Central Administrative Agency become involved. Through this process a need for a new code can be identified, and steps can be taken to create it.

The process for reporting degree and certificate conferrals described by the Registrar at the private institutions is different. In order for a CIP code to be created, it first takes upwards of 2-3 years of development by the department and the school within the new degree or certificate conferral program will be housed. During this time, the degree program is constructed using a combination of new courses, existing ones, and other institutional resources to demonstrate that the program will indeed meet both the institutions, and the states requirements. Following the construction of the program, the Provost’s Office will approve or disapprove the program before passing it to the President’s Office, who makes the final decision as to whether or not this program will be passed. The program is then sent to the state higher education department, where it is approved or sent back for revisions. Once it is approved, the Registrar and Director of Admissions review the description of the new program, and the definition of similar CIP codes. This is done to determine where the new program will be classified. The registrar noted this degree of interpretation was one limitation that should be considered when using or interpreting CIP code data, but that ultimately, “CIP codes bring a consistency to programs that program names by themselves do not allow for.” When asked for
elaboration, it was stated that, “Program names are where institutions get creative, in the sense that they try to market and vary what they offer to students.”

Ultimately, CIP codes were chosen as the core of these new measured of academic entrepreneurship. This was based on the information gathered from these interviews, NCES data collection measures, research into the reporting of degree and certificate conferral fields, and both contemporary and historical evidence of such fields adapting over time.

Relationships between government, public universities, and the private sector continue to grow in importance (Mars, Slaughter, & Rhoades, 2008). Institutions “realize the importance of developing new products so as to remain competitive in the marketplace . . . who do so through the development of new major fields of study (Sauer & O’Donnell, 2006, p. 136).” Major fields of study impact student goal commitments—which ultimately impact persistence and completion—and also provide opportunities for both institutions, and students to engage in new economic and entrepreneurial processes.

As these relationships flourish, institutions are finding new ways to adapt and evolve to meet the needs of society while attempting to preserve their core academic function of educating (Clark, 1998).

**Process of Creating Variables**

Creating measurements of entrepreneurship in the academic heartland that are based on the field of a degree or certificate conferral required substantial data collection, and manipulation. First, data was downloaded from the Integrated Postsecondary Data System (IPEDS) for academic years between 2004-05 and 2008-09. Within the files for each year, there were approximately 25,000 cases that represented every degree or
certificate that was conferred. Using the statistics program SPSS, each CIP code was assigned a value label that described the field of concentration in which the degree or certificate was conferred. Once each degree has its accurate label, each annual file needed to be organized in a way that the number of unique degree conferral fields could be aggregated.

After these academic years were merged, the task of tabulating and the number of unique fields of study in which degrees or certificates were conferred could be undertaken. This allowed for a review of the first three variables—the net change, percentage change, and absolute value change in unique CIP code conferrals between 2004-05, and 2008-09 (these variables just looked at the differences between these two years). The examination of these variables allowed for an understanding of broader trends; following this, more detailed analysis followed using the final two variables.

These variables—net and total entrepreneurship—examined the changes throughout the entirety of the time frame studied by looking more closely at year-to-year trends from 2004-05 thru 2008-09. To do this, the data file was manipulated in a way that filtered each CIP code based on: its year of origin in the data file, the number of years it appeared in the data file, the number of years it did not appear in the data file, and whether or not the program was discontinued during the time frame studied. This was achieved by creating filters in SPSS, which assigned dummy variables to each conferral code based on the aforementioned criteria. Those programs that appeared as both new, and disbanded during this time frame—a total of 336—were eliminated in order to create the most conservative calculations of academic entrepreneurship.
Each measurement of entrepreneurship in the academic heartland was then created using equation syntax. This allowed the subsequent use of multivariate techniques to analyze how these measures vary based on institutional characteristics.

Types of Variables

In this study, there nature of academic entrepreneurship was examined by measuring the changes in the number of unique degree and certificate conferral fields between 2004-05, and 2008-09.

Understanding general trends helps to guide more detailed analysis; as such, the first three variables—the net change, percentage change, and absolute value change in unique degree and certificate conferrals—were created by calculating the differences in unique conferrals fields between the first and last years of this study (2004-05, and 2008-09). This differs from the final two variables, net and total entrepreneurship, which are a continuous examination of conferral field changes in each of the academic years from 2004-05, thru 2008-09.

The first three variables allow a broad view of the changes occurring within this institution set. The final two variables allow for a deeper level of precision that requires further vetting. Together, these two variables provide complementary depth and breadth that enhances this study.

Methods of Analysis

In order to explore how academic entrepreneurship varies based on institutional characteristics, a variety of techniques were employed. The first method of analysis was
descriptive in nature. The distribution, and frequency statistics were collected for the subcategories in the independent and control variables.\textsuperscript{26}

Multiple regression analysis was then undertaken to examine the impact of different institutional categories, or classification frameworks—including Carnegie Classification-Basic, Institution Sector, and Carnegie Classification-Undergraduate Instructional Program Profile—on academic entrepreneurship between the academic years 2004-05 and 2008-09. Regression analysis is a quantitative tool that is used for modeling and analyzing several variables and their relationships. This technique is relevant because of its ability to demonstrate potential relationships between the institutional categories and classification frameworks, and the variation in the dependent variables, which includes the net, percentage and absolute value change in unique CIP code conferral fields between 2004-05, and 2008-09.

The following tables lists the variables used in the regression, as well as the composition of the constant. Table 3 provides a listing of the independent variables, and their organization within the parameters of the regression analyses. Table 4 provides the composition of the control variables used in the regression analyses. The following equations represent each regression

\textsuperscript{26} These include Carnegie Classification-Basic, Institution Sector, Carnegie Classification-Undergraduate Instructional Program Profile, Institution Size, Land-Grant Status, Carnegie Classification - Undergraduate Profile, Number of Patents assigned between, Region, Degree of Urbanicity, and the new measurements of Entrepreneurship in the Academic Heartland.
Net Change:
\[ y_i = \beta_0 + \beta_1(\text{carnegie classification basic}) + \beta_2(\text{control}) + \beta_3(\text{instructional program profile}) + \beta_4(\text{size}) + \beta_5(\text{undergraduate program profile}) + \beta_6(\text{land grant status}) + \beta_7(\text{region}) + \beta_8(\text{urbanicity}) + \epsilon_i \]

Percentage Change:
\[ y_i = \beta_0 + \beta_1(\text{carnegie classification basic}) + \beta_2(\text{control}) + \beta_3(\text{instructional program profile}) + \beta_4(\text{size}) + \beta_5(\text{undergraduate program profile}) + \beta_6(\text{land grant status}) + \beta_7(\text{region}) + \beta_8(\text{urbanicity}) + \epsilon_i \]

Absolute Value Change:
\[ y_i = \beta_0 + \beta_1(\text{carnegie classification basic}) + \beta_2(\text{control}) + \beta_3(\text{instructional program profile}) + \beta_4(\text{size}) + \beta_5(\text{undergraduate program profile}) + \beta_6(\text{land grant status}) + \beta_7(\text{region}) + \beta_8(\text{urbanicity}) + \epsilon_i \]

Net Entrepreneurship:
\[ y_i = \beta_0 + \beta_1(\text{carnegie classification basic}) + \beta_2(\text{control}) + \beta_3(\text{instructional program profile}) + \beta_4(\text{size}) + \beta_5(\text{undergraduate program profile}) + \beta_6(\text{land grant status}) + \beta_7(\text{region}) + \beta_8(\text{urbanicity}) + \epsilon_i \]

Total Entrepreneurship:
\[ y_i = \beta_0 + \beta_1(\text{carnegie classification basic}) + \beta_2(\text{control}) + \beta_3(\text{instructional program profile}) + \beta_4(\text{size}) + \beta_5(\text{undergraduate program profile}) + \beta_6(\text{land grant status}) + \beta_7(\text{region}) + \beta_8(\text{urbanicity}) + \epsilon_i \]
<table>
<thead>
<tr>
<th>Institutional Categorization &amp; Classification Frameworks</th>
<th>Subgroup Name</th>
<th>Name</th>
</tr>
</thead>
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<td>Private, Not-For-Profit, 4-Year &amp; Above</td>
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</tr>
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<td>Arts and Science Focus, High Graduate Coexistence</td>
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</tr>
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<td>Arts and Sciences Plus Professions, No Graduate Coexistence</td>
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<td>Professions Focus, High Graduate Coexistence</td>
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*Denotes variable used in the regression constant
### Table 4: Control Variables, Regression Analysis

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<tbody>
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<tr>
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<td>5,000-9,999</td>
<td>ISize2</td>
</tr>
<tr>
<td></td>
<td>10,000-19,999</td>
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<tr>
<td></td>
<td>20,000 and Above*</td>
<td>ISize3*</td>
</tr>
<tr>
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<td>Higher Part Time, 4 Year*</td>
<td>CCUGP1*</td>
</tr>
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<td></td>
<td>Medium, Full Time, 4 Year, Inclusive*</td>
<td>CCUGP1*</td>
</tr>
<tr>
<td></td>
<td>Medium, Full Time, 4 Year, Selective, Low Transfer In*</td>
<td>CCUGP1*</td>
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<td></td>
<td>Medium, Full Time, 4 Year, Selective, High Transfer In*</td>
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</tr>
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<td>Full Time, 4 Year, Inclusive</td>
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*Denotes variable used in the regression constant
Table 4 (Cont’d): Control Variables, Regression Analysis

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<td>City: Small*</td>
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<td>Not a Land Grant Institution*</td>
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<table>
<thead>
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</tr>
<tr>
<td></td>
<td>Great Lakes (IL IN MI OH WI)</td>
<td>Region2</td>
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<td></td>
<td>Plains (IA KS MN MO NE ND SD)</td>
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</tr>
<tr>
<td></td>
<td>Southwest (AZ NM OK TX)</td>
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<tr>
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<td>Rocky Mountains (CO ID MT UT WY)</td>
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<td></td>
<td>Southeast (AL AR FL GA KY LA MS NC SC TN VA WV)*</td>
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</table>

*Denotes variable used in the regression constant
Following this quantitative analysis, descriptive analysis of programs that were been added or subtracted in the studied timeframe will follow conferral field changes, and their parallels with occupational projections provided by the Bureau of Labor Statistics. It is important to note, that this analysis entailed a much less rigorous level of analysis. This was conducted by comparing—essentially, a simple eye-test, or gut-check—the added and disbanded conferral fields that made up net and total entrepreneurship to the occupational projections provided by the BLS Occupational Outlook. Furthermore, the measures net, and total entrepreneurship will be cross analyzed with patent assignment data collected from the United States Patent and Trademark Office. This will be done using Spearman’s Correlation techniques to determine if correlations exist between entrepreneurship in the academic heartland, and more contemporary notions of entrepreneurship that are based on research and intellectual property.

Limitations

After careful review of reporting files, conversations with representatives from the National Center for Educational Statistics (NCES), and with administrators who work extensively with CIP data, there were overlapping themes that need to be taken into consideration when analysis is undertaken. These include organizational reporting, methodological choices, and the nature of CIP data.

Organizational choices are important to take into consideration when using and analyzing CIP conferral data. Some institutions report CIP codes independently, whereas others report to larger administrative systems that can ultimately affect reporting standards and procedures. For example, separate interviews with a Registrar of a private
institution, and an Associate Vice President of Institutional Research at a large State University revealed very different methods of reporting degree and certificate conferrals.

**Human choice** is linked with organizational policies and actions. Depending on the person(s), the reporting of conferral fields how curriculum content is interpreted, institutional goals, and layers of bureaucracy involved in reporting can all influence the degree of standardization, and specificity of a particular conferral field code.

**Methodological choice** also plays a role in the degree of academic entrepreneurship that appears in the analyses. The decision to allow for conferral fields based on a hard number of degrees or certificates conferred—in this study a CIP field was included so long as it was reported, regardless of the number of degrees or certificates conferred—can impact the number of unique conferrals fields. Moreover, choosing to disallow programs that were both new and disbanded in the five-year time frame studied resulted in a reduction in the number of new, and discontinued conferrals. Thus, the degree of entrepreneurial behavior exhibited by institutions was reduced to take the most conservative approach to measuring adaptation and change.

**The nature of CIP conferrals** is also important to take into account. These conferral field codes do provide insight into the taxonomy and cataloging of degree and certificate conferrals at each institution, and they also allow for numerous degrees of analysis that would otherwise be impossible; there are no other databases that provide the depth, and breadth of degree conferral data that CIP codes do. However, theses codes are not an audit, nor are they a definitive regulatory tool on degree and certificate conferrals. This is important to note because it does allow for diverse reporting procedures, and
specificity standards. This requires careful attention and consideration when preparing and analyzing CIP data.

The nebulous nature of CIP codes and the diverse, ambiguous, or finite choices of both researcher and organizations likely influence variance in degree and certificate conferral fields, and must be taken into account for. Steps have been taken to account for these issues in order to limit the impact that such a subjective reporting process can have on the validity of the data.

The NCES representative, Registrar, and Associate Vice President of Research all echoed that such data must be cautiously interpreted, but that it would likely yield insight into changes in conferral fields, particularly, at the macro level.

Another limitation of this study is that it does not attempt to reconstruct an entire historical account of added and disbanded degree and certificate conferral fields; leading to metrics that are limited in their historical foundations. The resulting analysis used the year 2004-05 as a benchmark for conferrals considered new in 2008-09. This may result in what the NCES representative described as, “An overestimation in the number of new unique CIP code conferrals.” Another potential inflator identified through cooperation with the NCES included the changes, additions, and subtractions are made to CIP code conferrals fields every decade or so. This could result in an overestimation in new CIP code conferrals because institutions may be breaking existing programs into different fields, or consolidating many into one. Measures were undertaken to determine the impact of such an effect; these included creating a variety of alternative measures of academic entrepreneurship with different definitions of what a new degree and certificate conferral is. These gut-checks led to the conclusion that the number of new degree and
certificate conferrals remained relatively stable despite new definitions. It is important to understand that academic entrepreneurship is likely to provide an accurate depiction of institutional change, but it is not without its shortcomings.

New measures also assumed that programs no longer present in 2007-08 and 2008-09 were disbanded. These are important assumptions to take into consideration when interpreting the data derived from the newly created measures of academic entrepreneurship.

The comparison between labor projections, and the added and disbanded conferral fields that make up academic entrepreneurship was not sophisticated. Instead, it relied on a simple comparison. This analysis was intended to provide context to the newly created measured of academic entrepreneurship; it was conducted to enhance the reader’s understanding of what was actually being measured.

Regarding data from the USPTO, this data is also based on large scale reporting. One major issue is the use of separate organizations that register patent data on behalf of the institution. This can potentially skew reporting, depending on the availability of the name of said organization (or organizations). Steps were undertaken to limit this potential effect by cross-referencing research arms of institutions with separate organizations (please see the section, Patent Data, directly above). The scale of the study may limit the specificity of findings. The subsequent chapters will present the results of the analysis and discuss the findings of this quantitative, secondary data analysis of entrepreneurship in the academic heartland.
CHAPTER IV
RESULTS

The purpose of this study is to measure entrepreneurship in the academic heartland, and to understand how institutions may differentially demonstrate such behavior. As discussed in the first chapter, a significant amount of research has been conducted about entrepreneurial activities in the periphery of institutions (Clark, 1998; Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004; Bok, 2003). However, there have been few attempts to measure such activity in the academic heartland (Mars & Aguilar, 2010). In part, this has been due to the difficulty in quantitatively measuring academic entrepreneurship. This study developed new measures, using degree and certificate conferral fields—CIP codes—to assess institutional change over time. Academic programs are one of the primary means for organizing activity within the academic heartland (Rudolph, 1977; Bok, 2003; Becher & Trowler, 2005). Changes in degree or certificate conferral fields are likely to be reflective of institutional adaptations to a changing environment. It is believed that significant changes in the number of academic programs are indicative of entrepreneurial activity within institutions (Rudolph, 1977; Thelin, 2004; Brint, 2005). To analyze this, new sets of measurements were created. These included: the net change in unique degree conferral fields, the percentage change in unique degree conferral fields, the absolute value change in unique degree conferral fields, net entrepreneurship, and total entrepreneurship between 2004-05 and 2008-09.

The analysis provided in chapter 4 aims to give an overview of the variables and findings of this study. This study used the number of new and disbanded unique CIP code conferral fields to measure entrepreneurial activity within the academic heartland between the academic years 2004-05 to 2008-09. Both new and disbanded CIP codes
were included because theories on innovation and entrepreneurship generally focus on the concept of change, whether it is positive or negative (Schumpeter, 1947; Weber, 1905; Drucker, 1985). In addition to an emphasis being placed on change, Schumpeter’s notion of industrial mutation (1947) demonstrates that organizations undertake adaptations that fluctuate with the ebb and flow of market conditions. Even retraction—represented in this study by disbanded conferral fields—may be considered part of the entrepreneurial process; it may signal that organizations are streamlining to align with new market demands. In higher education, retraction might indicate flexibility and willingness to change programs when demand changes, rather than holding on to programs that may no longer needed. As organizations strategically grow and shrink, innovations in the programs in which degrees or certificates are conferred may represent adaptation, evolution, or the beginnings of a new market standard (Schumpeter, 1947).

After these measures were created, multiple regression analyses were employed to determine if, and to what extent institutional characteristics accounted for the variance in these new variables. Descriptive analysis was conducted to analyze patterns in the types of programs that were being conferred and discontinued. Lastly, whether or not these new measures correlated with patents assignment data was determined using correlation analyses.

The regression analyses verified that institutional traits did impact the measures of academic entrepreneurship. This allowed for exploration into the relationships between each institutional characteristic, and entrepreneurship in the academic heartland. Table 5 lists each new variable of academic entrepreneurship and its interactions with different institutional characteristics.
Regression Analysis, Question 1, Hypotheses

1) Do relationships exist between Carnegie Classification-Basic, Institution Sector, Carnegie Classification-Undergraduate Instructional Program Profile, and entrepreneurship in the academic heartland, which was measured by the change in the amount of unique CIP code conferral fields between academic years 2004-05 and 2008-09?

This question was based on the hypothesis that institutional categorization and classification frameworks Carnegie Classification-Basic, Institution Sector and Carnegie Classification-Undergraduate Instructional Program Profile do help explain the variance in the amount of unique CIP code conferral fields between the academic years 2004-05 and 2008-09. A variety of institutional categorization and classification frameworks, which included Carnegie Classification-Basic, Institution Sector, and Carnegie Classification-Undergraduate Instructional Program Profile were analyzed to determine their impact on entrepreneurship in the academic heartland. These hypotheses were explored using the following three measures of entrepreneurship in the academic heartland: the total net change, the percentage change, and the absolute value change in unique CIP code conferral fields between 2004-05 and 2008-09.
Table 5: Regression Findings (Standard Deviation In Parentheses)

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Net Change</th>
<th>% Change</th>
<th>ABS Change</th>
<th>Net Ent.</th>
<th>Total Ent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>10.001***</td>
<td>10.185*</td>
<td>11.451***</td>
<td>14.508***</td>
<td>24.016***</td>
</tr>
<tr>
<td></td>
<td>(1.630)</td>
<td>(3.966)</td>
<td>(1.380)</td>
<td>(1.619)</td>
<td>(1.926)</td>
</tr>
<tr>
<td>CC-Basic: Masters-Medium Programs</td>
<td>-1.542 (1.721)</td>
<td>4.214 (4.188)</td>
<td>-0.546 (1.457)</td>
<td>-2.618 (1.710)</td>
<td>-1.991*** (2.034)</td>
</tr>
<tr>
<td>CC-Basic: Baccalaureate-Arts &amp; Sciences</td>
<td>-3.595** (1.77)</td>
<td>.076 (4.306)</td>
<td>-2.366 (1.498)</td>
<td>-4.652** (1.758)</td>
<td>-5.379** (2.092)</td>
</tr>
<tr>
<td>Sector: Private, Not-For-Profit</td>
<td>3.655*** (.940)</td>
<td>6.171** (2.287)</td>
<td>2.956*** (.796)</td>
<td>4.244*** (933)</td>
<td>4.234*** (1.11)</td>
</tr>
<tr>
<td>CC-UIP: Arts &amp; Sciences Focus</td>
<td>-.692 (.746)</td>
<td>1.97 (1.815)</td>
<td>-1.037** (.631)</td>
<td>-1.139** (.741)</td>
<td>-1.946* (.882)</td>
</tr>
<tr>
<td>CC-UIP: Professions Focus</td>
<td>-2.201** (1.091)</td>
<td>-1.962 (2.655)</td>
<td>-1.259 (.923)</td>
<td>-2.203* (1.080)</td>
<td>-.360 (1.285)</td>
</tr>
<tr>
<td>Size: 1-4,999 Students</td>
<td>-5.351* (2.191)</td>
<td>-4.284 (5.332)</td>
<td>-6.503*** (1.855)</td>
<td>-8.017*** (2.177)</td>
<td>-13.998*** (2.590)</td>
</tr>
<tr>
<td>Size: 5,000-19,999 Students</td>
<td>-5.208** (1.689)</td>
<td>-4.968 (4.109)</td>
<td>-5.685*** (1.429)</td>
<td>-6.457*** (1.677)</td>
<td>-10.146*** (1.996)</td>
</tr>
<tr>
<td>CC-UP: 4-Yr, Inclusive Student Pop.</td>
<td>-0.906 (.432)</td>
<td>-17.195 (.432)</td>
<td>-1.614 (.432)</td>
<td>-.172 (.432)</td>
<td>1.667 (.432)</td>
</tr>
<tr>
<td>CC-UP: 4-Yr, Selective Student Pop.</td>
<td>-0.305 (.494)</td>
<td>-22.076*** (.494)</td>
<td>-0.879 (.494)</td>
<td>0.401 (.494)</td>
<td>1.877 (.494)</td>
</tr>
<tr>
<td>Land-Grant Institutions</td>
<td>-1.555 (1.597)</td>
<td>.694 (3.887)</td>
<td>-.730 (1.352)</td>
<td>-1.597 (1.587)</td>
<td>-.038 (1.587)</td>
</tr>
</tbody>
</table>

* Value is significant at the .05 level. ** Value is significant at the .01 level. *** Value is significant at a .001 level.

^ Created to demonstrate the difference between two years; 04-05 & 08-09.
Table 5 (Cont’d): Regression Findings

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Net Change</th>
<th>% Change</th>
<th>ABS Change</th>
<th>Net Ent.</th>
<th>Total Ent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urbanicity: Suburban</td>
<td>.386 (.852)</td>
<td>-.924 (2.072)</td>
<td>-.195 (.721)</td>
<td>.311 (.845)</td>
<td>-1.027 (1.005)</td>
</tr>
<tr>
<td>Urbanicity: Town &amp; Rural</td>
<td>.547 (.786)</td>
<td>1.830 (1.912)</td>
<td>.968 (.665)</td>
<td>.878 (.780)</td>
<td>-1.00 (.928)</td>
</tr>
<tr>
<td>Region: New England, Mid-East</td>
<td>.201 (.873)</td>
<td>-.395 (2.125)</td>
<td>.476 (.739)</td>
<td>.354 (.866)</td>
<td>.947 (1.03)</td>
</tr>
<tr>
<td>Region: Great Plains</td>
<td>-.668 (.895)</td>
<td>-1.510 (2.177)</td>
<td>.319 (.757)</td>
<td>-.393 (.889)</td>
<td>.891 (1.057)</td>
</tr>
<tr>
<td>Region: Southwest, Far West, &amp; Rocky Mts.</td>
<td>.502 (.979)</td>
<td>-.585 (2.381)</td>
<td>.621 (.828)</td>
<td>.620 (.927)</td>
<td>-.161 (1.157)</td>
</tr>
<tr>
<td>R2 Value</td>
<td>.096***</td>
<td>.051</td>
<td>.126***</td>
<td>.173***</td>
<td>.31***</td>
</tr>
<tr>
<td>Sig.</td>
<td>.000</td>
<td>.025</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
</tbody>
</table>

* Value is significant at the .05 level. ** Value is significant at the .01 level. *** Value is significant at a .001 level.

*Signifies a snap-shot variable (using just 04-05 & 08-09) whereas Net and Total Entrepreneurship use each academic year in this study.
Findings

Hypothesis 1A

Sub-hypothesis 1, stated that institutions that were classified as Carnegie Classification-Basic: Research Universities-Very High Activity would demonstrate greater positive change in the number of unique CIP code conferral fields between 2004-05, and 2008-09 in comparison to Carnegie Classification-Basic classifications: Masters Colleges-Medium Programs, and Baccalaureate Colleges-Arts and Sciences.

Findings: Confirmed

Research institutions are more engaged in academic entrepreneurship than others.

The regression analyses that examined the change in the net, percentage, and absolute value change in unique degree conferral fields indicated that Carnegie Classification-Basic did make a significant impact. Institutions classified as Research Universities-Very High Activity demonstrated greater levels of entrepreneurship in the academic heartland in comparison to institutions that were classified as Masters Colleges-Medium Programs, or Baccalaureate Colleges-Arts and Sciences. This was true for the total net change, and absolute value change in unique degree and certificate conferrals between 2004-05 and 2008-09. In each of the regression analyses, the constant (Research Universities-Very High Activity) demonstrated significant, and positive beta values in comparison to the regression coefficients that represented Masters Colleges-Medium Programs and Baccalaureate Colleges-Arts & Sciences. There was no evidence to suggest that Baccalaureate Colleges-Arts & Sciences or Masters Colleges-Medium Programs had any impact on the entrepreneurship of an institution in the absolute change in unique degree conferral fields between 2004-05 and 2008-09. Baccalaureate
Colleges-Arts and Sciences had a significant and negative impact on the net change in unique conferral fields during the studied time frame.

**Hypothesis 1B**

The second sub-hypothesis stated that institutions that are classified as *private, not-for-profit, four-year and above* institutions would demonstrate greater positive change in the number of unique CIP code conferral fields between 2004-05, and 2008-09 in comparison to *public, 4-year and above institutions*.

**Findings: Confirmed**

**Public institutions are less likely than private, not-for-profit institutions to engage in entrepreneurship in the academic heartland.**

*Private, not-for-profit, 4-year and above* institutions demonstrated higher, and significant coefficients in comparison to *public, 4-year and above institutions*, which had a significant and negative impact on the net, and absolute value change in unique conferral fields. In each of the variables analyzed, the findings indicate that institution sector significantly influenced the changes in unique degree conferral fields between 2004-05 and 2008-09.

**Hypothesis 1C**

Sub-hypothesis 3 stated that institutions that were categorized by Carnegie Classification-Undergraduate Instructional Program Profile as being *Professions-Degree Focused*, would exhibit greater total net change, and absolute value change in the number of unique CIP code conferral fields between 2004-05, and 2008-09, in comparison to institutions with profiles that *were balanced in their concentration of arts and sciences*
degrees and professions-degrees, or schools with profiles classified as predominantly arts and sciences.

Findings: Rejected

Balanced instructional program profiles are most likely to be entrepreneurial.

Carnegie Classification-Instructional Program Profiles that were balanced in Arts and Sciences, and Professional degrees had positive and statistically significant coefficients in comparison to program profiles that were professionally focused, or arts and sciences focused. There was some evidence to suggest both professions-focused institutions, and institutions with arts and sciences focused programs had negative impacts on the level of academic entrepreneurship. The regression analysis that analyzed the impact of institutional characteristics on the net change in unique program conferrals between 2004-05 and 2008-09 revealed schools with a professions focused profile had a negative and significant coefficient. However, this characteristic did not significantly impact the absolute value change in unique degree and certificate conferral fields. Institutions that had an arts and sciences oriented program profile demonstrated a negative and significant impact on the absolute value change in unique degree and certificate conferral fields, but did not have an impact on the net change in conferral fields. So while there is evidence to suggest there is an impact, it is not conclusive.

Institution size helps determine academic entrepreneurship.

Institution size was a statistically significant indicator of academic entrepreneurship. Institutions with the largest student populations were most likely to exhibit entrepreneurship in the academic heartland; schools with populations of 20,000 or more students were found to have positive, and significant coefficients in comparison to
institutions with fewer students in each variable analyzed. Institutions with 1-4,999 students, and institutions with 5,000-19,999 students had significant, and negative coefficients when compared to schools with 20,000 or more students in both the net change, and absolute value change in unique conferral fields.

Finally, there was no evidence to suggest Land-Grant status, region, degree of urbanicity, or the selectiveness/inclusiveness or an institution had any impact on the entrepreneurship of an institution (Coefficients were both positive and negative, with no significance in the net and absolute value change in unique degree conferral fields between 2004-05 and 2008-09).

**Percentage Change In Unique Conferral Fields**

During analysis of the first two research questions, the only insignificant measure of academic entrepreneurship was the percentage change in unique conferral fields between 2004-05, and 2008-09. Many of the coefficients are inverse in value, and disproportionate in comparison to the same subgroups in the other new metrics. Moreover, only two coefficients are significant—making the likelihood that the values derived from this analysis are significantly different from zero—leading to the conclusion that the percentage change is a bad specification of the phenomenon this study attempts to capture.

**Regression Analysis, Question 2, Hypotheses**

2) *Do relationships exist between net entrepreneurship, total entrepreneurship between 2004-05, and 2008-09, and Carnegie Classification-Basic, Institution Sector, and Carnegie Classification-Undergraduate Instructional Program Profile?* This question was based on the hypothesis that institutional categorization and classification
frameworks Carnegie Classification-Basic, Institution Sector, and Carnegie Classification-Undergraduate Instructional Program Profile do help explain the variance in net, and total entrepreneurship in the academic heartland between 2004-05 and 2008-09. The aforementioned institutional categorization and classification frameworks were analyzed to determine their impact on net and total entrepreneurship in the academic heartland between 2004-05 and 2008-09.

**Hypothesis 2A**

Sub-hypothesis 2 stated that institutions that were classified as Carnegie Classification-Basic, *Research Universities- Very High Activity* would demonstrate the highest degrees of net entrepreneurship, and total entrepreneurship in the academic heartland between 2004-05, and 2008-09. Institutions classified as *Masters Colleges-Medium Programs*, and *Baccalaureate Colleges-Arts and Sciences*, would demonstrate lower levels of academic entrepreneurship.

**Findings: Confirmed**

*Research institutions demonstrate more academic entrepreneurship than others.*

The regression analyses that examined the change in net, and total entrepreneurship between 2004-05 and 2008-09 provided evidence that supports sub-hypothesis 2. In each of the regression analyses, the constant (*Research Universities-Very High Activity*) demonstrated significant, and positive beta values in comparison to the regression coefficients that represented *Masters Colleges-Medium Programs* and *Baccalaureate Colleges-Arts & Sciences*. There was also evidence to suggest that *Baccalaureate colleges, arts and sciences* had a significant, and negative impact on total entrepreneurship. There was no evidence to suggest that *Master’s colleges-Medium...*
programs had any impact on total entrepreneurship. However, there was also evidence that suggested Master’s colleges-Medium Programs had a significant, and negative impact on net entrepreneurship. Baccalaureate colleges—Arts & Sciences—did not have a significant impact on net entrepreneurship.

**Hypothesis 2B**

The second sub-hypothesis stated that institutions that were classified as private, not-for-profit, 4-year and above institutions would demonstrate greater absolute value change in unique CIP code conferrals between 2004-05, and 2008-09 in comparison to public, 4-year and above institutions.

**Findings: Confirmed**

Public institutions are less likely than private, not-for-profit institutions to engage in entrepreneurship in the academic heartland.

Private, not-for-profit, 4-year and above institutions demonstrated higher, and significant coefficients in comparison to public, 4-year and above institutions, which had a significant and negative impact on net and total entrepreneurship. In analyzing the effect of institutional characteristics on both net and total entrepreneurship, the findings indicate that institution sector was a significant influence.

**Hypothesis 2C**

Sub-hypothesis 3 stated that institutions that were categorized by Carnegie Classification-Undergraduate Instructional Program Profile as having a professions degree focus would exhibit greater degrees of net, and total entrepreneurship in the academic heartland between 2004-05, and 2008-09, when compared to profiles that were
balanced in their concentration of arts and sciences degrees and professions-degrees, or arts and sciences oriented instructional program profiles.

Findings: Rejected

Balanced instructional program profiles are most likely to be entrepreneurial.

Carnegie Classification-Instructional Program Profiles that were balanced in arts and sciences, and professional degree focus had a positive and statistically significant impact on net and total entrepreneurship between 2004-05 and 2008-09 when compared to program profiles with a professions focus, or profiles with an arts and sciences focus between 2004-05, and 2008-09. Carnegie Classification-Instructional Program Profiles that were balanced in Arts and Sciences, and Professional degrees had positive and statistically significant beta values when compared to program profiles that were professionally focused, or arts and sciences focused. Having an Arts and Sciences focus had a significant, negative influence on both net and total entrepreneurship negatively.

There was also evidence to suggest that having a professions focused program profile had a negative impact on net entrepreneurship.

Institution size helps determine academic entrepreneurship.

Institution size was a statistically significant indicator of academic entrepreneurship. Evidence suggests that institutions with populations of 20,000 or more students had a significant, and positive impact on academic entrepreneurship.

Comparatively, institutions with 1-4,999 students, and institutions with 5,000-19,999 students had significant, and negative coefficients when compared to the larger institutions.
Finally, there was no evidence to suggest Land-Grant status, region, degree of urbanicity, or the selectiveness/inclusiveness or an institution had any impact on net and total entrepreneurship between 2004-05 and 2008-09.

**Discussion, Hypothesis 1 and 2**

The purpose of this study was to measure entrepreneurship in the academic heartland, and to understand how institutions may differentially demonstrate such behavior. By using secondary source data made available from the NCES, measures of entrepreneurship in the academic heartland were created that capture the evolution of degree conferral fields, which demonstrate a historical linkage with market demands and societal interests (Thelin, 2004; Drucker, 1985). The new measures created to analyze this type of change included: the total net change, the percentage change, and the absolute value change in unique CIP code conferral fields between 2004-05 and 2008-09.

Additional variables included net entrepreneurship, and total entrepreneurship.

Following the creation of these variables, multiple regression analyses were conducted to determine if institutional characteristics could account for the change in the number of unique degree fields that institutions offered degrees and certificates in. The following discussion details the findings of these analyses.

Academic capitalism has created an environment that has created new challenges and opportunities for institutions. Many postsecondary institutions have looked to research and development, and intellectual property to diversify their funding bases (Clark, 1998). However, a more historical method employed by institutions to navigate through new—and perhaps more turbulent—environments has been to adapt what types of programs, degrees, and certificates they offer to students (Duderstadt, 2009). Such
changes are made in an effort to compete against other students for greater numbers of students—which helps to increase revenues—more status, and prestige (Bok, 2003; Bordiuex, 1988; Marginson, 2007). Each school tries to leverage its own unique resources to take advantage of new opportunities allowed by increased intersections between higher education, government, and the private sector (Clark, 1998; Etzkowitz, 1998; Duderstadt, 2009). How they do this can be considered to be entrepreneurial. However, the application of the term entrepreneurship is considered by many to be symptomatic of a larger problem in higher education: the infusion of business practices into a field that some believe should be separated from commercial interests (Bok, 2003).

Further splitting the divide that may be inhibiting academic entrepreneurship from further study are countless ambiguities—ambiguities, engrained in higher education institutions, and the application of entrepreneurship—that lead to diverse interpretations, applications, and opinions regarding the place of such behaviors in higher education. (Mars & Aguilar, 2010; Cohen & March, 1986; Anderson, 2001). In addition, the United States system of postsecondary education has provided an environment in which diverse institutions have been able to thrive using equally varied strategies. For example, there are a total of 186,624 different combinations attained using the new Carnegie Classification subgroups (Pulley, 2005). As a result, it can be anticipated that institutions will employ different entrepreneurial strategies.

The findings of the regression analyses supported the broader hypotheses that institutional characteristics do impact the entrepreneurial nature of institutions within the academic heartland. Once this hypothesis was confirmed, each individual characteristic
and the subgroups within were individual institutional analyzed to understand to understand how institutions may be entrepreneurial in different ways.

It was hypothesized that Carnegie Classification Basic would have a significant impact on entrepreneurship in the academic heartland. Institutions that were classified as Research Universities-Very High Research Activity were anticipated to have greater degrees of academic entrepreneurship than those classified as Baccalaureate Colleges-Arts and Sciences, and Masters Colleges-Medium Programs. In each significant analysis—the percentage change in unique conferrals was determined to be a bad specification—Research Universities-Very High Research Activity demonstrated positive, and significant coefficients in comparison to the other subgroups.

Research universities have a long history of evolving in an attempt to satisfy new demands. The creation of technical colleges, land-grant institutions, and larger public research universities are just some examples of our system of postsecondary education responding to specific demands unique to their time (Thelin, 2004; Drucker, 1985; Bush, 1945). Research universities are typically rich in financial resources, which allow them to take greater risk (Katkin, 2003). These institutions are also more closely aligned with science, technology, engineering, and mathematics fields (STEM), which are more research-ready fields that rapidly evolve, and that are more likely to produce more profitable intellectual property (Brint, 2005). As a result, such programs may be modified more frequently in an attempt to keep them current. This provides evidence as to why Research universities demonstrated greater degrees of entrepreneurship in the academic heartland.
Next, the other Carnegie Classification-Basic subgroups, *Masters Colleges*—*Medium Programs*, and *Baccalaureate Colleges Arts and Sciences*, were examined to determine why they demonstrated lower degrees of entrepreneurship in the academic heartland. Selective colleges and institutions that have strong academic profiles are likely to have commitments to programs in the arts and sciences (Brint, 2005). These types of institutions are more likely to have accumulated status and prestige, and may be less likely to risk the capital they have accumulated by being first-time changers in the conferral fields they offer (Drucker, 1985; Trow, 1984; Bok, 2003). Institutions that do not have the comprehensive doctoral programs that are effective at generating research may be less likely to experiment with their degree or certificate conferral fields; such experimentations are costly, and potentially devastating to schools that rely heavily on the programs they offer for revenue (Marginson, 2007). This combination of factors supports the findings that institutions classified as *Research universities-Very High Research Activity* had the highest levels of academic entrepreneurship.

It was also hypothesized that institutions that were *private, not-for-profit, 4-year and above* institutions would demonstrate greater degrees of entrepreneurship in the academic heartland than *public, 4-year and above* institutions. *Private institutions* are less constrained by organizational structure and bureaucratic red tape; this may make them more nimble, and able to adapt. This conceivably would allow private institutions to absorb demands faster, which manifests itself in more new and disbanded unique conferral fields (Altbach, *et al.*, 2010). There are also fewer layers of oversight, and fewer subsidies for private institutions. This gives them greater freedoms, but it also provides less shelter from competition and market volatility (Lane, 2007; Hanna, 1997).
They are not publicly created, and have to compete more against for-profit models of educational institutions that are not constrained by societal expectations (Hanna, 1997; Kinser, 2007). This requires greater malleability on the part of private, not-for-profit institutions in comparison to public institutions (Altbach et al., 2010; Brint, 2005). This supports the evidence that suggests private institutions are more entrepreneurial than public institutions.

Public institutions may also be slower to change due to more bureaucracy and less incentive to adapt and evolve rapidly. Greater subsidy, bureaucracy, and oversight may all work in concert to inhibit the ability of public institutions to innovate the programs in which they offer conferrals. Greater subsidy, and lower net price may naturally steer a growing body of cost-conscious prospective students towards the cheaper, public alternative (Claar & Scott, 2007; Farrel, 2005). When combined with larger enrollment sizes, public institutions do not need to respond as quickly as private institutions, and as a result, can be expected to be less entrepreneurial in their academic heartlands (Altbach et al., 2010; Brint, 2005).

It was also hypothesized that Carnegie Classification-Undergraduate Instructional Program Profile would demonstrate significant differences in entrepreneurship in the academic heartland based on its subgroups. Specifically, it was hypothesized that institutions that had higher concentrations of professions-focused academic programs would be more entrepreneurial in their academic heartlands in comparison to schools with arts and sciences-focused programs, or schools with a program profile that was balanced in arts and sciences and professions-focused fields. This hypothesis was rejected. In each instance, having a balanced instructional program profile was found to
have a positive impact on academic entrepreneurship in comparison to having professions-focused, or arts and sciences focused program profiles. There is some evidence to suggest that arts and sciences focused schools are also less entrepreneurial. All of the coefficients estimated are negative and at least 3 of the coefficients were significant. Additionally, there is some evidence to suggest that a Professions focus has a negative impact on entrepreneurship. All coefficients are negative, but only 2 are significant. This is not conclusive evidence.

*Professions focused-programs* were expected to demonstrate the greatest levels of academic entrepreneurship due to the nature of their programmatic offerings. Programs that have a stronger professions-oriented focus are traditionally more applied, and consequently, more sensitive to shifting market demands (Brint, 2005). Institutions with *Arts and sciences-focused program profiles* were expected to be less entrepreneurial because they are traditionally more selective institutions, which typically have greater degrees of capital, and as a result, more risk averse (Marginson, 2007). In hindsight, the rejection of this hypothesis is explainable.

While applied in nature, *professions-focused* schools may already have programs that align with the needs of society. This may result in less of a need for change, which would diminish the need for adaptation in the academic heartland. Some applied fields such as business or engineering are lucrative, and have been a stable programmatic offering for decades; these resources may allow institutions to be less entrepreneurial in their academic heartlands (Katkin, 2003; Bush, 1945). Instead, these schools may prioritize different types of entrepreneurship in areas like research and development,
tech-transfer, and intellectual property (Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004; Etzkowitz & Leydesdorf, 2000).

Modern opportunities to add and disband conferrals fall between disciplines, and in more general areas, such as liberal arts, general studies, and multi-disciplinary programs (Slaughter & Rhoades, 2004; Bok, 2003). Institutions with balanced program profiles may be more likely to have the ability to create broad, multi-disciplinary programs that connect different disciplines; leading to lower walls, more diverse institutional research, and more customizable programs that cater to client-interests (Brint, 2005; Townsend et al., 2009). If new programs are indeed created by using a combination of previously existing courses—as described by the Registrar of a private university—those institutions with greater diversity in what they offer may have a natural advantage when it comes to creating new programs. This helps to explain why institutions with balanced program profiles demonstrated greater degrees of entrepreneurship in the academic heartland in comparison to other types of profiles.

**Question 3, Hypothesis**

3) *Do patterns exist between the type of new and discontinued degree fields with conferrals between 2004-05, and 2008-09?*

Descriptive analysis was undertaken following the regression analyses to determine the types of degree conferral fields that were being added and disbanded. This question is based on the hypothesis that there are patterns that exist in the type of new and disbanded degree and certificate conferral fields between 2004-05, and 2008-09. Institutions examined in this study were more likely to add conferral fields that were applied in nature. Table 6 provides the number of new unique CIP code conferrals for
each academic year between 2005-06, and 2008-09 (2004-05 was the benchmark year for this study), and the number of disbanded CIP code conferrals for the studied time frame. Additionally, there were steps taken to identify programs that appeared both as new, and disbanded degree and certificate conferral fields. A total of 336 programs were removed because they appeared as both new, and disbanded for the timeframe studied.

Following the removal of these programs the types of degree and certificate programs that were being added, and disbanded were analyzed. Table 7 contains the 30 most frequently added conferral fields. Additionally, the 10 most frequently occurring new conferral fields were listed for each year between 2005-06 through 2008-09 (See Appendix B). The list of the 30 most frequently disbanded degree and certificate conferral fields were tallied from 2004-05 thru 2008-09. These were then compared with occupational projections from the Bureau of Labor Statistics (BLS) to determine whether or not similarities existed. It should be reiterated, that the level of analysis for question 3 did not match that undertaken for questions 1 and 2. This was designed to provide a descriptive context to the impact that institutional characteristics had on academic entrepreneurship.

**Findings: Confirmed**

**Institutions are changing to respond to economic needs.**

The hypothesis that institutions would add and disband degree and certificate fields would mirror what Brint (2005) described as a shift from liberal to practical arts was confirmed. Institutions were likely to add, and disband conferral fields that were practical in nature, and which aligned with occupational growth projections made available by the Bureau of Labor Statistics. Table 7 lists the top 30 new unique degree
conferral fields between 2004-05, and 2008-09.

Applied fields constituted the majority of fields that were newly added by institutions during the timeframe studied. Of the ten most frequently added conferral fields, 9 were in education, scientific, or multi-disciplinary fields; these included International Global Studies, Educational Leadership and Administration, General, Environmental Science, Biochemistry, and Multi-Interdisciplinary Studies, Other). Only 1 of the top 10 newly added conferral fields was arts-related (Fine Studio Arts, General).

Health related fields, such as Nursing, and Health Services, Allied Health, and Health Sciences, general reflect the increasing demand for healthcare arising from an aging population. Management Information Systems and Information Technology are programs that are in high demand for a variety of reasons, most notably, the increasing virtualization and digitalization of our society. Business Administration oriented degrees were also applied in nature.

Despite applied programs making up a majority of the most frequently added programs, there were some arts-oriented conferral fields that are also growing rapidly. Music Performance, Art History Criticism and Conservation, Creative Writing, and Drama and Dramatic Arts and theatre are some examples. These programs are traditionally housed within the liberal, or creative arts. This provides evidence that even though applied programs are becoming increasingly popular, the arts still are an important component of a college education.

The most frequently disbanded conferral fields were analyzed in addition to exploring the most frequently added new degree conferral fields. A disbanded conferral field is one that was not present in both of the final two years of analysis (2007-08, and
Disbanded conferral fields were included in the analysis because of their ability to reflect what Schumpeter describes as industrial mutation, or creative destruction. In order to meet new stakeholder demands, organizations will attempt to change in such a way that can satisfy them. Making new products can do this, but it may also take the form of retraction (Schumpeter, 1947). This type of behavior is a hallmark of entrepreneurial organizations, and provides the rationalization as to why both new, and discontinued CIP code conferrals were included in this study. If a field appeared as both new and disbanded—there were a total of 336—it omitted from this study.

Table 8 lists the 30 most frequently disbanded degree conferral fields for the timeframe studied, which included all academic years between 2004-05 and 2008-09. The most frequently disbanded conferral field was art studies; furthermore, fine arts was another arts specific conferral field that was one of the most frequently disbanded. Additionally, numerous foreign language programs appear—French language teacher education, French language and literature, German language and literature, and foreign languages and literatures—among the most frequently disbanded conferral fields.

Various educational programs were also frequently disbanded. A total of 14 education-related programs were among the 30 most frequently disbanded conferral fields for the time frame of 2004-05 thru 2008-09. Additionally, broad programs, including liberal arts and sciences, and multi-interdisciplinary studies were frequently dropped. Technical fields were also present—computer and information sciences general was the second most disbanded conferral field, and computer science—among the most frequently disbanded conferral fields. Other scientific fields included biological and biomedical sciences, and clinical laboratory science technologists.
<table>
<thead>
<tr>
<th></th>
<th># of Unique Conferral Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Conferral Fields, 05-06</td>
<td>1214</td>
</tr>
<tr>
<td>New Conferral Fields, 06-07</td>
<td>971</td>
</tr>
<tr>
<td>New Conferral Fields, 07-08</td>
<td>1093</td>
</tr>
<tr>
<td>New Conferral Fields, 08-09</td>
<td>1094</td>
</tr>
<tr>
<td>Disbanded CIP Code Conferrals</td>
<td>1421</td>
</tr>
<tr>
<td>CIP Code - 2000 Classification</td>
<td># of Times New In 2005-06</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>International Global Studies</td>
<td>10.0</td>
</tr>
<tr>
<td>Educational Leadership and Administration, General</td>
<td>11.0</td>
</tr>
<tr>
<td>Education, General</td>
<td>8.0</td>
</tr>
<tr>
<td>Secondary Education and Teaching</td>
<td>10.0</td>
</tr>
<tr>
<td>Environmental Science</td>
<td>12.0</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>11.0</td>
</tr>
<tr>
<td>Multi-Interdisciplinary Studies, Other</td>
<td>14.0</td>
</tr>
<tr>
<td>Fine Studio Arts, General</td>
<td>10.0</td>
</tr>
<tr>
<td>Environmental Studies</td>
<td>6.0</td>
</tr>
<tr>
<td>Early Childhood Education and Teaching</td>
<td>6.0</td>
</tr>
<tr>
<td>Art History Criticism and Conservation</td>
<td>7.0</td>
</tr>
<tr>
<td>Health Services Allied Health, Health Sciences, General</td>
<td>6.0</td>
</tr>
<tr>
<td>Music Performance, General</td>
<td>9.0</td>
</tr>
<tr>
<td>Nursing, Other</td>
<td>1.0</td>
</tr>
<tr>
<td>Women’s Studies</td>
<td>6.0</td>
</tr>
<tr>
<td>Information Technology</td>
<td>4.0</td>
</tr>
<tr>
<td>Mathematics Teacher Education</td>
<td>9.0</td>
</tr>
<tr>
<td>Education, Other</td>
<td>4.0</td>
</tr>
<tr>
<td>Liberal Arts and Sciences, Liberal Studies</td>
<td>4.0</td>
</tr>
<tr>
<td>Business Administration Management &amp; Operations, Other</td>
<td>9.0</td>
</tr>
<tr>
<td>Creative Writing</td>
<td>8.0</td>
</tr>
<tr>
<td>Drama and Dramatics Theatre Arts, General</td>
<td>8.0</td>
</tr>
</tbody>
</table>
Table 7 (Cont'd): 30 Most Frequently Occurring New Conferral Fields, 2004-05 Thru 2008-09

<table>
<thead>
<tr>
<th>CIP Code - 2000 Classification</th>
<th># of Times New In 2005-06</th>
<th># of Times New In 2006-07</th>
<th># of Times New In 2007-08</th>
<th># of Times New In 2008-09</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management Information Systems, General</td>
<td>11.0</td>
<td>6.0</td>
<td>3.0</td>
<td>3.0</td>
<td>23</td>
</tr>
<tr>
<td>Kinesiology and Exercise Science</td>
<td>5.0</td>
<td>7.0</td>
<td>3.0</td>
<td>7.0</td>
<td>22</td>
</tr>
<tr>
<td>Music, General</td>
<td>10.0</td>
<td>5.0</td>
<td>4.0</td>
<td>3.0</td>
<td>22</td>
</tr>
<tr>
<td>Computer Science</td>
<td>11.0</td>
<td>1.0</td>
<td>3.0</td>
<td>6.0</td>
<td>21</td>
</tr>
<tr>
<td>Biology Teacher Education</td>
<td>8.0</td>
<td>5.0</td>
<td>5.0</td>
<td>3.0</td>
<td>21</td>
</tr>
<tr>
<td>Sport and Fitness Administration Management</td>
<td>4.0</td>
<td>4.0</td>
<td>5.0</td>
<td>8.0</td>
<td>21</td>
</tr>
<tr>
<td>Philosophy</td>
<td>10.0</td>
<td>5.0</td>
<td>1.0</td>
<td>5.0</td>
<td>21</td>
</tr>
<tr>
<td>Business Administration and Management, General</td>
<td>6.0</td>
<td>5.0</td>
<td>4.0</td>
<td>6.0</td>
<td>21</td>
</tr>
<tr>
<td>CIP Code - 2000 Classification</td>
<td>Frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>-------------------------------</td>
<td>-----------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Art, Art Studies General</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer and Information Sciences General</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education General</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary Education and Teaching</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Professions and Related Clinical Sciences, Other</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication Studies Speech Communication and Rhetoric</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Music Teacher Education</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science Teacher Education General Science Teacher Education</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher Education Profess Development Subject Areas, Other</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>French Language and Literature</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liberal Arts and Sciences Liberal Studies</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological and Biomedical Sciences, Other</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-Interdisciplinary Studies, Other</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Laboratory Science Medical Technology Technologist</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry Teacher Education</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>French Language Teacher Education</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>German Language and Literature</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speech and Rhetorical Studies</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fine Arts and Art Studies, Other</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business Management Marketing &amp; Related Support Services, Other</td>
<td>8</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Science</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary Education and Teaching</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 8 (Cont'd): 30 Most Disbanded Conferral Fields, 2004-05 Thru 2008-09

<table>
<thead>
<tr>
<th>CIP Code - 2000 Classification</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kindergarten Preschool Education and Teaching</td>
<td>7</td>
</tr>
<tr>
<td>Early Childhood Education and Teaching</td>
<td>7</td>
</tr>
<tr>
<td>English Language Arts Teacher Education</td>
<td>7</td>
</tr>
<tr>
<td>Social Science Teacher Education</td>
<td>7</td>
</tr>
<tr>
<td>Education, Other</td>
<td>7</td>
</tr>
<tr>
<td>Foreign Languages and Literatures General</td>
<td>7</td>
</tr>
<tr>
<td>Health and Physical Education General</td>
<td>7</td>
</tr>
<tr>
<td>Kinesiology and Exercise Science</td>
<td>7</td>
</tr>
</tbody>
</table>
Discussion

While reviewing the most frequently added conferral fields, there were notable themes. Health-related CIP code conferrals like nursing, health-professions, and therapy-related degrees were frequently added conferral fields. In addition, liberal arts programs, general studies, and multi-disciplinary programs were also commonly added programs. Environmental sciences, and environmental studies were among the most added conferral fields for all institutions analyzed. Educational programs were also frequently added; programs like educational administration and leadership, and general education conferral fields were commonly added. Applied science programs like biomedical sciences and biochemistry were well represented. Moreover, computer science, and information technology programs were commonly occurring new programs for the time frame studied.

While analyzing the most commonly disbanded conferral fields two key patterns emerged—the elimination of various education programs that were teaching-specific, and the departure of foreign language related programs—while reviewing the most frequently disbanded conferral fields. There were some similarities between new and discontinued CIP code conferral fields, and this may provide evidence that institutions are trying to adapt using specific programmatic offerings through trial and error (Chen et al., 2009). The types of added and disbanded degree and certificate conferral fields were compared to the Bureau of Labor Statistics (BLS) Occupational Outlook Projections for jobs between 2008-2018. This was done to determine if institutions were adding and disbanding conferral fields to align with labor demands.
Occupational Projections

Shifts in industry, and population trends ultimately lead to changes in the types of occupations required within society (BLS, 2010). The aging of the baby boomers combined with slower birth rates, and the shift from an industrial-oriented economy to a service and knowledge-oriented economy will be important factors in shaping the occupational demands of the next decade (BLS, 2010; Etzkowitz & Leydesdorff, 2000; Olssen & Peters, 2005). For example, it is anticipated that professional, scientific, and technical services will increase by a projected 34% (2.7 million jobs) by 2018. Healthcare and social assistance occupations are expected to increase by 24% (4 million jobs) in the same time frame. Educational services are anticipated to increase by 12% (1.7 million jobs) (BLS, 2010; Carnevale et al., 2010; Christensen & Soares, 2011). The following two tables list the occupational fields with highest growth potential—on the indicators are both numerical, and percentage changes in projected occupational growth—based on Bureau of Labor Statistics projections.

There are points of intersection between the most frequently added conferral fields that make up the newly created measures of academic entrepreneurship, and BLS occupational growth projections. For example, nursing programs appeared as one of the most frequently added conferral fields in 3 of the 4 years analyzed, and was projected by the BLS to have the highest numerical growth in occupations. Biomedical engineers and biochemists were among the occupations with the highest projected percentage growth between 2008 and 2018; this aligns with programs such as biological and biomedical sciences, and biochemistry, that were among the most frequently added conferral fields according to the new measures of entrepreneurship in the academic heartland (BLS,
Occupations in scientific, educational, and knowledge services were also expected to grow. These growing occupations included: postsecondary teachers, other teachers, and analysts; they align with the shift from goods to services occurring in the United States (BLS, 2010).
### Table 9: Occupations With The Largest Numerical Growth (2008-2018 Projections)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number of New Jobs (In Thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered Nurses</td>
<td>581.5</td>
</tr>
<tr>
<td>Home Health Aides</td>
<td>460.9</td>
</tr>
<tr>
<td>Customer Service Representatives</td>
<td>399.5</td>
</tr>
<tr>
<td>Combined Food Preparation &amp; Serving Workers</td>
<td>394.3</td>
</tr>
<tr>
<td>Personal and Home Care Aides</td>
<td>375.8</td>
</tr>
<tr>
<td>Retail Sales Persons</td>
<td>374.7</td>
</tr>
<tr>
<td>Office Clerks, General</td>
<td>358.7</td>
</tr>
<tr>
<td>Accountants and Auditors</td>
<td>279.4</td>
</tr>
<tr>
<td>Nursing Aides, Orderlies, &amp; Attendants</td>
<td>276</td>
</tr>
<tr>
<td>Postsecondary Teachers</td>
<td>256.9</td>
</tr>
<tr>
<td>Construction Laborers</td>
<td>255.9</td>
</tr>
<tr>
<td>Elementary School Teachers, Except Special Education</td>
<td>244.2</td>
</tr>
<tr>
<td>Truck Drivers, Heavy &amp; Tractor Trailer</td>
<td>232.9</td>
</tr>
<tr>
<td>Landscaping and Groundskeeping Workers</td>
<td>217.1</td>
</tr>
<tr>
<td>Bookkeeping, Accounting, &amp; Auditing Clerks</td>
<td>212.4</td>
</tr>
<tr>
<td>Executive Secretaries &amp; Administrative Assistants</td>
<td>204.4</td>
</tr>
<tr>
<td>Management Analysts</td>
<td>178.3</td>
</tr>
<tr>
<td>Computer Software Engineers, Applications</td>
<td>175.1</td>
</tr>
<tr>
<td>Receptionists &amp; Information Clerks</td>
<td>172.9</td>
</tr>
<tr>
<td>Carpenters</td>
<td>165.4</td>
</tr>
</tbody>
</table>

Source: BLS Occupational Employment Statistics and Division of Occupational Outlook
<table>
<thead>
<tr>
<th>Occupations</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical Engineers</td>
<td>72</td>
</tr>
<tr>
<td>Network Systems and Data Communications Analysts</td>
<td>53</td>
</tr>
<tr>
<td>Home Health Aides</td>
<td>50</td>
</tr>
<tr>
<td>Personal and Home Care Aides</td>
<td>46</td>
</tr>
<tr>
<td>Financial Examiners</td>
<td>41</td>
</tr>
<tr>
<td>Medical Scientists, except Epidemiologists</td>
<td>40</td>
</tr>
<tr>
<td>Physician Assistants</td>
<td>39</td>
</tr>
<tr>
<td>Skin Care Specialists</td>
<td>38</td>
</tr>
<tr>
<td>Biochemists &amp; Biophysicists</td>
<td>37</td>
</tr>
<tr>
<td>Athletic Trainers</td>
<td>37</td>
</tr>
<tr>
<td>Physical Therapist Aides</td>
<td>36</td>
</tr>
<tr>
<td>Dental Hygienists</td>
<td>36</td>
</tr>
<tr>
<td>Veterinary Technologists &amp; Technicians</td>
<td>36</td>
</tr>
<tr>
<td>Dental Assistants</td>
<td>36</td>
</tr>
<tr>
<td>Computer Software Engineers, Applications</td>
<td>34</td>
</tr>
<tr>
<td>Medical Assistants</td>
<td>34</td>
</tr>
<tr>
<td>Physical Therapists Assistants</td>
<td>33</td>
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<tr>
<td>Veterinarians</td>
<td>33</td>
</tr>
<tr>
<td>Self-Enrichment Education Teachers</td>
<td>32</td>
</tr>
<tr>
<td>Compliance Officers</td>
<td>31</td>
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</tbody>
</table>

Source: BLS Occupational Employment Statistics and Division of Occupational Outlook
Disbanded conferral fields generally included education-related conferral fields, foreign-language related programs, multi-disciplinary programs, and programs that were oriented towards liberal arts, and arts. While the occupational projections for teachers and educators remains on par with national averages, a variety of changes may account for the appearance of education-related programs. According to the occupational outlook guide, “the traditional route to becoming a public school teacher involves completing a bachelor’s degree from a teacher preparation programs (BLS, 2010).” This is changing as, “most States now offer alternative routes to licensure for those who have a college degree in other fields (BLS, 2010).” This may explain the appearance of education programs as some of the most disbanded, specifically the conferral field, education general. As alternative pathways to such a degree become increasingly accessible, a more generalized education program may see declines in enrollments and popularity in favor of more specialized programs. However, such programs are essential and still popular, explaining their presences as both frequently added and disbanded fields.

The appearance of foreign languages among the most frequently disbanded conferral fields does not align with the steady growth outlook for interpreters and translator professions over the next decade. Such positions are expected to experience steady increases, particularly in high-demand languages, which include Mandarin and Arabic, but also traditional ones such as German, French, Italian, and Hispanic (BLS, 2010). The high growth potential of these areas does contradict the types of programs being disbanded; however, the demand for such skills sets is relatively small. For many foreign languages few jobs exist due to the specialization, and most are in or near urban areas (BLS, 2010). Even with high growth projections, the number of such programs that
are financially viable for institutions may rely heavily on a combination of factors that must closely align to create a sustainable foreign language program. This may explain the appearance of such fields as frequently disbanded fields, while still being projected to have occupational growth.

Yet another possibility is that in addition to accounting for market and social demands for specific programs, the measures of academic entrepreneurship also account for an increase, or decrease in specialization. This would explain why some programs appear as frequently added and disbanded conferral fields. It is a noted limitation of this study, and while efforts have been made to diminish any such effect, it is impossible to determine if it has been fully eliminated. Changes in institutional personnel or reporting policies can alter how conferral fields are categorized and reported. These unpredictable elements of CIP code data do allow for some degree of distortion, and as a result, findings derived from such information must be interpreted with caution. Still, the general alignment between the added and disbanded conferral fields that make up academic entrepreneurship, and BLS occupational projections helps to verify the validity of such measures.

**Measurements of Entrepreneurship & Patent Data**

Following a review of BLS data, and added and disbanded conferral fields, Spearman’s correlation was undertaken to determine if the new measures of entrepreneurship in the academic heartland correlated with patent and copyright data. These tests were conducted to determine if commonly discussed measures of entrepreneurship like intellectual property shared a significant correlation with changes in conferral fields. After the number of patents assigned to each institution was tabulated,
descriptive analysis was run to determine if a specific subset of institutions received the majority of patent assignments in the studied time frame. Table 17 shows the descriptive statistics for all research universities in this study, and for all non-research institutions.

| Table 11: Average Number of Patents; 2002-03 Thru 2006-07 |
|-----------------|-----|-----|
| Institutional Type                                      | N   | Mean |
| Research Universities-Very High Research Activity       | 96  | 104.96 |
| Baccalaureate Colleges-Arts & Sciences, and Master’s Colleges, Medium Programs | 435 | 0.17 |

According to Table 17, a majority of patents were assigned to research-oriented institutions. Subsequently, research institutions were isolated to see if their patent activity correlated with academic entrepreneurship. To do this, patent data collected from the United States Patent and Trademark Office was collected for each institution. This information was used to undertake correlation analyses. The results of these correlation tests can be reviewed in Table 18, and Table 19.
Chart 10: Average # of Patents: Research V. Non-Research Institutions

- Non-Research Institutions: 0.17
- Research Universities: 104.96

Average Number of Patents, 2002-03 Thru 2006-07
Number of Institutions
Table 12: Correlations, Academic Entrepreneurship at Research Universities & Patent Assignments

<table>
<thead>
<tr>
<th>Spearman’s rho</th>
<th>Net Entrepreneurship</th>
<th>Total Entrepreneurship</th>
<th>Number of Patents Assigned Between Academic Years 2002-03 and 2006-07</th>
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<td>Correlation Coefficient</td>
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<td>Net Entrepreneurship</td>
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<td>Total Entrepreneurship</td>
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<td>Sig. (2-tailed)</td>
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<td>Number of Patents Assigned Between Academic Years 2002-03 and 2006-07</td>
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<td>Sig. (2-tailed)</td>
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**. Correlation is significant at the .01 level (2-tailed).
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<th>Net Entrepreneurship</th>
<th>Total Entrepreneurship</th>
<th>Number of Patents Assigned Between 2002-03 and 2006-07</th>
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<td>Net Entrepreneurship</td>
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<tr>
<td>Total Entrepreneurship</td>
<td>Correlation Coefficient</td>
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<td>Sig. (2-tailed)</td>
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<td>435</td>
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<tr>
<td>Number of Patents Assigned Between Academic Years 2002-03 and 2006-07</td>
<td>Correlation Coefficient</td>
<td>-0.053</td>
<td>0.059</td>
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<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.266</td>
<td>0.220</td>
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<td></td>
<td>N</td>
<td>435</td>
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**. Correlation is significant at the 0.01 level (2-tailed).
The analyses revealed no significant correlation between net or total entrepreneurship (calculated for the years 2004-05 thru 2008-09) and the number of patents assigned between 2002-03, and 2006-07. This provides evidence that indicates academic entrepreneurship is different from other types of entrepreneurship characterized by research and development, and intellectual property. Neither measure of entrepreneurship is more accurate than the other; rather, they are complementary and provide greater insight into how institutions adapt and evolve.

The analysis of these newly created measures have uncovered broader themes that help fill a void previously present in research that investigates entrepreneurship in postsecondary education.

**Key Themes**

The global context of the knowledge economy usually details the implications of increasing collaboration between higher education, private sector, and governments in ways that leverage intellectual capital for commercial gain (Etzkowitz, 1998; Slaughter & Rhoades, 2004). Until now, research that focuses on applying entrepreneurship in higher has done so while focusing on market interactions, and the increasing opportunities for revenue diversification that are growing in areas like intellectual property (Bok, 2003; Rahal & Rabelo, 2006). While important, behaviors that emphasize research are not the sole form of entrepreneurship undertaken by institutions. Many institutions lack the infrastructure to capitalize on research; even institutions that have the ability to do so still find it difficult to uncover lucrative breakthroughs (Slaughter & Leslie 1997; Slaughter & Rhoades, 2004). However, all accredited institutions confer degrees and certificates, and
such program offering have long been adapted and evolved in ways that mirror social and economic needs (Thelin, 2004; Rudolph, 1977; Drucker, 1985).

This longitudinal, quantitative analysis explored the implications of an increasingly turbulent, demanding environment on higher education institutions by investigating the nature of change in the conferral field of a degree or certificate. Using unique degree and certificate fields as a proxy for organizational change, multiple measures of entrepreneurship—that were centered around the concepts of adaptation, change, and innovation—were created that accounted for the number of new and disbanded unique conferral fields over the five-year time frame between 2004-05 and 2008-09. These measurements were created to determine: a) if institutions demonstrated entrepreneurship differentially; b) if these measures aligned with current shifts in programmatic offerings. Using regression analysis, these lines of inquiry were explored. The analysis yielded several important points, which included the following:

**Traits Impact Entrepreneurship**

The concept of academic capitalism manifests itself varyingly. While primarily discussed in the global context, the proliferation of demand for the learning and service provided by postsecondary education also plays a pivotal role on local, regional, and national scales (Deem, 2005). The need to act on opportunities is multiplied as the perils—slashes in public funding and endowments, greater competition for students, increasing costs, and greater expectations—become magnified themselves (Christensen & Soares, 2011). The faster cycle of change has resulted from technological revolution, heightened reliance on educational research infrastructure, and a need to double the numbers of citizens with a postsecondary education (Schumpeter, 1947; Slaughter &
Rhoades, 2004; Carnevale et al., 2010). The need to understand how institutions are evolving their academic heartlands to satisfy short-term and long-term goals is increasingly important (Mars & Metcalfe, 2009; Mars & Aguilar, 2010).

Diverse postsecondary institutions have unique identities, strengths, and weaknesses that are framed in ways that best positions institutions to satisfy new demands (Lane & Brown, 2004; Drucker, 1985; Pulley, 2005); this spectrum of characteristics has also helped to guide how entrepreneurial institutions behave (Thelin, 2004; Rudolph 1976; Brint, 2005). The regression analyses conducted in this study concluded that institutional traits do impact the degree of entrepreneurship in the academic heartland significantly and substantively. Institutions that were classified as private not-for-profit, research-oriented, with large enrollment, and balanced programmatic profiles demonstrated the highest degrees of academic entrepreneurship in comparison to institutions that were public, non-research, smaller, and which had program profiles that were specifically applied or arts and sciences focused.

Institutional traits accounted for 31% of the variance in total entrepreneurship, 17% of the variance in net entrepreneurship, 10% of the total net change in unique conferral fields, 13% of the absolute value change in unique conferral fields, and 5% of the percentage change in unique conferral fields. The concept that institutions of different types adapt and evolve to varying degrees based on their characteristics may seem basal. However, confirming and articulating such a relationship warrants broader considerations, which include:

**Standardization:** The lack of a common language has hampered the dialogue about entrepreneurship in higher education, and has served as a deterrent to measuring
the evolution of institutions. By explicitly defining entrepreneurship within a specific higher education context, this study and its findings help to establish guidelines for further measures of organizational adaptation and change (Mars & Aguilar, 2010).

**Metrics and Assessment:** Without clear and contextual quantifications of entrepreneurship, the analysis of what has become known as the ‘innovation deficit’ in higher education is hindered. This measure helps account for adaptation and change undertaken by entire institutions, and is just one part of a broader research agenda that will attempt to quantify entrepreneurship in the entire academy (Mars & Metcalfe, 2009).

**The Role of Federal and State Governments:** By providing data that allows for the creation of new measurements focusing on organizational responses to a changing environment; agents of oversight are facilitating institutional self-regulation, and analysis. Future requirement of greater depth and broader breadth of data will allow for the creation and refinement of more metrics. It may also help to inform stakeholders—like administrators, policymakers, and analysts—who rely on a variety of measures to improve our system of postsecondary education (Christensen & Soares, 2011).

**Efficiency and Outcomes:** Measures and patterns in the number and type of programs being added and discontinued are important components of navigating an environment characterized by diminished subsidy and high overhead burden rates. They provide institutions and accreditation agencies with actionable knowledge that can identify opportunities for intelligent growth, innovation, and cost-consciousness. By qualifying the types of programs being added and dropped, trends regarding student credentials and skill sets can be better understood, which can ultimately ensure students are receiving a quality education that provides a value-addition (Bresciani, 2006).
Institutions Behave Differently

The confirmation that institutional characteristics account for academic entrepreneurship led to a deeper exploration about the role of those traits in determining the degree of entrepreneurship. To do this, each regression was analyzed to determine which features played a significant role in degree of entrepreneurship in the academic heartland.

The analysis revealed that comparatively, institutions classified as Research Universities—Very High Research Activity, demonstrated greater degrees of academic entrepreneurship in comparison to Masters Colleges-Medium Programs, and Baccalaureate Colleges-Arts and Sciences. Perhaps research universities are more equipped to adapt and evolve because of their relative youth when compared to institutions that are focused on arts and sciences—programs, more steeped in accumulated capital that is not risked lightly (Brint, 2005; Marginson, 2007). Additionally, research-oriented institutions have been created at varying points in order to satisfy new demands for skills and research which are less abstract, and more defined; making them more sensitive to the pulse of stakeholders, and better able to change effectively (Thelin; 2004, Bush, 1945). The financial risk and reward for creating and disbanding relevant programs may lead to greater competition, and a culture of action and evolution in research-oriented institutions as opposed to others (Katkin, 2003; Brint, 2005; Kauffman, 2007).

Private, not-for-profit institutions demonstrated greater academic entrepreneurship than their public counterparts. This may be attributable to greater exposure to competition, less public subsidy, fewer layers of bureaucracy and oversight
when compared to public institutions (Altbach et al., 2010; Brint, 2005). Emerging models of for-profit education continue to move towards the center of competition between both public, and private, not-for-profit institutions (Christensen & Soares, 2011; Kinser, 2007). Increases in the cost and price of an education may lead private, not-for-profit institutions to behave more entrepreneurially throughout their organizations in order to demonstrate value to consumers who may be reluctant to pay a higher price for an education (Farrel, 2005). Public institutions are more constrained by oversight that can inhibit the pace of organizational change (Lane, 2007).

Moreover, institutions with balanced program profiles demonstrated higher levels of entrepreneurship in the academic heartland than schools with an emphasis on arts and sciences programs, and schools that prioritized applied and professional fields. Schools with balanced programs may be better able to harness their intellectual capital to satisfy demands for an education that provides depth in an applied area, and the breadth and flexibility provided by more traditional, arts and sciences programs (Rudolph, 1977; Townsend et al., 2009). Schools with program profiles that focused on applied and professional fields demonstrated higher levels of entrepreneurship in comparison to schools with program profiles that focused on arts and sciences. More applied programs have less history, are more malleable, and carry less accumulated capital than arts and sciences programs (Rudolph, 1977; Marginson, 2007). As a result of this flexibility, changes in applied programs may be more frequently than adaptations in arts and sciences programs, which have borne out in this analysis (Rudolph, 1977; Trow, 1985; Thelin, 2004). This may be because institutions are more reluctant to risk changing more
traditional programs that have accumulated greater capital (Bourdieu, 1988; Marginson, 2007).

*Larger* institutions demonstrated higher degrees of academic entrepreneurship than *smaller* ones. Institution sector was significant influence on academic entrepreneurship. The findings of this study revealed that institutions with the largest populations demonstrated the highest levels of academic entrepreneurship. Enrollment size has been shown to be a determinant of institutional prestige in the past (Volkwein & Sweitzer, 2006). “Campus size, whether measured by enrollment or budget, is another functional measure in so far as size reflects the likelihood that curricular activities will be more diverse than concentrated (Brint, 2005, p. 160).” Campus size has broader implications on the collection of intellectual capital, the diversity of programs, and general organizational structure of the institution.

Institutions that have greater numbers of students have a wider pool from which to increase revenues. As state subsidy continues to decline, institutions look strategies that include increasing enrollments, and tuition revenue as a means of balancing this out (Shin & Milton, 2007). Furthermore, institutions with larger enrollment sizes are more likely to have more diverse offerings with which they can attract more students (Rhoades, 2001). The size of institutions also is of significant influence on the types of programs being offered (Brint, 2005). This helps to explain the finding that larger institutions demonstrated greater degrees of entrepreneurship in the academic heartland.

**Metrics and Current Demands Align**

The scholarly community acknowledges the need for new measures that are designed to understand entrepreneurship. It is vital that any new measurement be
conceptually sound (Mars & Aguilar, 2010). Even if conceptually sound, these measures must also be evidential to enhance their validity. Academic entrepreneurship was explored by analyzing the types of programs being added and disbanded during the studied time frame. It was determined that the most frequently added and disbanded programs aligned with current demands for fields that were applied and professional, and that also supplied students with a broader, more generalized knowledge base that enhances the ability of one to adapt (Brint, 2005; Townsend et al., 2009; BLS, 2010).

Entrepreneurship Extends Beyond Research and Development

Entrepreneurship has existed in higher education well before patents, copyrights, and the research intensive institutions optimally designed to create them (Drucker, 1985). The correlation analysis between the patent and copyright activity, and entrepreneurship in the academic heartland within research universities revealed insignificant relationships between the two. This lack of a statistically significant relationship implies that these measurements are accounting for different methods of institutional entrepreneurship; thus, providing evidence that institutions that fall outside of the research sphere do practice entrepreneurship, albeit, differently. The most pertinent findings include:

1) Institutions with balanced programs have the greatest impact on academic entrepreneurship.

2) Schools with large enrollments tend to be more entrepreneurial than smaller schools.

3) Research oriented institutions are more engaged in academic entrepreneurship than others.
4) Private institutions demonstrate more academic entrepreneurship than public institutions.

5) It is important to investigate academic entrepreneurship separately from research and development.

6) These measurements reveal shifts in conferral fields that mirror economic demands. These key themes are relevant to the scholarly community because, “of the urgency in better understanding the benefits, limitations, and consequences of the different ways of supporting and creating entrepreneurial activity in higher education (Mars & Aguilar, 2010, p. 442).

The following chapter will discuss the results and findings in greater detail. It will discuss the implications of the results, and summarize the study, while offering suggestions for future research.
CHAPTER V
SUMMARY AND DISCUSSION

The purpose of this study was to understand how academic entrepreneurship—the process of adaptation and change undertaken by institutions within their core academic units—might develop differently based on unique institutional traits. To accomplish this, measures were created that were based on changes in degree and certificate conferral fields. These included the net, percentage, and the absolute value change in unique CIP code conferrals between 2004-05 and 2008-09. Additionally, net entrepreneurship, and total entrepreneurship between 2004-05 and 2008-09 were created using year-to-year changed in unique degree and certificate conferral fields from 2004-05 thru 2008-09.

The newly created measures of entrepreneurship in the academic heartland were centered on entrepreneurial theories that emphasize adaptation and change resulting from changing demand streams, opportunity structures, and stakeholder expectations (Schumpeter, 1947; Drucker, 1985; Clark, 1998). Changes in degree conferral fields were chosen to measure academic entrepreneurship based on their linkage with social, and economic demands throughout the history of our system of postsecondary education (Rudolph, 1977; Thelin, 2004; Brint. 2005).

Once these variables were created, regression analyses were employed to explore how different institutional traits impact academic entrepreneurship. The characteristics used—including Carnegie Classification-Basic, Institution Sector, Carnegie Classification-Undergraduate Instructional Program Profile, Institution Size, Land-Grant Status, Carnegie Classification Undergraduate Profile, Degree of Urbanicity, and Region—were chosen for their ability to represent the diversity present in our system of higher education.
The concept of academic entrepreneurship was based on Clark’s paradigm of the entrepreneurial university (1998), Slaughter, Leslie, and Rhoades’s (1997 & 2004) research on academic capitalism, and turbulent environmental and economic conditions that have led to adaptation by institutions. This change has long been considered an integral component of entrepreneurship in higher education (Say, 1855; Weber, 1950; Schumpeter, 1947; Drucker, 1985). The idea that institutions evolve in ways that support core academic missions and values is based on Clark’s (1998) notion of the academic heartland. According to Becher and Trowler (2001), this heartland—the function of education—is at the center of the higher education landscape. This core function is changing to conform to contemporary demands (Bok, 2003; Brint, 2005). By evolving, institutions preserve their academic missions, and move towards more sustainable organizational models (Clark, 1997; Brint 2005; Christensen & Soares, 2011). How institutions respond to this may be influenced by their own institutional characteristics, which may alter how internal and external pressures create entrepreneurial action (Lane & Brown, 2004; Lane, 2007).

To examine the relationships between institutional characteristics and academic entrepreneurship, a series of hypotheses were formulated. It was hypothesized that institutional categorization and classification frameworks would help explain the variance in the net, percentage, and absolute value changes in unique CIP code conferrals. These characteristics were also hypothesized to influence net and total entrepreneurship. Newly created measures of academic entrepreneurship were based on calculating the number of newly added, and disbanded degree conferral fields from 2004-05 thru 2008-09.
The third hypotheses explored the types of degree or certificate fields that were added and disbanded; it was believed that patterns would exist in the types of degree conferrals that were being added and disbanded. Specifically, new and disbanded programs would most likely be applied and practical in nature, and would bare similarities to occupational projections provided by the Bureau of Labor Statistics.

The final component of this study was to determine if academic entrepreneurship, and more modern, research oriented notions of higher education innovation, patent assignments, would be related to one another. This chapter will include a discussion of the key findings of this study, and the implications they have on government and institutional policy.

**Discussion**

**Institutions Are Entrepreneurial In Different Ways**

The American system of postsecondary education is diverse, and so is the idea of what constitutes entrepreneurship. Some schools focus on peripheral functions like research, whereas others may be applied or technical. Regardless of the thousands of combinations of traits an institution may have, the institutions in this analysis all confer degrees or certificates in fields of study. It was hypothesized that some institutions would be more likely than others to change these fields based on their unique characteristics and capital (Lane, 2007; Marginson, 2007). This study explored this by determining the impact of different institutional characteristics on the newly created
measures of academic entrepreneurship. The following paragraphs will detail the key themes of these analyses.

**Research Oriented Institutions Are Most Engaged in Academic Entrepreneurship**

The findings of each regression analysis supported the hypothesis that Research Universities-Very High Research Activity would demonstrate the highest degrees of entrepreneurship in the academic heartland. Research Universities-Very High Research Activity has positive and significant coefficients of academic entrepreneurship. Schools that were classified as Masters Colleges-Medium Programs, and Baccalaureate Colleges, Arts and Sciences had negative coefficients—some of which were significant, and some were not—indicating that these characteristics had either a negative, or no impact on academic entrepreneurship whatsoever.

It was anticipated that Baccalaureate Colleges-Arts and Sciences and Masters Colleges-Medium Programs would have a lesser, and negative impact on academic entrepreneurship than research institutions. Baccalaureate colleges with stronger academic profiles are more likely to be arts and sciences-oriented. The programs contained within arts and sciences oriented schools are likely to have established status within the academy (Lee & Rhoades, 2004; Volkwein & Sweitzer, 2006). While not completely resistant, these programs are less likely to change; leading to less of a likelihood that such schools will be entrepreneurially with the programs they offer (Brint, 2005; Trow, 1985; Becher & Trowler, 2001). Additionally both baccalaureate colleges and masters colleges are less likely to have the research infrastructure that supports more

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27 These included Carnegie Classification-Basic, Carnegie Classification-Undergraduate Instructional Program Profile, Institution Sector, Institution Size, Land-Grant status, Degree of Urbanicity, Region, and Carnegie Classification-Undergraduate Profile.
applied and technical fields, making it less likely that their programs adapt and evolve over time (Bush, 1945; Volkwein & Sweitzer, 2006).

Moreover, research institutions may be more flexible due to their applied nature; the programs in which they confer degrees or certificates may be more frequently created and disbanded due to rapidly changing social and economic needs (Rudolph, 1977; Volkwein & Sweitzer, 2006; Duderstadt, 2009). These influences help to explain why institutions classified as Research Universities-Very High Research Activity demonstrated the highest levels of academic entrepreneurship (Trow, 1984; Becher & Trowler, 2001; Brint, 2005).

**Private Institutions Tend To Be More Entrepreneurial Than Public Institutions**

Entrepreneurial activity in the academic heartland varied based on institutional sector. The findings of the analysis confirmed that private, not-for-profit, 4-year and above institutions had a greater, positive impact on academic entrepreneurship than public, 4-year and above institutions. In each analysis, private, not-for-profit, 4-year and above institutions had positive, and significant values of academic entrepreneurship in comparison to public institutions.

The competition for capital in all its forms can impact the entrepreneurial behaviors of institutions (Bourdieu, 1988; Marginson, 2007). Institutions that are, “Older, larger, and wealthier...have an edge in the competition for faculty, students, and prestige (Volkwein & Sweitzer, 2006, p. 143).” In addition to potential resource advantages and uncertainty, private institutions are less bureaucratic, and have less oversight (Lane, 2007); this allows such organizations to adapt and evolve to environmental changes faster than public institutions. Due to a greater need and ability to
be responsive likely plays a role private institutions absorbing and synthesizing demand faster (AltbachRudolph, 1977 2010). More competition, and less financial certainty—although, this financial stability is eroding—may contribute to the higher levels of academic entrepreneurship demonstrated by private institutions in this study.

External conditions include a rapidly deteriorating economy, and rising costs in higher education. These have led to for-profit institutions migrating upstream—by rapidly increasing their market share of students over the last decade—and competing with not-for-profit institution more prolifically (Geiger & Heller, 2011; Christensen & Soares, 2011). Private, not-for-profit institutions feel this more acutely, due to less insulation from competition—as illustrated by lower levels of public-subsidy in comparison to public institutions—that may require more malleability. This elasticity is fundamental to maintaining competitive legitimacy in a more volatile environment (Etzkowitz, 1998; Mars & Metcalfe, 2009).

Additionally, public institutions have their own unique context and traits that make them less likely to demonstrate entrepreneurship. Public institutions are state created and funded enterprises that receive greater levels of subsidy. Moreover, public institutions generally cost less for students to attend; this may create an advantage when competing for tuition dollars and students (Geiger & Hanna, 2011). Greater degrees of latent and manifest agents of oversight also contribute to public institutions being less likely to rapidly evolve (Lane, 2007).

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28 Although, according to analysis provided by Wellman & the Delta Cost Project (2010), the only institutional type that has experiences increases in subsidy are private, research institutions.
Balanced Program Profiles Are The Most Entrepreneurial

The nature of an institution’s instructional program profile significantly influenced academic entrepreneurship; this finding confirmed the broader hypothesis regarding the role of instructional program profiles in determining the entrepreneurial nature of institutions. Institutions with balanced instructional programs are in an optimal position to reach into both applied and traditional fields. These institutions have the diverse, internal units and structures that allow for multi-disciplinary centers, constellation programs, and more customized programs that are increasingly in demand in a knowledge-oriented economy (Brint, 2005; Townsend et al., 2009). The inherent limitations of institutions with more content-specific programs, combined with the growing demand for students with diverse disciplinary exposure may explain the findings that balanced institutions were the most entrepreneurial in their academic heartlands.

However, it was originally hypothesized that institutions classified as having professions-degree focused program profiles would demonstrate greater academic entrepreneurship than institutions with profiles that were arts and sciences focused, or balanced in their concentration of arts and sciences, and professions-degrees. While such a finding was anticipated due to the continued growth in demand for occupational and applied fields, the rejection of such a hypothesis is explainable in hindsight (Grubb & Lazerson, 2005; Bok, 2003; Clark, 1998).

Institutions with greater concentrations of professions-oriented degree programs were anticipated to be more agile with their programmatic offerings than other types of instructional program profiles. This was attributed to the growing need for degree and certification completion for the creation of a qualified workforce (Arum, 2011).
Schools that offered more applied and professional degree and certificate programs were expected to broaden the scope of programs that would satisfy demands (Townsend et al., 2009). However, this hypothesis was rejected. Institutions that were professions-focused did not demonstrate the highest levels of entrepreneurship in the academic heartland; instead, schools that had balanced academic program profiles did.

Professions-focused institutions are more likely to already have programs that are theoretically in tune with the economic and labor demands of society; they are already in place, and make it less likely that such schools will have to undergo massive adaptations that would be reflected by conferral field changes. In addition, they have a limited diversity in intellectual capital—as do institutions with arts and sciences focus—in comparison to institutions that have balanced academic program profiles (Brint, 2004; Townsend et al., 2009). Arts and sciences programs have a greater tendency to be more prestigious; the status they carry with them is something institutions may be unwilling to risk by adding and disbanding programs (Brint, 2005; Trow, 1985). On the other hand, schools that are professions focused may be reluctant to add or drop programs that are perceived by many to be, “cash-cows (Mangan, 2011).” Both types of institutions—those that focus on professions versus those that are more arts and sciences focused—focus on niches in comparison to institutions with a more balanced focus. This likely lead to the findings that more balanced programs demonstrated greater, and positive levels of academic entrepreneurship.

**The Larger the Institution; The Greater the Level of Academic Entrepreneurship**

The finding that larger institutions demonstrated higher levels of academic entrepreneurship than smaller institutions is important to note. While not an independent
variable, institution size demonstrated a statistically significant impact on the nature of entrepreneurship in the academic heartland between 2004-05 and 2008-09.

As state budgets continue to get slashed, institutions are increasingly looking to alternative sources of revenue to compensate for these financial shortcomings. While many institutions seek out revenues from research and development, “another attractive source of revenue for policy makers and administrators is tuition and fees, since the principles of consumer payment are more applicable in higher education than elementary and secondary education (Shin & Milton, 2007, p. 720).” Since the 1970’s, which saw the beginning of belt-tightening policies that hampered colleges and universities, these organizations have attempted to determine how to maximize revenues per student without alienating them (Shin & Milton, 2007).

The combination of decreased state subsidy, and an access agenda that has been considered successful by most accounts—there are still those who consider it incomplete due to a failure on the part of the larger postsecondary system to enfranchise underrepresented groups—has left these institutions with more students from which to maximize revenues from (Christensen & Soares, 2011). Increased student enrollments, and the proliferation of new methods of accessing higher education—namely, online education—have spawned new avenues through which institutions can pursue funding (Oh, 2003; Bok, 2003). During a time when higher education has become more globalized, larger institutions that have both the capacity, and experience dealing with large numbers of students. They have expanded their reach, and recognition by offering comprehensive distance education programs, and most recently—to varying degrees of success—by creating international branch campuses (Lane & Kinser, 2011).
According to Rhoades (2001), “as colleges and universities have increased in their number and size, one might suppose there would also have been an increase in variety and richness of offerings (Rhoades, 2001, p. 20).” It could be inferred that institutions that have larger may be able to generate more revenues from more students, who in return demand a greater diversity of programs offered. The findings of this study—that institutions with the largest enrollments are most likely to engage in academic entrepreneurship—suggests that this combination of more students, greater revenue potential, and larger programmatic capacity and diversity may motivate these institutions to adapt and evolve as a means of attracting more students, and thus, more financial stability.

Larger institutions may be more entrepreneurial with their academic heartlands; however, the findings of the descriptive analysis of the changes in degree and certificate conferrals may suggest there are limits to how innovative these institutions are being. Similar programs were being added and disbanded; this may be an alarming sign that institutions are simply following the pack. “One of the unintended—and paradoxical—consequences of growth in student numbers has been a trend toward uniformity of educational styles (Rhoades, p. 20, 2001).” This lends credibility to the idea that institutions are becoming increasingly homogenized; one commonly cited peril of those leery of entrepreneurship in higher education.

Institutions Adapt Based on Economic Demands

The notion of academic entrepreneurship was based on new and disbanded conferral fields. To determine if the newly created measures accounted for substantive patterns of change in programmatic offerings; the types of new and disbanded conferral
fields were analyzed in addition to quantitatively measuring such change. Using Brint’s (2005) work on changes in conferral fields, and projections from the Bureau of Labor Statistics (BLS), an analysis was undertaken to determine if these newly created measures substantively mirrored the demand for more occupationally oriented and practical programs.

The analysis of the most frequently occurring new and discontinued conferral fields found that occupationally related and general programs were added and disbanded most frequently. Programs that satisfy labor demands—in programs that were health related, education related, scientific, and multi-disciplinary—were more likely to be added. Patterns existed between these programs, and the occupational fields identified by the BLS to have the greatest growth potential over the next decade (BLS, 2010). For example, the Bureau of Labor Statistics projected the health care field would, “grow by 14 million jobs between 1992 and 2005,” and, “The U.S. population over 85 is growing four times as fast as the total population (Health Majors, 1997, p. 1).” Nursing, and health related fields were among the most frequently added. Other high growth fields included biomedical and biochemical sciences; these were also among the most frequently added new conferral fields. Foreign languages, arts-related, and education programs were among the most frequently disbanded fields. While this may not seem to have a correlation with BLS statistics, deeper investigations did. For example, the scarcity of foreign language opportunities, and high level of competition for arts-related employment likely have a negative impact on the number of such programs in existence. Many of the education programs disbanded were more general; as greater role specialization continues, such programs may fall by the wayside. Fiercer competition
among the programs is an indication that there is great opportunity for those that establish elite, or high-value programs, but risk for those institutions that cannot.

The appearance of generalized liberal arts programs, and multidisciplinary fields would be added and disbanded is likely a symptom of the evolution of the liberal arts curriculum. Such volatility may reflect the deconstruction of disciplinary barriers in traditional fields; this can be partially attributed to market demands, and greater levels of student choice. Evolutions in programmatic offerings have also been caused by the unique needs that have emerged from a knowledge-oriented economy, growth in information communication technology, and the diversification of the type and number of educational institutions that compete for students (Etzkowitz & Leydesdorff, 2000; Oh, 2003; Hanna, 1998). Fewer types of related occupations were expected to grow; however, the skills learned from these more general fields—including broad knowledge bases, effective communication skills, and diverse perspectives which can enhance analytical abilities—are important components of occupations like financial analysis, customer service, and sales (BLS, 2010). This may lead to a contrasting—broadening—effect taking hold in arts and sciences programs in comparison to more applied fields, which appear to be undergoing greater specialization in this study.

Students may also be playing a role in shaping academic entrepreneurship. They are participating in swirling, which is, “taking courses in a variety of institutions and accumulating degrees credit by credit (Grubb & Lazerson, 2005, p. 7).” This ala-carte style of education can blur disciplinary and organizational boundaries. This lowering of disciplinary walls may be more appealing to students. Institutions are using their missions, values, governance structures, and resources to create and disband conferral
fields in order to maintain their legitimacy and ability to compete (Rudolph, 1977; Thelin, 2004; Townsend et al., 2009; Grubb & Lazerson, 2005). This has led to experimentation by institutions, as they try to determine how they can optimally adapt and evolve.

The high representation of occupational and professional fields in both new and discontinued CIP code conferrals reflects long-term trends in higher education. Shifts in conferral fields that reflect economic and labor needs have long been part of higher education (Brint, 2005; Townsend et al., 2009). For example, occupational majors have largely risen following World War II. According to Grubb & Lazerson (2005), “While the 1960’s, with its idealism and economic expansion, created a slight fall in the proportion of occupational majors, from 62% in 1959–60 to 58% in 1970–71, since then the proportion has gone back up to about 65% in 1987–88, before declining slightly during the expansionary period of the 1990s (p. 7).” Larger, national trends indicate that institutions use conferral fields to respond to changes in their environment (Rudolph, 1977; Bok, 2003). Contemporary trends emerged from the analysis of the types of added and disbanded conferral fields

Over the last few decades, health fields, biological, computer science, and business fields have grown (Geiger & Heller, 2011; Brint, 2005). Fields in traditional disciplines have not experienced such expansion. “The only exceptions have been psychology and the life sciences, both closely linked to health occupations, and two small fields labeled “liberal/general studies” and “interdisciplinary studies (Grubb & Lazerson, 2005, p. 7).” As a result, the hypothesis that institutions would demonstrate a greater likelihood to add and disband more occupationally relevant and general fields was
confirmed. The findings of this study reflect the rising demand for occupational and professional programs, and the evolution of the traditional undergraduate curriculum from discipline specific content to broader, more generalized and multidisciplinary programs.

**Academic Entrepreneurship Isn’t Research and Development**

Relationships between the academy, industry, and government are increasingly dominating the discourse regarding entrepreneurship in higher education (Slaughter & Leslie, 1997; Etzkowitz, 1998; Anderson, 2001; Bok, 2003; Slaughter & Rhoades, 2004). For the private sector and government, the commercialization of knowledge produced by higher education institutions takes on broad appeal because of its capacity to fuel economic growth, and grow new jobs; increasing individual prosperity, regional economic viability, and national competitiveness in a more interconnected world (Slaughter & Rhoades, 2004; Carnevale et al., 2010).

Many institutions are participating in the triple-helix by focusing predominantly on the market for research in an effort to drive innovation. The buzz surrounding research stems from a combination of diminishing public subsidy, the increasing role of postsecondary education in driving a knowledge-dominated economy, the idea of intellectual property and the potential for revenue generation that it provides (Etzkowitz, 1998; Anderson, 2001; Christensen & Soares, 2011). However, the notion that research and development is at the center of postsecondary entrepreneurship does not paint the whole picture. In reality, it’s only a small piece of it because most institutions are unable to compete in the research game (as previously evidenced in this study). According to Slaughter and Rhoades (2004), “Pleading inability to engage in private research markets
based on location or type of field legitimates resistance (p. 195).” This may prevent institutions from embracing what they are good at, which is education because there is little incentive provided based on current rankings and measures of status (Carey, 2006). By articulating that most academic entrepreneurship does not take the form of research, institutions may be able to focus on what they do best.

The conclusion that academic entrepreneurship and research and development—as measured by patent activity for the purposes of this study—bare little relation to one another substantiates the outcries of many institutions. All institutions demonstrate, “evidence of a programmatic push toward the private marketplace (Slaughter & Rhoades, 2004, p. 205).” The discovery of the phenomenon of academic entrepreneurship outside of research and development demonstrates the diverse ways that institutions evolve in the face of mounting pressures, and environmental changes.

**Academic Entrepreneurship Can Be Measured**

Defining entrepreneurship in specific terms can be difficult because the concept is flexible, and ambiguous nature (Mars & Aguilar, 2010). The term entrepreneurship has been used in very broad and scattered ways, leading to increased confusion about how to apply it in higher education (Mars & Metcalfe, 2009). Literature calls for operationalized measures of entrepreneurship, which can enhance the body of research regarding institutional adaptation and innovation (Shane & Venkantaraman, 2000).

To satisfy the call for clear and contextual definitions of entrepreneurship, this study began with a literature review that focused on uncovering the foundational themes of entrepreneurship. Examining works that focus on what entrepreneurship is, including those of Jean Baptiste Say (1855), Max Weber (1905), Joseph Schumpeter (1947), and
Peter Drucker (1985) led to measures that focused on evolution, innovation, adaptation, and change to improve an organization.

Further efforts to conceptualize meaningful definitions of entrepreneurship in higher education were honed by exploring the changing postsecondary environment. To harness the opportunities provided by a more knowledge-oriented economy, institutions use their unique capital to grow in ways that support traditional academic missions and values (Clark, 1998; Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004; Bok, 2003). The notion of the, “academic heartland,” articulated by Clark (1998) was coupled with Becher & Trowler’s (2001) idea that education is central to the academic landscape to operationalize academic entrepreneurship.

To represent entrepreneurship in the academic heartland, Classification of Instructional Program (CIP) codes were selected. These codes are a taxonomic coding scheme designed to catalog the major, or area of study that a degree, or certificate is conferred in during a given academic year. These concepts allowed for a definition of entrepreneurship that is based on organizational adaptation and change that is represented by new and disbanded degree conferral fields (Rudolph, 1977; Thelin, 2004). This led to the use of metrics that were based on the number of added and disbanded conferral fields between 2004-05 and 2008-09. The evidence that these measures are influenced by institutional characteristics, and align with occupational projections provides evidence that such measures may be a viable means of investigating innovation in institutions.

**Policy Implications**

Costs are ballooning, prices are rising sharply, and institutions have done very little to demonstrate that they will be the drivers of necessary change (Christensen &
Soares, 2011). Furthermore, many of our public and private institutions have inefficient business models that are plagued by unacceptably high overhead burden rates. Few if any institutions are willing to disregard traditional indicators of status and prestige; they are facing an identify crisis (Trow, 1985; Christensen & Soares, 2011). By measuring academic entrepreneurship, and determining how it manifests, stakeholders can shape policies that are aimed at influencing institutions to adapt and evolve more effectively.

**Government Policy**

The growing interdependencies between higher education, government, and the private sector require sound government policies. In the past, policies have been used to expand access, create a more qualified and technical labor force, and to enhance innovation in the country. Policies that promote more entrepreneurial organizations can be important drivers of effective institutional growth, adaptation, and change.

A variety of examples that illustrate how policy can impact postsecondary adaptation and change exist. These include the Morrill Land Grant Acts (1872 & 1890), the G.I. Bill (1944), the Higher Education Act (1965), and the Bayh-Dole Act (1980). All of these policies have led to important changes to the American system of postsecondary education, and have also influenced the fields of study offered by institutions. Understanding that one root cause of academic entrepreneurship—resource dependency—drives change, and can aid in the creation of policies that promote the optimization of institutional capital (Thelin, 2004; Rudolph, 1977).

To do this, ambiguities that exist in the language pertaining to costs, prices, and metrics need to be cut through. It leads to confusion—among administrators, involved faculty members, public-policy makers, scholars, and the public (Cohen & March, 1986;
Mars & Metcalfe, 2009). This is furthered by the inherent lack of clarity embedded into higher education institutions. Building an agreed upon language can help lift the fog that surrounds academic entrepreneurship. State and federal agencies can help create this language by requiring more actionable knowledge—by increasing the depth and breadth of data reported—as a requirement for public funding.

By taking efforts to increase the tools at the disposal of researchers, and institutions federal and state governments can take a more active role in increasing the flow of information to and from schools. This can lead to more accurate metrics, and more informed consumers; ultimately it can promote the new methods of organizational analysis, such as those undertaken in this study. Institutions could use this new wealth of information to improve their operations.

Higher education offers considerable benefit to society; these benefits include, “critical thinking, scientific and quantitative reasoning, preparation for citizenship, moral, reflection, readiness for work, respect for diversity, broad intellectual knowledge, and the transmission of, culture, and appreciation of our national values (Entrepreneurship In American Higher Education, 2007, p. 4).” Policies that promote broader information streams that analyze adaptation and change based on conferral fields can assist students in identifying programs that offer credentials in fields they are most interested in.

Measures like this, which help to illustrate how institutions are changing to satisfy external demands, can also help shape policies that require institutions to focus on creating an education of value; one, which attempts to give students a specific credential, or skill set that leads to future employment (Smith, 2008; Huisman & Currie, 2004). Efforts should be made to ensure that such policies do not strictly identify applied
programs, as studies have shown that critical thinking, and oral and written communication are just as appealing to employers in the future (Kelderman, 2010).

Demonstrating which institutions are responding to the needs of external stakeholders can help identify organizational models that should be followed in times where funding is dwindling, and quality and access are stagnating (Carnevale et al., 2010; Christensen & Soares, 2011).

Ultimately, determining if and how institutions are being entrepreneurial can lead to policies that identify institutions that are more proactive, which could lead to disbursement of subsidy that is more strategic and effective (Chen, 2009; Mars & Metcalfe, 2009; Kelderman, 2010). While the creation of such programs is important, completion is also an essential aspect. Policy that rewards the completion of programs will be essential to ensuring a strong foundation of certified and employable citizens (Townsend et al., 2009; Brint, 2005). Policy may change to measure success on metrics like time to completion, retention, debt burden following graduation, starting salary, and outcomes based assessment (Bresciani, 2006).

Measures of entrepreneurship could potentially have future impact on accreditation procedures, which are tied to Title IV funding. Accreditation organizations allow for institutions to adapt and evolve, helping promote the entrepreneurial process within organizations (Perley, 2008). However, the peer-reviewed accreditation process often results in a one-best way of evaluation that can limit transformative innovation. This process allows for gradual institutional improvement, but can stymie rapid growth that may be lead to immediate decreases in quality (Christensen & Soares, 2011; Schumpeter, 1947). The Spellings Report of 2006 highlighted this limitation of
accreditation—a lack of emphasis on outputs, inadequate support for institutional innovation, and measurements that had varied definitions, leading to inconsistency from agency to agency—suggesting that more precise and innovative measures may be useful in promoting greater efficiency, more standardized assessment, and improved metrics of assessment and evaluation (A Test of Leadership; Pascarella & Tetenzini, 1998; Upcraft & Schuh, 1995). In addition to government policy, institutional policies may be influenced by these measures.

**Institutional Policy**

New measures of organizational adaptation and change entrepreneurship can guide institution-level decisions. As schools are being increasingly scrutinized about quality, access, value, and subsidy, it will be important for institutions to reflect on how they behave. Increasing calls for sea change are leading institutions to pursue entrepreneurship more ambitiously (Bok, 2003). Internal policies that can spur adaptation and change—while being centered on the core academic mission and values of the institution—can better position the institution to act favorably in the knowledge economy (Etzkowitz & Leydesdorf, 1998). This can help to counter much of negative associations many have about the presence of entrepreneurship in higher education. “In a Public Agenda survey conducted in 2007, 52 percent agreed with the statement that ‘colleges today are like most businesses and care mainly about the bottom line.’” In 2008, 55 percent assented to this statement, and by 2009, 60 percent of survey respondents conveyed this view (Presidential Leadership, 2011, p. 3).” This may be partially attributed to the limited body of research that examines how institutions change in their academic heartlands. Colleges and universities that create policies, which emphasize a
culture of entrepreneurship throughout the entire academy can facilitate positive momentum that can become more adaptable, and well-perceived organizations (Clark, 1998).

Due to the questionable usefulness of such ratings for institutions that are not among the notable or elite institutions; college administrators may be better served focusing on more specified measures of organizational behaviors, including the entrepreneurial nature of institutions. New measures of entrepreneurship can be useful guides for institutions that lack prestige, or the research and development infrastructure to realistically compete for status. While rankings and prestige can motivate institutions to implement change, such measures can be flawed—focusing on various accumulated capital, research, and spending—without considering other institutional factors that create competitive advantages and disadvantages (Carey, 2006). Many institutions lack the research infrastructure to maintain organizational models that can compete for such rigid indicators of status. This status-grab has led to an identity crisis for many institutions that are trying to be something they are not. In reality, institutional policies that focus on innovation within their core function of educating students may provide numerous benefits; simultaneously refocusing institutional efforts on core academic functions, and breaking free from measures of prestige that are out of context and burdensome for most institutions (Christensen & Soares, 2011; Carey, 2006).

This reframing of priorities may influence internal practices and policies that will reward more proactive academic units, and create competition and disruption among disciplines that can enhance the academy (Trow, 1985; Christensen & Soares, 2011). The academic units that create greater, and more lucrative cross-disciplinary partnerships
share resources, increase their appeal, and are better equipped to satisfy demands with their combined capital. Institutional policies that promote partnership between internal units can be developed using measures of entrepreneurship that focus on changes in conferral offerings. These benchmarks can also be used to identify the success and failure of programs that have been added and disbanded to help inform future decisions. Such policies can help institutions improve their status and increase revenue growth while being more efficient (Bourdieu, 1988; Etzkowitz, 1998; Marginson, 2007). “Too often traditionally organized colleges and universities, both public and independent, seem incapable of innovation or change except by adding to the full range of programs currently in place (Presidents Report, 2011, p. 4).” For this reason, the newly created measures of academic entrepreneurship included both the addition, and subtraction, of degree conferral fields. This was done to highlight institutions adding and dropping program, as opposed to those that may simply add new programs in an attempt to circumvent red tape—avoiding disingenuous change, or a type of virtual adoption of entrepreneurship (Birnbaum 2000).

This study can help to frame new institutional policies that place efficiency and strategic risk-taking in higher regard. As public funding decreases for institutions, maintaining programs with little or no output can be too costly. Institutions may create internal policies that reward programs that willingly discontinue programs while creating new ones that are designed to recruit more students and resources to the campus. Ultimately, institutions must be able to recognize the impact of their organizational behaviors, or the lack thereof, to create more optimal organizations.
Future Research

The last few decades have significantly enhanced the understanding of the impact that broadened inter-sector collaborations have on higher education. However, there is still a degree of ambiguity that can be attributed to the lack of conceptual and theoretical underpinnings referenced in entrepreneurship research (Mars & Aguilar, 2010). There are a variety of key areas where future research will improve upon measuring entrepreneurship; specifically in the academic heartland.

Defining Entrepreneurship Explicitly and Contextually

Mars and Aguilar (2010) undertook a content analysis examining 44 studies of entrepreneurship in higher education; the analysis noted that there was no use of economic and managerial theory in the studies. In addition, this study also found that only 2 of the 44 articles sampled explicitly defined entrepreneurship within a specific context. It is recommended that future research be guided by a combination of economic, business, and higher education theories in order to strengthen the conceptual foundations of entrepreneurship in higher education. As noted in Chapter 1, adaptation, innovation, and change are frequently included in definitions of entrepreneurship (Say, 1855; Weber, 1950; Schumpeter, 1947; Drucker, 1985). The nature of academic entrepreneurship was also based on historical examples of institutions adapting and evolving—changes, which often took shape in the form of changes in conferral fields—to meet changing demands (Thelin, 2004; Yale Report, 1828; Drucker, 1985).

The modern context for change in higher education revolves around the emergence of a knowledge economy that has placed greater emphasis on the outputs of postsecondary institutions, which include research, intellectual property, credentials, and
conferrals (Etzkowitz & Leydesdorf, 2000; Bok, 2003; Brint; 2005; Duderstadt, 2009). The unique characteristics of institutions can play an important role in determining the entrepreneurial responses (Lane & Brown, 2004). Institutions practice social entrepreneurship due to their mission-driven nature, and in ways that preserve academic values, while still allowing for innovation. By continuing to construct contextual and conceptual definitions of entrepreneurship, there are broad (Zietlow, 2001; Mars & Metcalfe, 2009). Additional research that provides a more thorough understanding of the strengths and limitations of CIP codes can build upon these newly created measures; enhancing our understanding of academic entrepreneurship.

Observing Entrepreneurship in the Academic Heartland at the Institutional Level

This study explored broad, national level trends regarding the emergence and disbandment of specific fields in which a degree of certificate was conferred in using secondary source data. Additional exploration of academic entrepreneurship can be undertaken at the institutional level; providing insight into micro-level trends pertaining to organizational changes within academic units.

Combining Measurements of Entrepreneurship

The majority of research on entrepreneurship in higher education highlights the interactions between private sector, government, and higher education (Etzkowitz, 1998; Mars & Metcalfe, 2009). These interactions typically include research and development and cross-industry collaborations (Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004). The findings of this study reveal that academic entrepreneurship, and research and development are separate, and can be used together to understand the evolution of the academy more holistically. Both types of measures provide important insight into the
diverse ways that institutions can practice entrepreneurship. Further analysis of the connections between change on the peripheries of institutions, and in the academic heartland would build upon this initial study.

**Creating an Entrepreneurship Metric**

Finally, creating measurements of entrepreneurship that highlight organizational adaptations within institutions and their traditional academic units, and combining these measurements with funding data, patent and trademark assignments, and research and development data—that is currently available from the National Science Foundation—is just one example of how an overall metric that measures entrepreneurship can be created.

**Access to Innovative Institutions**

The findings that institutions that are comparatively awash with opportunities—more students, applied programs, less bureaucracy, and diverse content—and potentially lucrative programs positively impact academic entrepreneurship may not come as a surprise to anyone. Such institutions should be anticipated to adapt and evolve more frequently; they have the resources, and means to do so. However, what about those institutions that do not? More importantly, what about the students who may not have access to these supercenters of knowledge? Future research should be conducted to determine the nature of those institutions that do not demonstrate entrepreneurial tendencies. There could be a quality gap between the educations received by students attending entrepreneurial institutions, versus those who are not.

**Conclusion**

The purpose of this study was to examine academic entrepreneurship by creating measures of organizational adaptation and change. These measures tracked changes in
the number of added and disbanded degree and certificate conferral fields between 2004-05, and 2008-09. These new measures of entrepreneurship in the academic heartland were analyzed to reveal differences in entrepreneurship based on institutional characteristics.

Institutions that were studied included public, 4-year and above and private, not-for-profit, 4-year and above institutions that were categorized within the Carnegie Classification Basic subgroups: Research Universities-Very High Research Activity, Masters Colleges-Medium Programs, or Baccalaureate Colleges-Arts and Sciences.

Using these new measures, patterns in academic entrepreneurship were observed based on institutional characteristics—which were represented by a variety of categorization and classification frameworks. The primary goals were to determine if: a) institutions engage in academic entrepreneurship in different ways, and if so, how; b) what patterns existed in new and disbanded degree conferral fields, and; c) if traditional measures of entrepreneurship, which focus on research and development align with the new measures of academic entrepreneurship.

Based on the results of this study, it was concluded that the entrepreneurship in the academic heartland does vary based on institutional categorization and classification frameworks. Research Universities-Very High Research Activity demonstrated the highest levels of entrepreneurship in the academic heartland in comparison to Baccalaureate and Masters colleges. This was anticipated, as research universities are more likely to have applied programs that are malleable in nature, and which are more interrelated to the market conditions arising from a knowledge-oriented economy (Bush, 1945; Etzkowitz & Leydesdorf, 2000).
Furthermore, private, not-for-profit institutions demonstrated higher levels of academic entrepreneurship in comparison to institutions that were public, 4-year and above. This finding was expected because private institutions receive less public subsidy, are less constrained by oversight and bureaucracy, and are exposed to greater competition arising from increasing numbers and types of institutions; these influences require private institutions to evolve more frequently (Lane, 2007; Hanna, 1998).

Institutions with program profiles that were balanced in their offerings of arts and sciences and professions-oriented programs were the most likely to be entrepreneurial in their academic heartlands. This was an unexpected finding; it was originally hypothesized that institutions with greater degrees of professions-focused programs would be most likely to add and disband conferral fields due to market demands. Due to the greater demand for both applied programs, and more general, multi-disciplinary programs, institutions with balanced program profiles are better able to leverage a more diverse stock of intellectual capital. This allows for greater experimentation with conferral fields that satisfy greater demand for choice, and an increased need for a broadly educated workforce (Rudolph, 1977; Thelin, 2004; Townsend et al., 2009; Grubb & Lazerson, 2005).

Institution size significantly influenced academic entrepreneurship. Schools with populations of 20,000 or more students demonstrated higher levels of academic entrepreneurship than smaller institutions. The greater number of students; the more likely an institution may be to have more diverse programs.

The variables of entrepreneurship were constructed in a way that attempted to satisfy growing demands for measurements that were both contextual, and conceptually
sound (Mars & Aguilar, 2010; Mars & Metcalfe, 2009). To that end, the study explored the meaning of entrepreneurship by analyzing economic theories—these included works from Say, Weber, and Schumpeter—to establish the nature of the entrepreneurship, which was interpreted to be adaptation and change. Following this, the catalysts for transformation, and the subsequent methods of change were identified within a specific context (the academic heartland) and operationalized through the use of degree and certificate conferral fields.

There are inherent limitations with CIP data, such as human, organizational, and methodological choice, lack of reporting standardization, and changes in the specificity of conferral fields. However, the alignment of the added and disbanded conferral fields with occupational projections from the BLS provides evidence that these are valid measures of institutional adaptation and change.

Health-related programs, like nursing and health administration, were frequently added based on the findings of this study. The appearance of applied programs like those that are health-related mirror patterns in shifting curriculum (Brint, 2005). Broader, more general, and more multi-disciplinary programs appear out of the need for students to understand complex problems from diverse perspectives. This results in programs that draw from diverse fields, rather than those that are isolated in disciplinary silos (Spelt, Biemans et al., 2009). This points to, “one interesting trend in academe: the slow and still very limited erosion of disciplinary boundaries in the liberal arts (Brint, 2005, p. 159).” The addition and dissolution of more general programs that have origins in diverse fields is a sign that this is indeed happening. It indicates that institutions are experimenting with their degree and certificate conferral fields.
A variety of explanations exist for the patterns observed in new and disbanded conferral fields. It could be argued that, “in a time of rapid change, academic programs must experiment and evolve in order to keep pace with advanced in knowledge, changes in professional practice, and shifting conditions in society (Baldwin & Baumann, 2005, pg. 89). Institutions are resorting to a sort of dynamism in their programmatic offerings that may indicate that institutions are still trying to find best practices, or that they must continually change in order to stay relevant in a hypercompetitive environment. The innovation and change undertaken by institutions that has been revealed in this study may simply be a sign of the times (Spelt et al., 2009; Brint, 2005; Baldwin & Baumann, 2005).

Entrepreneurship in higher education has its share of support and opposition. The changing social, political, and economic structure within which institutions operate has contributed to rapid organizational change over the last few decades (Clark, 1998; Bok, 2003). Broadened access, reductions in traditional funding, policies that provide new revenue opportunities, rapidly evolving technologies, and greater expectations have led to more proactive institutions (Slautgher & Leslie, 1997; Clark, 1998; Etzkowitz & Leydesdorf, 2000; Bok, 2003). Moreover, emerging organizational models and scarcer resources have led to fierce competition that requires more entrepreneurial behaviors (Hanna, 1998; Rhoades & Lee, 2004; Christensen & Soares, 2011). These behaviors include increased pursuit of revenues, new units in the peripheries of institutions, and more centralized organizations; characteristics believed by some to be shifting the institutional priorities away from the academic heartland (Bok, 2003; Trow, 1984; Becher & Trowler, 2001). In reality, changes on the periphery, and evolution in the academic
heartland are both examples of entrepreneurship in higher education; when considered together, these diverse measurements are complementary. The new measures of change in programmatic offerings and degrees conferred should be seen as an additional metric that can be used to foster greater organizational success in the future.

No institution is immune to the need for change; embracing and finding ways to understand it can only lead to more innovation by a system of higher education, which is widely considered to be the most vibrant, diverse, and effective collection of unique institutions in the world.


Bell, Allie. Interview By Author, Telephone, September 27, 2011.


Say, Jean-Baptiste. "A Treatise on Political Economy."


APPENDIX A

Table 1.

The following table lists the findings of correlation analysis undertaken to determine if the independent and control variables demonstrated collinear relationships. This occurs when two variables have a perfect, or near perfect relationship (Kennedy, 1985).

Statistically significant relationships exist between Carnegie Classification-Basic (CC-Basic), and institution sector (PC= .486, p (two-tailed) <.01). Statistically significant relationships also exist between CC-Basic, and Carnegie Classification-Undergraduate Instructional Program Profile (CC-UIP) (PC=.411, p (two-tailed) <.01). Additionally, statistically significant relationships exist between institution sector and CC-UIP (PC= -.290, p (two-tailed) <.01). This indicates that there is colinearity between the three independent variables chosen for this study. Institution size also had statistically significant relationships with CC-Basic (PC= -.838, p (two-tailed) <.01), and institution sector (PC= -.555, p(two-tailed) <.01).

While significant, the R-squared coefficients are not at or above .90, which would require further exploration according to Kennedy (1985).
### Table 1: Correlations, Independent & Control Variables

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**. Correlation is significant at the 0.05 level (2-tailed).  **. Correlation is significant at the 0.01 level (2-tailed).
Table 1 Cont’d: Correlations, Independent & Control Variables

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**. Correlation is significant at the 0.01 level (2-tailed).  *. Correlation is significant at the 0.05 level (2-tailed).
APPENDIX B

Tables 1 thru 4 list the 10 most frequently added unique conferral fields for each year studied—the lone exception being 2004-05, which was used as the benchmark year in order to determine whether or program was new, or preexisting. A new program is one that did not appear in 2004-05, and appeared in any subsequent year thereafter. The first year a program appeared was the year it was considered new.

Table 1 lists the top 10 new unique degree conferrals during 2005-06. The majority of programs that were most frequently added during this timeframe were in fields that were in applied, including: environmental studies and sciences, nursing fields, and education. Other fields were multi-disciplinary in nature, such as general studies, and international and global studies. There were some liberal arts oriented programs that were among the most frequently added conferral fields, including women’s studies, and drama and dramatic arts. However, these fields were outnumbered by more applied fields, and many were multi-disciplinary in nature. Similar patterns continued in 2006-07. Programs like nursing, education, and international global studies were again among the most frequently added programs. Applied fields like computer and information sciences, educational leadership and administration, secondary education, and health services were present. Music performance was the sole arts-oriented program most frequently added during 2006-07. Table 2 lists the 10 most frequently occurring new unique degree conferral fields during the academic year 2006-2007.

During the 2007-08 (Table 3) year the trends from the previous two years continued. Nursing, educational leadership, education general, environmental science, secondary education and teaching, early childhood education and teaching, and international global studies appeared as some of the most frequently added programs (they also had appeared in previous years). Additions to the most frequently appearing new programs included information technology, biomedical sciences, and sports and fitness administration management—which all are high growth occupational fields, according to the BLS—during 2007-08. Fine studio arts was the only arts program that appeared as one of the most frequently added fields during 2007-08.

Education-related programs were well represented among frequently added; Education general, elementary education and teaching, music teacher education, science teacher education, and teacher education and professional development were all included. Applied and scientific programs like health professions and related clinical sciences, computer and information sciences, biological and biomedical sciences, communication studies, and clinical laboratory sciences were some of the most frequently added conferral fields. French language and literature was the sole liberal arts oriented programs. Multi-Interdisciplinary studies were also one of the most frequently added fields between 2008-09 (See Table 4).

The most frequently disbanded conferral fields were analyzed in addition to exploring the most frequently added new degree conferral fields. A disbanded conferral field is one that was not present in both of the final two years of analysis (2007-08, and 2008-09).
Disbanded conferral fields were included in the analysis because of their ability to reflect what Schumpeter describes as industrial mutation, or creative destruction. In order to meet new stakeholder demands, organizations will attempt to change in such a way that can satisfy them. Making new products can do this, but it may also take the form of retraction (Schumpeter, 1947). This type of behavior is a hallmark of entrepreneurial organizations, and provides the rationalization as to why both new, and discontinued CIP code conferrals were included in this study. If a field appeared as both new and disbanded—there were a total of 336—then that field was omitted from this study.
Table 1: Most Frequently Occurring New Conferral Fields, 2005-06

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<td>Latin Language and Literature</td>
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<td>International Global Studies</td>
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<td>Philosophy</td>
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<td>CIP Code - 2000 Classification</td>
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