USING STATE POLICY TO PROMOTE THE COMMERCIALIZATION OF UNIVERSITY RESEARCH: AN ANALYSIS OF THE WEST VIRGINIA RESEARCH TRUST FUND

by

PATRICK BRENT CRANE

(Under the Direction of Sheila Slaughter)

ABSTRACT

Although state governments have had a long-standing interest in university research and development, in was in the early 1980s that state governments began to develop policies that explicitly incorporate university researchers into economic development programs. Since 1983, over twenty states have implemented programs or policies designed to attract so-called star scientists capable of bringing in external funds through research grants or the commercialization of research. In order to better understand the factors that lead a state to develop an economic development policy focused on university research, the impact such a policy can have on a state and its public higher education institutions, and the effectiveness of these policies as economic development tools, this study closely examines the development and implementation of the West Virginia Research Trust Fund. Created by West Virginia Senate Bill 287 during the 2008 regular session of the West Virginia Legislature, the West Virginia Research Trust Fund is a $50 million directed research endowment that provides funding for the state's two research universities to promote research-based economic development, increased patenting and related technology transfer and commercialization of scientific and technological research in the state. This study concludes that executive branch support, influential policy entrepreneurs and a strong legislative

advocate are all necessary for a policy supporting university research commercialization to become implemented. Once a program is in place, however, the alignment between donor interests and university strategic plans becomes a critical factor in fundraising success. This research also finds that the while this policy clearly supports academic capitalism at the two universities, more radical forms of academic capitalism were less successful in raising funds than more moderate forms. Finally, this research finds that although the West Virginia Research Trust Fund program successfully increased fundraising at Marshall University and West Virginia University, its impact on increased commercialization, job creation and economic development are quite limited.

INDEX WORDS: Higher education, State policy, Research commercialization, Economic development, Organizational theory, Academic capitalism

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TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1

STATE POLICY AND THE ROLE OF UNIVERSITY RESEARCH IN ECONOMIC DEVELOPMENT

Introduction

While the U.S. federal government has been using policy to encourage public institutions of higher education to provide practical benefits to citizens for at least 150 years, they have generally left the specifics up to the states and the institutions. When the Morrill Act for example, was passed in 1862 the federal government was quite specific about the way land should be apportioned. Regarding the benefit that a higher education institution should provide to the citizens of the state, however, it left the matter of how "such branches of learning as are related to agriculture and the mechanic arts…should promote the liberal and practical education of the industrial classes" (1862, §§ 2-8) to the legislatures of the states. In the intervening century and a half, most of the regulation and funding of higher education has been left at the state level, with the important exceptions of federal funding for university research and the provision of federal financial aid. In recent years, however, the percentage of higher education funding that comes from state governments has been on a downward trend in most states. This has been the result of increased obligations in areas such as K-12 education, Medicaid and post-employment benefits, combined with declining revenues during the five economic recessions the United States has faced since 1979 and higher education's ability to raise outside funds through tuition and fundraising (Hodel, Laffey, & Lingenfelter, 2006). While many states have made cuts

to higher education, one of the other state policy responses has been to look for ways that higher education institutions can contribute more directly to state economic development. Rather than focusing exclusively on the training and workforce development functions that universities provide, as has been the case for most of the period since 1862, states have also looked to the potential of university research to provide economic benefits to a state and spur the growth of knowledge and innovation-based sectors of the economy.

States have a long-standing interest in increasing economic development within their borders. Beginning with Mississippi in the 1930s, states have used incentives to attract industry to locate facilities and create jobs (Berglund & Coburn, 1995). These attempts at industrial recruitment, also known as locational economic development strategies or pejoratively as "smokestack chasing" (Hart, 2008) continue to this day. The competition among Appalachian states to attract an ethane cracker plant to tap the natural gas in the Marcellus Shale (Ward, 2012) is a contemporary and relevant example. States have realized over time, however, that while industrial recruitment is a tool that can be used to promote economic development, it is both wise and necessary to look to other options. One of the other options some states have pursued is to focus more energy on developing resources in research and technology that can be used to drive economic development. North Carolina's development of the Research Triangle Park in the 1960s is often cited as the first state-level partnership between government, universities and industry that focused on research as a means for state-level economic development (Berglund & Coburn, 1995, p. 6; Link & Scott, 2003). Other states developed their own programs throughout the 1960s and 1970s, but it was in the early 1980s that state cooperative technology programs began to expand substantially, fueled in part by an industrial recession (Berglund & Coburn, 1995, p. 8). State economic development programs that explicitly incorporate university

researchers started to develop in the early 1980s as well, with the most prominent and successful example of that time being the University of Texas's pledge to provide endowed chairs as part of an overall state effort to attract the Microelectronics Computer Consortium (Plosila, 2004).

This increased interest in creating a knowledge and innovation driven economy through policy has meant that university-based scientific research has come to be seen as one of the key elements in the economic development of national and regional economies. This interest has increased recently as state budgets in the United States have continued to suffer in the wake of the Great Recession and elected officials around the country have started to take a closer look at universities as a potential source of revenue for the state. While many have looked to decrease expenditures by cutting funding to higher education, other states have viewed universities as a place to invest state funds in the hopes that the investment will pay dividends later. The economic benefits that have been realized through the commercialization of university-based research and development in places such as Palo Alto, CA, Austin, TX and Boston, MA have led university leaders and policy makers around the country to consider how university research can be a vehicle for economic development in their own regions. The benefits of investing state dollars in universities to promote partnerships with industry have also been articulated by researchers such as Henry Etzkowitz (2008), political and economic organizations such as the National Governors Association (L. Tornatzky, 2000) and the Business Roundtable (Business Roundtable, 2011), and by nonprofit technology development groups such as the Battelle Memorial Institute (Berglund & Coburn, 1995).

One of the key elements associated with a university's active participation in regional economic development is a closer relationship with both government and industry. Etzkowitz & Leydesdorff (1997) argue that the end of the Cold War and decreased funding from the

Department of Defense in the United States precipitated the development of a "triple helix model" where government, industry, and universities collaborate and universities are expected to contribute more directly to economic development agendas. This model encourages universities to become more entrepreneurial and to collaborate with and seek funding from industry, while taking more direction and less money from state sources. While the proponents of increasing the economic role that universities play in regional development see it as beneficial for all parties involved, critics argue that it undermines university autonomy, limits academic freedom and shifts the focus of universities from serving the public good to benefitting private firms and individuals (Gumport, 2000; Marginson, 2000; Olsen, 2005; Slaughter & Rhoades, 2004). In particular, Slaughter & Rhoades' (2004) theory of academic capitalism argues that when universities and actors within them use state resources to create linkages with private sector firms it undermines the position of universities as institutions that serve the public good and promote the open generation and dissemination of knowledge. Slaughter and Rhoades also argue that these linkages and the new circuits of knowledge they create reward those within colleges and universities who are close to the market while excluding those who are not, raising the questions of who benefits from these investments of public funds and how these investments benefit the general public. Their work also raises questions about what the consequences to researchers and the university as a whole are when policies that reward commercialization become more prevalent and university researchers are encouraged to prioritize activities that lead to private-sector profit over those which produce direct public benefit.

The efficacy of state policies that push universities closer to the market and promote more entrepreneurial behavior is also subject to debate. Feller (2004) argues that when universities focus support on research areas that are believed to lead to economic development

and withdraw support from general educational infrastructure, they actually do damage to the ability of the institutions to contribute to the economic development of the state. Some critics of using state money to develop connections between university researchers and the private sector contend that this type of government action does a disservice to the public goals of universities, increases stratification between universities and can lead to disappointment in what is actually accomplished (Feller, 2004; Hearn, McLendon, & Lacy, 2009). Others wonder whether these types of economic development policies actually have their desired positive effects (Jenkins, Leicht, & Jaynes, 2006; Peters & Fisher, 2004; Saiz, 2001). Researchers looking at technology and economic development policy in general have found that these policies may create wealth, but that they have no impact on employment and little economic impact in general (Feiock, 1991; Grant & Wallace, 1994). Bozeman argues that while these policies may have positive effects such as "increasingly favorable perceptions of the business climate of the state (Niemi, Bremer, & Heel, 1999), beneficial linkage of educational and business institutions (Feller, 1992, 1997) and the support of significant number of new business ventures" (2000, p. 176) these benefits disproportionately accrue to individuals in the top quintile.

The organizational structure of universities also leads to difficulties in steering them with state policy. Studies of universities as organizations highlight the fact that they are loosely-coupled internally (Weick, 1976), tend to place higher worth on shared values and beliefs than external authority (Clark, 1983) and are made up of academic departments that have significantly different values and norms according to their discipline (Becher, 1989). A recent study by Johnson (2012) also highlights the fact that many faculty members are resistant to doing research that they view as too focused on commercialization. Studies of the role universities play in technology-based economic development also illustrate the complex interplay of factors and

chance that go into the development of a successful research and development cluster (Feldman & Francis, 2004; Sá, Geiger, & Hallacher, 2008; Youtie & Shapira, 2008). To add to the difficulties inherent in steering a university with state policy, the share of university funding that comes from the state has been on the decline for over a decade, weakening a major policy lever for state governments and leading some institutions to refer to themselves as state-located or state-affiliated rather than state-funded organizations, and causing many more to question the appropriate level of state authority over their activities. Specifically in regards to research and development (R&D) expenditures at colleges and universities, the share provided by state and local governments nationally decreased from 7.8 percent in 1997 to 6.6 percent in 2009, even though their total contribution grew from $1.9 billion to $3.6 billion. During that same time period federal government funding remained steady at roughly 60 percent and institutional funds comprised about 19 percent (National Science Foundation, 2010a).

Taken together, these factors illustrate some of the challenges states face in designing policies that increase the role higher education institutions play in promoting research-based economic development. They also raise questions about what benefits accrue from investing state funds in university research, how those benefits are distributed, and the potential gaps between the stated goals of such programs and the actual results. Nonetheless, many states view policies and programs designed to turn university research into economic development as "win-win" programs (Bozeman, 2000) and continue to pursue them.

Research Study

In order to better understand the factors that lead a state to develop an economic development policy focused on university research, the impact such a policy can have on a state and its public

higher education institutions, and the effectiveness of these policies as economic development tools, this study closely examines the development and implementation of the West Virginia Research Trust Fund. Created by West Virginia Senate Bill 287 during the 2008 regular session of the West Virginia Legislature, the West Virginia Research Trust Fund is a $50 million directed research endowment designed to provide funding for Marshall University (Marshall) and West Virginia University (WVU) to promote "research-based economic development and…increased potential for patenting, licensing and related technology transfer and commercialization of scientific and technological research in the state," (*Directed Research Endowments,* 2008, § 18B–18A–1). Similar to legislation passed in Kentucky in 1997, the bill makes $15 million in state matching funds available to Marshall and $35 million available to WVU. The universities are able to access the state funds at a ratio of 1:1 when they match them with qualified private donations. The state funds and private donations must then be used to create endowments, the interest on which may only be spent on the base salaries for newly created research positions or basic research infrastructure necessary to support them. Positions and infrastructure must be in one of six specific fields as determined by the Legislature: 1) energy and environmental sciences; 2) nanotechnology and materials science; 3) biological, biotechnological and biomedical sciences; 4) transportation technology and logistics; 5) biometrics, security, sensing and related identification technologies; or 6) gerontology.

State policies that incorporate universities researchers into economic development activities started to develop in the early 1980s and over time states across the country have become increasingly interested in creating industry clusters and state leaders have become more willing to make sizable investments in areas where they hope to create them (Plosila, 2004, p. 121). One of the policy strategies that has gained increased attention since the late 1990s has

been the investment of state money in programs that recruit accomplished researchers from other states (Hearn et al., 2009). Among the range of policies and initiatives that states use to encourage university research that leads to economic development, Hearn, McLendon, and Lacy argue that "state programs to fund the pursuit of star scientists appear to have the greatest potential to influence higher-education institutions," (2009, p. 1). They found that twenty states adopted state-funded "eminent scholars" programs during the period 1983 to 2007, with eight adopting between 2004 and 2007. Although the West Virginia Research Trust Fund was created outside of the window of their study, it fits the definition of an eminent scholars program that invests public funds in endowed chairs for professorships at state research universities. When compared with other technology-based economic development initiatives, such as the creation of business incubators, provision of venture-capital, or investment in research parks, their ability to stimulate university development as well as regional knowledge economies makes them interesting to higher education researchers, as well as those that study policy or economic development.

The West Virginia Research Trust Fund provides a valuable case study for analyzing how state policy is used to tie university research to economic development for several reasons. First, the economic and educational issues faced in West Virginia echo those of rural and less developed parts of nearly every state. In 1979, West Virginia was one of the first five states to receive money from the NSF's Office of Experimental Program to Stimulate Competitive Research (EPSCoR) in an attempt to help the state develop a competitive research infrastructure (Odom, 2006). The program has now expanded to include 27 states. During a time when policy makers all over the world are attempting to use universities and scientific research as tools for economic development, West Virginia's situation is more relevant for the majority of higher

education institutions and regions than those of Silicon Valley or Route 128. Second, a factor that sets West Virginia apart from many other states is that higher education funding remained stable during the Great Recession, though the levels of state funding per full-time enrolled student remains low in comparison to other states (Marks, 2011). This means it may serve as an example for what other states may need to adjust to under the "New Normal" of decreased resources (Lumina Foundation for Education, 2010). Third, West Virginia's relatively small size also makes it a good case study because its enables the mapping of power and influence in a more accessible way, especially because the two research universities in the study, Marshall University and West Virginia University, are the only two in the state. The differences between the two institutions in size, research funding and institutional mission provides a valuable source of information on how different types of institutions react to state attempts to promote commercialization. Finally, while $50 million is not a tremendous amount of money in the overall research landscape, it is a significant sum in a state where public investments in university research have been historically small. The Research Trust Fund also has political significance for the institutions because the program has had high levels of political support and a failure to meet the goals could reflect badly on several high ranking state policymakers.

Theoretical Framework

In order to understand the development of the Research Trust Fund (RTF) and analyze the impact that the legislation has had on West Virginia and its two research universities, three analytical frameworks will be used. First, a theory of policy adoption is used to identify the key actor and factors that led to the adoption of the RTF legislation during the 2008 regular session of the legislature. Second, a combination of neoinstituitonalism and resource dependency theory

is applied to analyze the organizational responses of Marshall and WVU to the creation of the RTF program. Third, Slaughter & Rhoades' (2004) theory of academic capitalism is used to analyze the legislation and the extent to which it has promoted closer connections to the market at Marshall University and West Virginia University.

The theory of policy adoption applied here builds off of Kingdon's (2003) concept of policy entrepreneurs and research conducted by Hart (2008) and Hearn, McLendon, & Lacy (2009) on the factors that lead states to adopt research-based economic development policies. Hart's analysis of entrepreneurial economic development policy in sixteen states found that executive branch support, specifically that of governors, combined with legislative support were the key factors that led to the adoption and success of the policies. Hearn, McLendon, & Lacy's event history analysis of the spread of eminent scholars programs found that legislative professionalism, the presence of a higher education coordinating board, and gubernatorial strength were all important to the adoption of those policies. This research suggests that for an economic development policy promoting the commercialization of research to be enacted two factors are essential. First, *executive branch support* is a necessity. Without gubernatorial backing for the idea, it will not get off the ground. Second, at least one high level public official in or near the executive branch needs to act as a *policy entrepreneur* that uses her or his influence to advocate for the policy. This research takes the work of Kingdon and Hart as a starting point for examining the factors that influence executive branch support of research-based economic development. It extends their work and adds to it by also clarifying the role that the legislature plays in the policy development process as both a gatekeeper and a site for competition between institutional interests.

The second analytic framework used in this study combines neoinstitutional theory and resource dependency theory and is utilized to explain the organizational responses to the RTF program, specifically the different approaches WVU and Marshall have taken in raising and spending their RTF monies. Neoinstitutional theory emphasizes rules, norms and legitimacy and argues that within highly structured organizational fields rules and norms can constrain innovation and push organizations to emulate one another (DiMaggio & Powell, 1983; Greenwood & Hinings, 1996; Larsen, 2000). DiMaggio and Powell write that, "strategies that are rational for individual organizations may not be rational if adopted by large numbers. Yet the very fact that they are normatively sanctioned increases the likelihood of their adoption" (1983, p. 148), arguing that emulation may actually decrease the competitive advantage of individual organizations. Within the field of research universities, the fact that technology transfer offices have been created on campuses across the country, but that very few of them generate any resources for their institution, is an example of this. Resource dependency on the other hand emphasizes power relations between organizations and their environment and the need for organizations to locate reliable resource streams and argues that they will differentiate themselves from others and find niches that enable them to secure stable funding (Pfeffer & Salancik, 1978). The theoretical position that combines these two argues that resource dependency relationships are important, but that their importance is mediated by environmental and organizational norms, and that organizational change is influenced by both resources and norms (Huisman, Norgaard, Rasmussen, & Stensaker, 2002; Kraatz & Zajac, 1996; Van Vught, 1996). Combining these two theories into one analytic framework enables an analysis of the pressures exerted by the expectations and resources of the actors within the organizational fields of the two institutions.

In this study, West Virginia University and Marshall University operate in separate but overlapping organizational fields. Rather than focusing on a narrow definition of an organizational field as only consisting of "disparate organizations in the same line of business" (DiMaggio & Powell, 1983, p. 148), I refer to Scott's somewhat broader definition which defines an organizational field as,

> …a group of organizations producing similar products or services (much like the concept of population as employed by the ecologists or industry group as employed by economists) but include as well their critical exchange partners, sources of funding, regulatory groups, professional or trade associations, and other sources of normative or cognitive influence. (1991, p. 173)

Due to the fact that the Research Trust Fund provides state funding that is contingent upon private match, this definition of an organizational field has greater explanatory power. The organizational field for each institution includes the West Virginia Legislature, the Office of the Governor, major donors, academic faculty and the higher education institutions that Marshall and WVU consider peers for planning and comparison purposes. Due to the small size of the state and the historical relationships between higher education institutions, Marshall and WVU are part of one another's organizational fields even though they do not consider themselves peer institutions for planning purposes.

The third framework that is used to analyze the impact of the RTF legislation is Slaughter and Rhoades' (2004) theory of academic capitalism. This theory is applied to an analysis of the legislation itself and its impact on the governance of research at the two universities. The theory of academic capitalism describes the changes to the relationship between higher education institutions and the larger society in the context of the developing global knowledge economy and analyzes how groups of actors within higher education institutions are, "using a variety of state resources to create new circuits of knowledge that link higher education institutions to the

new economy" (2004, p. 1). The new economy, also called the knowledge or information economy, is built upon the idea that knowledge is a, "critical raw material to be mined and extracted from any unprotected site…then sold in the marketplace for a profit" (2004, p. 4). Academic capitalism identifies a number of ways that universities have changed to facilitate the transformation of research and knowledge into capital, especially changes to patent and copyright policy, strengthened executive management, the weakening of boundaries between industry, government, and universities, and the creation of interstitial organizations that occupy critical intersections between universities and the market. Another aspect of the academic capitalist knowledge regime described by Slaughter and Rhoades is the development of a new reward and prestige system for university researchers based upon the commercial viability of research. This can be measured by the number of patents generated, by the creation of profitable spin-offs, or by the amount of capital brought in to support research, either from federal grants or private sources. This reward system has developed alongside the traditional reward system based on peer reviewed publications, citations, and the successful acquisition of federal research grants. Their research does not indicate that the academic capitalist reward system has completely replaced the traditional academic values, but does suggest that academic capitalist values are gaining ground and that the amount of resistance to them varies significantly across departments and institutions. These changes to the reward system represent a move away from the institutional arrangement of the post-WWII era where fairly clear boundaries existed between industry and universities and knowledge was treated as a public good, or at the very least something that could be used by the government agency that had provided support for the research first, with potential commercial applications developed later.

These trends have manifested themselves in universities and research in a number of ways. Some of the most salient elements of this trend for the governance of scientific research have been decreased levels of state support for higher education in exchange for greater autonomy (as in Virginia, Wisconsin, and Michigan), increased reliance on performance measures to assess quality, increased funding for fields likely to generate profitable patents, and the development of units within and connected to universities designed to manage potentially profitable research (incubators, research parks, spin-off corporations, patent offices, etc.) (Feller, 2009; Slaughter & Rhoades, 2004). It can also be seen in other areas, such as the shift in funding from need-based to merit-based aid (Bastedo & Gumport, 2003). These trends have taken place, to varying degrees, all over the world and have been well documented (Feller, 2009; Gumport, 2000; OECD, 2004; Slaughter & Rhoades, 2004). One of the common threads in these different changes is that they tend to favor individual success and economic growth over notions of the public good or social and economic equality. However, while this trend has been a global one, the form that these developments have taken has been different in each location, one reason why case study research in this area is important. Global forces need to be understood within their local and national contexts because their operation is by no means monolithic (Marginson & Rhoades, 2002) In this study, academic capitalism provides a tool for critically examining the West Virginia Research Trust Fund and its impact on activities at the two universities. The policy itself sends a clear message from the state to the institutions that research linked to economic development is a priority and will be rewarded as such. Institutional reaction to the legislation, however, indicates the degree to which academic capitalism guides institutional decision making at the two research universities in the study.

Research Questions

The overarching question motivating this research is "*How do state policies that promote the commercialization of university research impact state economies and universities?"* In order to answer that question, this study investigates four questions about the West Virginia Research Trust Fund. The questions are:

1. Which actors, socio-economic, and political factors had the greatest impact on the development and adoption of the West Virginia Research Trust Fund?
2. How have West Virginia's two research universities reacted to the Research Trust Fund program?
3. How has the Research Trust Fund promoted closer connections between West Virginia's research universities and the market?
4. To what extent has the West Virginia Research Trust Fund led to expanded commercialization at the state's research universities and increased economic development in their regions?

As more governments attempt to increase the entrepreneurial behavior of university researchers through policy, a better understanding of what factors influence the creation of such policies, their efficacy in meeting state policy goals, and the impact they have on the universities themselves is critical. This research meets those needs in several ways. First, by interviewing those directly involved in the policy development process this research is able to answer questions about which actors and socio-economic factors led to the program's development as well as why policymakers and policy entrepreneurs acted in certain ways. Second, this research provides insight into how universities react to policies that promote university-based economic development and the commercialization of research and how reactions vary based on internal factors, such as institutional mission and leadership, and external factors, such as the expectations and resources of other actors in the organizational field. Third, this study provides information on the interaction between state policy and academic capitalism and expands our understanding of how academic capitalism operates at different types of higher education

institutions. Fourth, this research contributes to our understanding of the economic and cultural impact of such policies and the implications for state policy and research universities.

One of the major contributions of this research is the multi-phase approach that it takes to one state policy and the response by the state's two research universities. Examining the policy from development to implementation brings together a set of theories that work well together but are rarely combined. This provides a rich analytical tool that sheds light on the role that norms and expectations play in the success, or failure, of policies that promote the commercialization of university research. This type of analysis helps unpack the black boxes that event history analysis leaves unexamined, while at the same time extending the research on policy adoption by examining the temporal components in the process and how the influence of policy entrepreneurs waxes and wanes through the multiple phases. While one of the major limitations of a case study approach is that the findings are difficult to generalize, the implications for policy and practice nonetheless contribute to our understanding of how state policies that promote the commercialization of university research impact state economies and universities.

This research will be organized in the following manner. This chapter has outlined the purpose of this study, the research questions and the theoretical frameworks that have been applied. Chapter 2 provides relevant history and background on research and economic development in West Virginia helpful for understanding the Research Trust Fund. Research methods and the limitations of the study are also discussed in Chapter 2. Chapter 3 examines the actors, socio-economic, and political factors that had the greatest impact on the development and adoption of the West Virginia Research Trust Fund, paying particular attention to the role of executive branch advocates and legislative gatekeepers. Chapter 4 investigates the institutional responses to the Research Trust Fund and the importance of expectations, norms and resources at

work in the organizational fields of Marshall University and West Virginia University. Chapter 4 also examines the West Virginia Research Trust Fund through the lens of academic capitalism and how the RTF program has promoted closer connections between the state's research universities and the market. Chapter 5 explores the economic and cultural impact of the Research Trust Fund and the extent to which it has met its goals. This is framed within the broader context of how other states have attempted to use university research to drive economic development and a consideration of the multiple factors that lead to the success, or failure of such policies. Chapter 6 concludes with a discussion of how expectations intersect and conflict in such a policy process, the economic, political and cultural implications for policies promoting the commercialization of university research, and recommendations for future research.

CHAPTER 2

BACKGROUND AND METHODS

This study takes a close look at a state policy designed to promote economic development through the commercialization of university research, the West Virginia Research Trust Fund. In order to better situate the West Virginia Research Trust Fund (RTF), I provide some background information about the state and a detailed history of major policy initiatives promoting research in West Virginia. I then provide a detailed description of the legislation creating the Research Trust Fund and a chronology of events that led to its creation in 2008. This is followed by a discussion of research methods utilized in this study.

Research-Based Economic Development in West Virginia

A look at West Virginia's demographics does not suggest that it is a likely candidate for developing a robust knowledge-based economy. The mostly rural state ranks 37th in population with 1.85 million citizens (U.S. Census, 2010), with larger population centers around the capital Charleston, Huntington, home to Marshall University, north-central West Virginia where West Virginia University is located and the Eastern Panhandle, often viewed as a distant suburb of Washington D.C. and Baltimore and one of the few areas of the state experiencing population growth. The overall state population has been relatively stable for the last 40 years, but it has aged so that West Virginia has one of the oldest citizenry in the country, and shifted over time from the coal fields in the southern part of the state to the northern and eastern panhandles. U.S. Census data also shows that West Virginia has one of the lowest educational attainment rates in

the country, and has the lowest bachelor attainment rate with 17.1 percent of the adult population holding a bachelor's degree or higher (American Community Survey, 2008). It is also near the bottom for average family income, and ranks at the bottom of the southern region, already a poorer area of the United States, in terms of funding per student enrolled in higher education (Marks, 2011). At the same time, West Virginia has a relatively large number of public higher education institutions: ten community and technical colleges, most of which have multiple campuses; eleven four-year institutions, two of which are doctoral granting; and a school of osteopathic medicine. The institutions have relatively small enrollments, with all of the state's public institutions serving fewer than 5,000 students except Marshall and WVU, and fifteen of the state's twenty-two colleges serving fewer than 3,200. This is largely due to the state's mountainous geography and the policy goal of providing access to higher education to as much of the state as possible.

The size of its economy ranks slightly lower than its population, with a gross state product in 2011 of $66.8 billion and a ranking of 39th (Bureau of Economic Analysis, 2011). Historically, the state's economy has been built around resource extraction, particularly coal but also natural gas and timber. Mining is the largest private industry in the state, making up 14 percent of total gross state product, the third highest percentage in the country after Alaska and Wyoming. Part of the history of the state's heavy reliance on resource extraction has been that relatively high-paying jobs were available for those with limited formal education. As the economy has shifted, fewer jobs exist in the mining industry and those that do often require more technical expertise then they did thirty years ago. This has led state policy makers and institutional leader to push for increased levels of degree attainment in the state and a diversification of the state's economy (West Virginia College Completion Task Force, 2012).

While workforce predictions do highlight the need for increased degree attainment in the state West Virginia remains the state with the greatest need for high school graduates and the lowest need for those with a bachelor's degree or higher (Carnevale, Smith, & Strohl, 2010; Unruh, 2011).

State investment in research is a relatively new phenomenon in West Virginia but has been gaining momentum in the last decade or so. While the major economic driver of the state's economy for most of the last hundred years has been resource extraction, university leaders and some elected officials have begun to argue that diversifying the state's economy is essential to its future economic well-being. There have been some successes in developing new economy sectors, especially in the areas of pharmaceuticals and biotechnology, but they are largely concentrated in small pockets around the two research universities. Although they began later than other states in the region like North Carolina and Ohio, state policy makers have been working to increase the role that research and technology play in economic development since the mid-1990s, and federal agencies have been providing funds to increase research and development in the state since 1980 with the advent of the EPSCoR program. Although workforce predictions like those made by Carnevale et al. (2010) suggest that the number of research-based "new economy" jobs in West Virginia will be relatively low, successful start-up companies around WVU and Marshall are still touted by policy makers as an important part of the state's future economy. Protea Biosciences in particular was mentioned in Governor Earl Ray Tomblin's 2012 State of the State address, despite the fact that the company has lost more than $37 million since it was formed in 2001 (The Associated Press, 2012).

R&D Expenditures at Universities and Colleges in West Virginia

To better understand West Virginia's research infrastructure, I will provide some information on research expenditures in WV and some background on Marshall University and West Virginia University, with a focus on their research funding and capacity. Figure 1 illustrates the overall trend in research expenditures at the state's universities and colleges (National Science Foundation, 2010b)

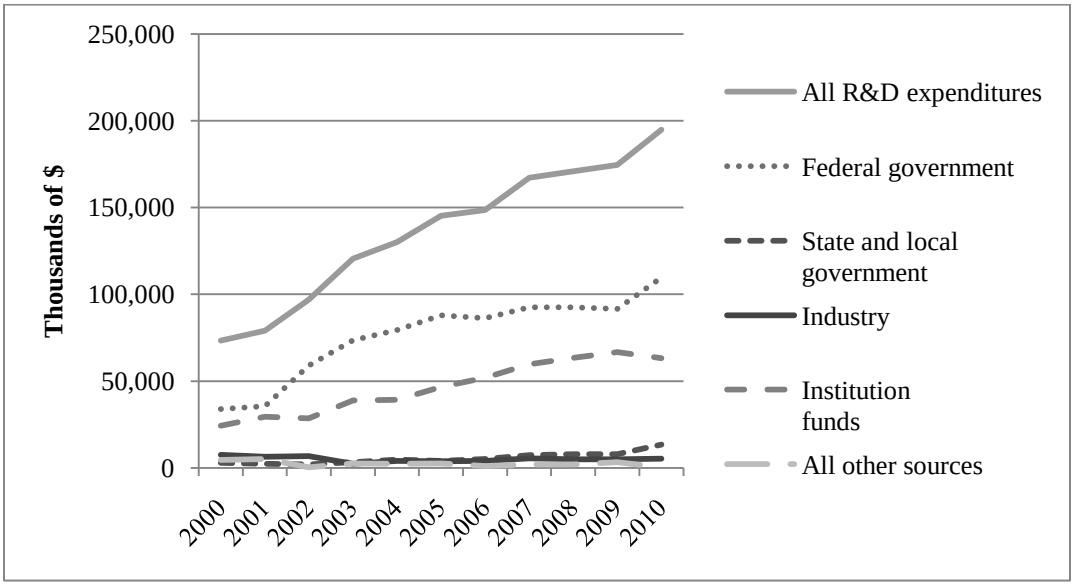


Figure 1: R&D Expenditures at Universities and Colleges in West Virginia by Source

As Figure 1 illustrates, R&D expenditures have been increasing steadily in West Virginia's universities, with the federal government and institution funds make up the bulk of the funding, with industry, state and local government and all other sources clustered together near the bottom.

Table 1 provides a comparison of research expenditures at the two universities over the same period and illustrates the significant difference in spending levels, as well as the large gains made by both institutions during the previous decades (National Science Foundation, 2010b).

Table 1: R&D Expenditures in West Virginia by Institution (in thousands of dollars)

Year	West Virginia (Total)	WVU	Marshall
2000	73,420	66,130	6,231
2001	79,076	71,311	7,218
2002	100,830	84,985	11,285
2003	125,417	104,748	15,070
2004	134,961	108,002	20,221
2005	146,489	115,398	22,321
2006	150,420	122,134	18,385
2007	167,208	133,590	22,519
2008	170,869	139,770	22,423
2009	185,914	145,656	23,645
2010	194,834	154,926	24,501

While Marshall and WVU are both research institutions with medical schools, there are considerable differences between them in expenditures on research, as illustrated above, as well as in size, funding, selectivity, and overall mission. WVU is the state's flagship institution and is classified as a research university with high research activity by the Carnegie Foundation, with the goal to, "attain and maintain the highest Carnegie research ranking by 2020"(West Virginia University, 2011). It enrolls approximately 29,000 students, over 50 percent of undergraduates come from out of state, and the incoming freshman have an average combined ACT of 24 making it the most selective public institution in the state. Marshall University is categorized as a master's college by the Carnegie Foundation and a regional university (south) by U.S. News and enrolls roughly 15,000 students with incoming freshman having an average combined ACT score of 22 and 22 percent coming from out of state. In 2011-12, WVU employed 2,343 full-time faculty and Marshall employed 813 (WVHEPC, 2012a). In terms of the economic impact the institutions have on the state, WVU had a total economic impact of $4.7 billion in FY2008, while Marshall's was estimated to be $1.5 billion (Higginbotham, Pennington, Christiadi, & Witt, 2010).

Commercialization and technology transfer receive formal organizational support at both WVU and Marshall. According to their website, WVU's Technology Transfer Offices was formed in 1999 and has a staff consisting of a Director whose sole responsibility is technology transfer, an Associate Director with a Ph.D., a Technology Licensing Associate with a J.D. and an administrative assistant. WVU's intellectual property policy states that after the WVU Research Corporation is reimbursed for "all direct expenses for obtaining intellectual property protection" net proceeds generated from the sale of intellectual property are distributed 40 percent to creator(s), 10 percent to creator's department/division, 10 percent to creator's college/school, and 40 percent to the WVU Research Corporation (WVURC, 2006). Between FY2006 and FY2011, WVU executed 65 license agreements and generated an average of $71,482 per year in license income. Marshall's technology transfer capacity is somewhat more limited. Their Technology Transfer Office was started in July 2003 as the Institute for Development of Entrepreneurial Activity (IDEA) under the direction of a Vice President for Technology Commercialization. IDEA has become the Technology Transfer Office and has a three person staff: a Director with a Ph.D. who is also Marshall's Vice President for Research and the Executive Director of the Marshall University Research Corporation, an Assistant Director with an M.B.A. and an administrative assistant. Net income, after the Vice President for Technology Commercialization and the Marshall University Research Corporation are reimbursed for expenses, are distributed 40 percent to the inventor, 30 percent to the inventor's college or school or program, 15 percent to the Marshall University Research Corporation and 15 percent to the Office of the Vice President for Technology Commercialization (Marshall University Board of Governors, 2004a). Between FY2006 and FY2011, Marshall University

executed seven license agreements and generated an average of $3,425 per year in license income. Technology transfer activity will be discussed in greater depth in Chapter 5.

Science & Technology Programs

There are several state and federally-funded science and technology programs in West Virginia that impact the state's research landscape. This section provides an overview of key programs designed to build research capacity in the state starting with EPSCoR and going through the creation and preliminary development of the West Virginia Research and Technology Park.

The National Science Foundation (NSF) created the Experimental Program to Stimulate Competitive Research (EPSCoR) in 1979 in response to concern at the federal level about the geographic concentration of federal R&D dollars. In FY1980, West Virginia was one of the first five states to receive money from the EPSCoR program in an attempt to help the state develop a competitive research infrastructure (Odom, 2006). This program has been an important source of research funds for the state and in 2010 West Virginia EPSCoR received a $20 million NSF Research Infrastructure Improvement (RII) award to expand research in bionanotechnology at three West Virginia higher education institutions, WVU, Marshall, and West Virginia State University.

State funded research and development programs developed later. In a survey of state and federal cooperative technology programs published in 1995 by the Battelle Memorial Institute, only one program, with no funding attached, was listed for West Virginia. At that time, WV ranked 40th in patents, 46th in Small Business Innovation Research (SBIR) funds awarded and 42nd in University and College R&D Expenditures (Berglund & Coburn, 1995, p. 464). According to the report's assessment of West Virginia's research and development programs in

1995, “West Virginia is in the initial stages of developing a centralized science and technology program. It is actively pursuing federal funding to design a statewide plan” (Berglund & Coburn 1995, p. 465).

The West Virginia Legislature made their first foray into funding research directly in 2004 with the establishment of the Research Challenge Fund. This program was created to,

> …assist public colleges and universities in West Virginia to compete on a national and international basis by providing incentives to increase their capacity to compete successfully for research funding. The Legislature intends for institutions to collaborate in the development and execution of research projects to the extent practicable and to target research to the needs of the state as established in the public policy agenda and linked to the future competitiveness of this state. (*Compact with Higher Education for the Future of West Virginia,* 2004, sec. 18B–1A–5–C)

The program is funded through a small portion (half of one percent) of the state’s profits from the slot machines located at tracks for greyhound and horse racing. This amounts to between $3 and $4 million per year, though it has decreased as state’s surrounding West Virginia have introduced table gaming. According to the West Virginia Higher Education Policy Commission (2008), the state invested $8.4 million between 2004 and 2008, which resulted in $20 million in external funding and the creation of five startup companies, 10 patent applications and five patents.

The following year a statewide plan for technology-based economic development was developed. Prepared by West Virginia EPSCoR Advisory Council, *Vision 2015: The West Virginia Science and Technology Strategic Plan*, was released in December 2005 and formally endorsed by then Governor Manchin in 2006. The stated goal of this plan is that, “By 2015 research and innovation will be the number one driver of West Virginia’s new, diverse and prosperous economy” (West Virginia EPSCoR Advisory Council, 2005). Another goal of the plan is to increase the annual economic impact of research in the state from less than $100

million a year, where it stood in 2005, to more than $500 million a year by 2015. The report has sixteen specific goals, but one of the chief requirements is a state investment of $250 million and the recruitment of 89 new scientists and engineers. So far, the state has fallen short of achieving these ambitious goals.

Two other science and technology initiatives are important for understanding the development of the Research Trust Fund. First was the creation of a group called TechConnect West Virginia. This non-profit organization was formed in 2006 and is "dedicated to the advancement of science, technology, and the innovation economy in West Virginia" (TechConnect WV, 2013). TechConnect's executive committee includes executives from the energy industry, law firms that specialize in the energy industry, research and development groups in information technology and the chemical industry, as well as the WVU and Marshall Research Corporations. This group contracted with Battelle Technology Partnership Practice, a division of the Battelle Memorial Institute, to develop the *West Virginia Blueprint for Technology-Based Economic Development* (TechConnectWV, 2009). This plan, initially presented in 2007, identifies five gaps that West Virginia needs to overcome to be in a more competitive position for technology-based economic development (TBED) as well as four key strength areas. The five gaps identified are 1) Talent, 2) Early-Stage Seed Capital, 3) Entrepreneurial Know-How, 4) Image, and 5) Leadership (2009, p. 4). The four strength areas identified by Battelle and TechConnect WV in their report are: 1) Advanced Energy and Energy-Related Technology, 2) Advanced Materials and Chemicals, 3) Identification, Security, and Sensing Technology (Biometrics), and 4) Molecular Diagnostics, Therapeutics, and Targeted Delivery Systems (Biotechnology). These four strengths, with some modification, are four of the six research areas targeted by the Research Trust Fund program. A second important program is

the Eminent Scholars Recruitment and Enhancement (ESRE) initiative. Created in 2007 by the West Virginia Legislature, ESRE provided $10 million in research funding for the state's two research universities, $5 million each for Marshall and WVU, to recruit scholars with "demonstrated research competitiveness in specialties that will help the universities build on their core research strengths, including biotechnology at Marshall University and energy materials at West Virginia University" (West Virginia Higher Education Policy Commission, 2008, p. 17). This program required each university to raise $5 million in private funds to match the state investment and is the precursor to the Research Trust Fund that was passed in 2008. Both universities have matched the state funds with private donations and hired four faculty a piece.

The West Virginia Research Trust Fund

The information provided above helps provide context for the environment in which the Research Trust Fund emerged. This section provides an overview of the legislation, Senate Bill 287, which established the West Virginia Research Trust Fund and was approved by Governor Joe Manchin on April 1, 2008. Events leading up to its passage will be discussed in the next chapter, but details of the legislation, including division of responsibilities, oversight, and timelines will be discussed here. The full text of the legislation as enrolled is in Appendix A.

According to the SB 287's section on legislative findings and purpose,

> The Legislature finds that the continued expansion of the nation's economy is dependent upon the ability of its institutions of higher education to increase the quality, quantity and productivity of its citizens who are engaged in scientific and technical fields of study. Failure of the United States to compete in these areas may lead to lower standards of living, dependence upon foreign intellectual capital and international insecurity. The economic future of West Virginia is equally dependent upon the ability of Marshall University and West Virginia University, the state's two doctoral-granting, public research universities, to promote, educate and train researchers and research support staff

> in these diverse fields of study. The Legislature further finds that a recent emphasis on the creation of innovative curricula and the receipt of significant private donations by Marshall University and West Virginia University has led to major expansions in certain areas of study, including energy, national security technology, environmental sciences, health and biomedical sciences, biometrics, biotechnology and nanotechnology. Despite these expansions, the additional investment of both private donations and state moneys is critical to recruiting world-class scientists, researchers, research staff, technicians and professional degree graduates, as well as providing funding for laboratories and scientific equipment. (*Directed Research Endowments*, 2008, §18B-18A-1-a)

The legislative findings section of legislation is intended to frame the purpose of a piece of legislation and explain the thinking behind its creation. The text draws a clear line between national security and the quality of research produced at institutions of higher education. It also connects the economic future of the state directly to the ability of Marshall and WVU to "promote, educate and train researchers and research support staff." While the language in this section focuses on the researcher training function of West Virginia's research institutions rather than on their research productivity, those are highlighted at the end of the legislative findings section. The final sentence of the findings section reads:

> Creation of this fund promotes strategic private donations targeted to specific areas of research initiatives that are critical to achieving long-term goals including, but not limited to, the following: (1) Research-based economic development and economic diversification; and (2) Increased potential for patenting, licensing and related technology transfer and commercialization for scientific and technological research in the state. (*Directed Research Endowments*, 2008, §18B-18A-1-b)

The goal, then, is economic expansion and diversification for the state of West Virginia through increased commercialization of university research, which will improve quality of life for West Virginians, and contribute to the safeguarding of American interests.

This bill aims to achieve these goals by establishing a fund, consisting of $50 million in legislative appropriations which are available for Marshall University and West Virginia University to draw down when they receive allowable private matching funds. The program is structured so that when a qualified private donation is received by one of the institutions, state

matching funds are released and both the private and state funds go into an endowment at the university. The interest generated from the endowment is then used to fund faculty or staff salaries, student scholarships or to purchase equipment necessary to support research. The legislation states that for the first five years, 70 percent of the funds are available for West Virginia University and 30 percent are available for Marshall University. If at the end of five years any of the funds have not been matched by one of the institutions, the other will be allowed to draw them down with appropriate matching funds. The legislation also allows that any interest that accrues from the $50 million in legislative moneys can be used by the state's other four-year colleges if they can generate private match for research-oriented initiatives if they are approved by the state coordinating board, the West Virginia Higher Education Policy Commission.

Qualified private donations can come from individuals, partnerships, associations, public and private for-profit and nonprofit corporations and nongovernmental foundations. They may not come from student fees or any state or federal sources. Each private donation must be at least $50,000 or bundled together with other donations to meet that minimum threshold, and must be either unrestricted gifts or expressly restricted to one of the eligible uses designated by the legislation. Those eligible uses include:

> (1) To pay the base salaries of newly endowed department chairs, new professorship positions, new research scientists and new research staff positions, including but not limited to, research technicians and support personnel, and to fund affiliated graduate or undergraduate student research fellowships. All positions or fellowships shall be engaged primarily in one of the following areas of research: (A) Energy and environmental sciences; (B) Nanotechnology and materials science; (C) Biological, biotechnological and biomedical sciences; (D) Transportation technology and logistics; (E) Biometrics, security, sensing and related identification technologies; or (F) Gerontology. (*Directed Research Endowments*, 2008, §18B-18A-6-1)

The legislation also allows for the purchase of "basic infrastructure directly related to an area of research identified in subdivision (1) of this subsection, including, but not limited to, laboratory

and scientific equipment, and other essential equipment and materials," (*Directed Research Endowments*, 2008, §18B-18A-6-2).

Oversight and distribution of funds is handled by the West Virginia Higher Education Policy Commission (HEPC), the state's higher education coordinating board. When the two research universities request state matching funds, they must submit information on the qualified donations and pledges, how they meet the criteria outlined in the legislation, the proposed use of the funds and the research endowment where they are to be transferred. The legislation also required the HEPC to develop a rule documenting the standards for distribution described above and requiring an annual report from WVU and Marshall, beginning January 1, 2010, detailing the donations received and distributions made. The HEPC is also responsible for receiving a five-year report by October 1, 2013 wherein,

> The participating institutions shall provide a comprehensive report to the Commission on the impact of the trust fund on research competitiveness, institutional growth and infrastructure development. Strategic goals realized and those yet to be realized shall be articulated clearly in the report. A full accounting of all trust funds, proceeds, outcomes, and designated endowments shall be included in the comprehensive report. (*Research Trust Fund Program*, 2009, sec. §133–48–14.3)

No specific targets, economic development goals or technology transfer expectations are included in the legislation or the legislative rule developed by the HEPC outside of the fundraising targets of $15 million for Marshall and $35 million for WVU.

Unfortunately for policy makers and university leaders, West Virginia and the United States entered a recession shortly after this legislation was passed. What had appeared to be easily managed fundraising goals for the two institutions, $35 million for WVU and $15 million for Marshall, became more daunting. By the end of 2010 Marshall had matched just $742,000 in state funds with private money and WVU had matched $8,437,401 (WVU, 2011). These fundraising challenges will be discussed in greater depth in Chapter 4. In 2011, SB 239 was

passed extending the initial deadline for the two institutions to raise matching funds from five years to seven years, giving them until 2015 to match the funds. This turned out to be beneficial for Marshall University. WVU finished matching the $35 million in state funds with private match in January of 2012 while Marshall had matched roughly $9 million by that time. During the 2012 regular session of the legislature legislation to put an additional $20 million into the Research Trust Fund was introduced, but did not pass out of committee.

West Virginia's Research Trust Fund in Context

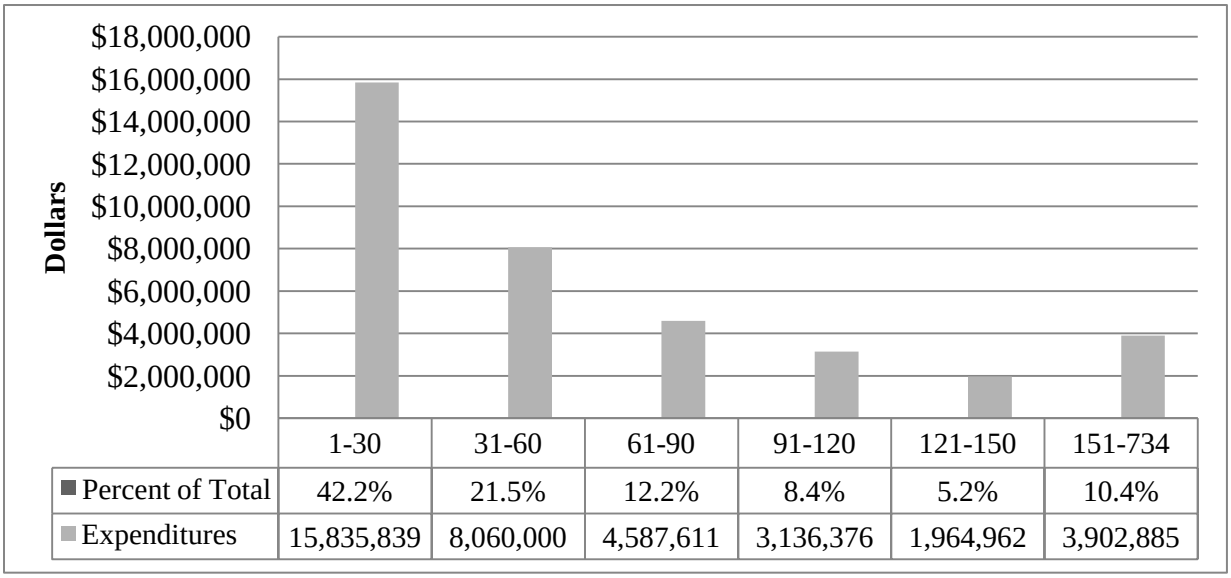
As Hearn et al.'s (2009) research on the adoption of eminent scholar programs shows, West Virginia is not unique in its attempt to use legislation and state funding to attract research scientists. Among the twenty eminent scholars programs they identify, West Virginia's program most closely resembles Kentucky's Bucks for Brains program in terms of structure, specifically requiring a 1:1 match and focusing the vast majority of available resources on the states' two largest research institutions. Kentucky's Bucks for Brains program was started in 1998 with $110 million in state funds and was continued with three additional rounds of state funding totaling $400 million between 1998 and 2008. Kentucky's Bucks for Brains program is structured so that funds are available to the University of Kentucky and the University of Louisville to draw down when they receive private match. Both the private and the public funds are then placed in a trust and the institution is able to expend the interest on faculty positions, programs or scholarships (Kentucky Council on Postsecondary Education, 2007). Some funds are available for Kentucky's regional universities, but the primary target in Kentucky and West Virginia has been the two universities with the largest research capacity. One difference is that Kentucky's program initially placed no constraints on the research areas that the money could be used for whereas

West Virginia's legislation defined six research concentrations where the Trust Fund money could be used based on expected area of economic development in the state. In that respect, West Virginia's Research Trust Fund is similar to the Missouri Life Sciences Research Trust Fund which allocates grant funding to scientists in seven research areas (Missouri Technology Corporation, 2007). Unlike Kentucky and West Virginia, however, Missouri does not require a private match for their program and funds it through the Missouri Tobacco Master Settlement Agreement.

Although the specific model for funding research that West Virginia and Kentucky utilize, a 1:1 public match, specified private donations and a specified split between the state's top two research universities, appear to be in place only in those two states, some elements are common with in other states. The overall goal of using state funds to attract eminent scholars is in place in at least twenty states according to Hearn et al. (2009) besides West Virginia. Matching private funds with state funds appears in a number of states as well, though the ratio varies. Florida's Eminent Scholars program has been in place since 1979 and sets a threshold of $600,000 in private funds to generate a state match of 70 percent, with 100 percent match for private donations above $2 million (Travis, 2011). The Georgia Research Alliance, created in 1990, has also used a mix of public and private money to fund their Eminent Scholars program and has invested over $510 million (Georgia Research Alliance, 2011). The Ohio General Assembly created the Ohio Eminent Scholars Program in 2001 with a $5.2 million appropriation to fund research in areas of state need and added a private match component in 2007 (Ohio Board of Regents, 2007). In comparison with other states, this makes West Virginia's Research Trust Fund program both more generous with its state match (1:1) and more proscriptive in how

the funds may be used (endowment rather than direct expenditure, defined split between Marshall and WVU, six research areas, new hires and infrastructure only).

Although it is relatively easy to quantify the public and private investment in these programs, it is less easy to assess the return on investment they have provided to the state. Research on technology and economic development programs have found little to no impact on job creation, though they can at times create wealth (Bozeman, 2000; Feiock, 1991; Grant & Wallace, 1994). At the same time, assessments of the impacts of eminent scholars programs, usually produced by those who manage the programs, tend to highlight the benefits they generate. These benefits, though, largely focus on additional external funding captured as a result of state investment (federal research dollars and private donations) and technology transfer activities (patenting, licensing, start-ups) of eminent scholars (Georgia Research Alliance, 2011; Kentucky Council on Postsecondary Education, 2007; WVHEPC, 2008). There is also little reference to how the improvements in those areas compare with activities nationally..



	1-30	31-60	61-90	91-120	121-150	151-734
Percent of Total	42.2%	21.5%	12.2%	8.4%	5.2%	10.4%
Expenditures	15,835,839	8,060,000	4,587,611	3,136,376	1,964,962	3,902,885

Figure 2: Federally Financed Higher Education R&D Expenditures Ranked by All Federal R&D, FY2010

Figure 2 illustrates the distribution of federally financed higher education research and development expenditures for FY2010 (NSF, 2012). Of the 734 institutions that received federal R&D funds, the top 30 capture 42 percent of the funds and the top 90 capture 76 percent of all funding. Both the distributions and the institutional rankings are fairly stable over time, raising the question of how much federal funding a higher education outside of the top 10 percent can really capture and how much movement in ranking they can expect. The federal EPSCoR program is designed to redress this somewhat by making more federal R&D funding available to states with lower levels of R&D expenditures, but geography and institutional prestige, both of which change very little over time, still factor very heavily. In the realm of patenting, the weighting at the top is even heavier, with ten institutions generating 66 percent of total profits from technology licensing (Slaughter, 2010). Although this research focuses on state policy, state level actors and regional economic impact, the federal government provides the largest share of university R&D funding and the federal policy landscape impacts state efforts as well.

While individual institutions and some state agencies may track the external research funding and technology transfer activities of newly hired researchers, there does not appear to be much, if any, scholarship connecting state policies designed to attract eminent scholars to the commercialization of university research. This research study addresses that gap by taking a close look at the West Virginia Research Trust Fund and the impact it has had on the state's economy, the promotion of technology transfer, and the activities of the state's two research universities, Marshall and WVU. It also situates these activities in the broader context of how the RTF program developed and the institutional responses to the program.

Methodology

This research study utilizes a case study methodology to answer the research questions identified in Chapter 1. A case study methodology is appropriate for several reasons. First, this study focuses largely on answering question "how" and "why" around a contemporary event (Yin, 1994). While one aspect of this research, evaluating the extent to which the Research Trust Fund has contributed to commercialization activities and economic development is a "what" question that could be answered with other methods, the overarching questions focus on *how* state policies that promote the commercialization of university research impact state economies and universities and *why* institutions choose the strategies they do. Second, Yin defines a case study as an empirical inquiry that, "investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (1994, p. 13). The West Virginia Research Trust Fund is an active program impacting Marshall University and West Virginia University and this study closely examines the interaction of individuals and organizations, as well as their underlying norms and values, in an attempt to understand the contextual conditions impacting the program's development, implementation and efficacy. Third, the focus on a single case study is appropriate because the purpose of this research is to better understand both how state policies that promote the commercialization of university research develop and how they impact state economies and universities. Investigating both aspects requires a level of contextual understanding that would be difficult to achieve in multiple settings simultaneously. Fourth, while individual case studies are sometimes criticized because of their lack of generalizability, they are very capable of providing information that can be used to generalize to and expand upon existing theory. While some of the findings described in this study point to factors that are unique to West Virginia, most point to factors that may be at

work in other states as well and may provide valuable information for researchers and policy makers studying or designing other state policies that attempt to promote commercialization.

The West Virginia Research Trust Fund was selected as a case study for several reasons. First, as a state with a relatively small portion of its economy comprised of so-called new economy sectors, West Virginia is an informative case for other states, or regions within states, that are in the early stages of expanding the research-based sectors of the economy. Second, as a late adopter of a program designed to attract eminent scholars, West Virginia highlights some of the challenges faced by institutions and states that are looking to emulate the successes of others. Third, because of the relatively small size of the state, identifying and analyzing the interactions of key actors is possible in a cleaner way than it might be in a larger, more complex environment. While these factors make West Virginia an interesting case study, they also shape the limitations. The size of the state and its historical focus on resource extraction as an economic driver mean that comparisons with states like California or Massachusetts may not be informative, although Montana or Vermont may have interesting parallels. Differences in state governance structures, (specifically, West Virginia has a part-time legislature and a higher education coordinating rather than a governing board) will also limit comparability with some locations. Despite these limitations, this case study is able to extend theory about policy adoption and the impact of commercialization policy on states and universities by connecting adoption and impact and identifying factors and individuals at work in multiple stages of the policy development and implementation process. The exploratory nature of this study also means that additional factors that influence the policy adoption process may be identified that can be used in future quantitative research projects.

Practical reasons also factored into the selection of the West Virginia Research Trust Fund as a case study. As an employee of West Virginia's higher education coordinating board and former employee of the West Virginia Office of the Governor, I had access to potential interviewees and insight into state dynamics that would have been difficult to replicate in another state. While there is a possibility that my position in relation to the process may magnify some factors and obscure others, I have used multiple sources of evidence in order to triangulate my data and justify my conclusions. Data sources include interviews, document analysis, and participant-observation. The use of each will be described in greater detail below.

Participant-Observation

According to Yin, participant-observation is a research strategy which "provides certain unusual opportunities for collecting case study data, but it also involves major problems" (1994, p. 88). On the upside, participant-observation provides access to information and individuals that are otherwise difficult to reach, such as Redman's (1973) research on the United States Senate. On the downside, being too close to an issue can produce bias or force the participant into an advocacy role that is in conflict with that of a more objective observer. In the case of the West Virginia Research Trust Fund I am a participant-observer because of my positions working for the Office of the Governor and the state's higher education coordinating board, the West Virginia Higher Education Policy Commission (HEPC). These positions have put me in contact with a range of policymakers and led to my attendance and participation in a variety of public and private meetings related to higher education policy, the development and implementation of legislation, and the promotion of policy ideas across state borders. However, due to the fact that the Research Trust Fund was created in 2008 and my relevant employment began in 2010, I was

not involved in the development or implementation of the program, though I have observed discussions and presentations on it. Rather, my experience with the workings of state higher education policy in West Virginia has given me some general insight into the nature of the policy process without providing me specific information about the Research Trust Fund. Because my involvement with the RTF has been as observer and researcher and not as a participant in that particular process, I believe I have sufficient distance from the research topic for the benefits of my position as a participant-observer to outweigh the potential biases. In order to limit bias as much as possible, I have exerted every effort to confirm my observations with others and support them with documentary evidence before using them to support the conclusions I draw in this research.

Interview Data

Kvale writes that, "The interview is an inter-subjective enterprise of two persons talking about common themes of interest," (1996, p. 183). Interviews provided a rich source of data for this research project and were particularly important for understanding how and why the Research Trust Fund program developed in West Virginia. The planned research design for this project included conducting six semi-structured interviews with state-level policymakers who had been involved in the development of the Research Trust Fund and two interviews each at Marshall and WVU, one with an upper-level administrator with responsibility for research and one with a dean or senior faculty member in a department that had been impacted by the RTF program. This research design was intended to provide information about the development of the RTF program at the state level, the involvement of the state's two research universities in the development of the program, and the process of developing and executing institutional plans for raising and

spending Research Trust Fund monies. It was also anticipated that the interview data would highlight differences between state-level actor and university-level actors in their reasons for supporting the RTF program. Attempts to contact university-level actors, however, were ignored or rebuffed which necessitated some changes to the research design. In the actual research design eight interviews were conducted, seven with state policymakers involved in the development of the Research Trust Fund and one with an individual from a national policy organization which has promoted the adoption of university-based economic development policies like the Research Trust Fund. These are summarized in Table 2 below.

Table 2: Summary of Interviews Conducted

Method	Date	Minutes	Organization
In person	12/28/2011	60	Coordinating Board
In person	1/5/2011	60	Legislature
In person	1/26/2012	36	Legislature
In person	1/27/2012	60	Coordinating Board
In person	2/14/2012	58	Governor's Administration
Phone	2/17/2012	69	Governor's Administration
Phone	4/3/2012	54	National Policy Organization
In person	11/5/2012	68	Coordinating Board

Six semi-structured interviews were conducted by the author between December 2011 and February 2012 with state-level policy makers that had been involved with the development of the Research Trust Fund. Two interviews were conducted with individuals at West Virginia's higher education coordinating board, two with individuals at the West Virginia Legislature and two with representatives from Governor Manchin's administration. One interviewee who had been involved in state policymaking but now works at WVU was able to provide some information about the program's impact at WVU in addition to their insights about the policymaking process. In addition to the state-level interviewees, one interview was conducted with an individual that had worked with a national policy organization, the National Governors

Association, which has promoted the adoption of university-based economic development policies like the Research Trust Fund. Interviewees were identified using a snowball technique beginning with one individual known to be closely involved in the process. Potential interviewees were contacted by email and then by phone if necessary. Six interviews were conducted in person in Charleston, WV and two were conducted by phone. Interviews lasted between 36 and 69 minutes with an average duration of 58 minutes. All individuals that were interviewed were known to the author through professional networks prior to the time interviews were conducted.

Two upper-level administrators at West Virginia University and one at Marshall University were contacted by email in July 2012. None of them replied to the request for an interview. Due to the fact that I had some information about West Virginia University already, I concentrated my efforts on setting up interviews at Marshall University. A follow-up email was sent to an upper-level administrator in October 2012 and another email was sent to a dean at the same time. No response was received. In November 2012 I attempted to contact the same upper-level administrator at Marshall by phone and left a voicemail. No response was received. Due to the non-response from campus-level actors, an eighth interview was conducted in November 2012 with an individual at the coordinating board that has worked with both institutions throughout the RTF program. In January 2013 I contacted a mid-level administrator at Marshall University in order to obtain information about the history of the institution's technology transfer office and received a prompt response to my inquiry. I also received a response from the upper-level administrator I had attempted to contact three times and was informed that due to the sensitivity of the information I was seeking, I would need to speak with the Director of Research

Integrity and likely obtain IRB approval from Marshall before my requests for interviews would receive any further reply.

I posit that my inquiries resulted in three non-responses and one negative response for three possible reasons. The first reason, which seems likely for non-responses, is that university administrators do not see discussing the Research Trust Fund as a valuable use of their time, and without compelling reason to do so, chose to ignore my attempts to contact them. Upper-level administrators certainly have numerous demands on their time and due to the fact that I had no personal relationship with them, they could ignore this request in favor of others that were more immediate or more consequential from their perspective. A second explanation is that my requests for interviews were ignored because administrators view information about the development and impact of the RTF program as sensitive, with potentially negative consequences for them or their institutions if unfavorable information about the program is published. This seems more likely in the case of Marshall based on the response I received and due to the fact that they had not finished raising their matching funds during the time I was trying to contact them. It is worth noting that Marshall University raised over $3 million in December 2012 and January 2013 and finished matching their $15 million RTF allotment in mid-January 2013 (Davis, 2013). This may explain why they were willing to speak to me in January, provided I was approved by their IRB office first, but not before. A third reason why university administrators did not respond to my requests for interviews may be because of my position working for the state's coordinating board. Due to the regulatory authority that the Higher Education Policy Commission has over certain aspects of university activities, and the fact that institutional interests and state interests are sometimes at odds, upper-level administrators may have seen my request for information as an attempt to gain political leverage. This perception

may be connected to my background as someone without ties to either institution, but is more likely influenced by the institutional affiliation of former governor Manchin and former chancellor Noland, both of whom are WVU alumni with deep connections to the institutions. Those affiliations may have also led to a perception that a bias in favor of WVU exists, or existed, within the executive branch and the coordinating board, further diminishing the motivation of actors at Marshall to speak with me.

Underlying all three explanations is an unwillingness on the part of campus administrators to explain their activities to those outside the institution. This may be the result of differences in orientation stemming from different priorities (institutional management as opposed to state policy efficacy) or a negative view of state actors on the part of institutional actors. Due to the fact that $50 million in state money was invested in the program, and that additional funds are being sought, there is also likely interest on the part of institutional leaders to control the way the program is represented as much as possible and ensure that only positive messaging occurs. The lack of response could also be viewed as a form of academic capitalism where university administrators limit access to information about how public research funds are used in order to increase access to future public and private funds.

An interview protocol was used with all interviewees. First, the research project and the nature of their participation in it were explained and interviewees were provided with a consent form to sign. Second, a series of interview questions were asked in a semi-structured format. The interview protocol can be found in Appendix B. Questions were intended to elicit information about the origins of the idea for the Research Trust Fund, its structure, and some of the key events that led to its creation in 2008. These questions helped ease interviewees into the interview and were designed to help identify the factors and actors involved in the development

of the legislation. Interviewees were then asked about their involvement in the development and passage of the legislation and their recollection of who supported and who opposed it. These questions helped elucidate the dynamics at work between the Legislature, the Governor's Office and others, as well as further clarify the legislative process and power dynamics at work within the West Virginia Legislature itself. A series of questions was asked about the program's impact on economic development, its success in meeting legislative expectations, and its impact on the state's research universities. Finally, interviewees were asked to reflect on the potential impact of the Research Trust Fund on the future of the state and to provide any additional commentary.

Interviews were conducted with individuals involved in the development of the Research Trust Fund in order to better understand which factors were critical to the program's development and the reasons why some individuals acted as policy entrepreneurs. This information would not be available without speaking to those close to the process, though aspects of the interviews could be confirmed by examining legislative records and other public sources. Using interviews to understand the development of the policy process also provides insight into the values, motivations and worldviews of those interviewed. This in turn helps better clarify their involvement in the Research Trust Fund program and helps us to understand better who supports such programs and why. By identifying and speaking with individuals representing different state-level policy making bodies, I was also able to gain a greater understanding of the interactions between different organizations and individuals within the state and the influence of those relationships on state policy making. The lack of interviewees at the campus level limits the analysis of campus-level dynamics and means that interview data about institutional impacts is seen through the lens of state-level actors. The negative response from one campus and the lack of response from another also suggests that a sizable gap may exist

between the individuals involved in the policy formation process and those responsible for policy implementation. Due to the fact that it is state-level actors that promoted and secured funding for this policy however, the focus on state-level actors is justified, though it does limit the scope of analysis.

Interviews were transcribed by the author and coded in order to identify key themes. Both deductive and inductive strategies were applied. Initial codes were identified using a deductive strategy based on the theoretical framework described in the first chapter that identified executive branch support and policy entrepreneurs as the two most critical factors in the development of state policy to promote the commercialization of university research. Additional codes were identified inductively based on an analysis of the transcripts, in particular the role of the legislature as a gatekeeper and site for competition between institutional interests. Due to the fact that interviewees were asked about events that took place in the past, there is some concern with bias or poor recall (Yin, 1994). To mitigate that concern interview responses were compared across interviews for consistency and checked against legislative records, policy documents and news articles in order to confirm statement validity. Some statements that could not be confirmed from multiple sources, but spoke to a consistent theme of theoretical importance were included in the analysis. Although campus interviews were not included, information collected from state actors was sufficiently consistent to assure the validity of the policy development narrative. For questions about the impact of the RTF program on West Virginia's two research universities, interview material in combination with policy documents and other data also serve to provide a clear state-level perspective on the impact of the program on WVU and Marshall.

Document Analysis

A variety of documents were used in this research project. For clarity, the documents will be discussed in relation to the research questions that they help answer. The first question that this research seeks to answer is: *Which actors, socio-economic, and political factors had the greatest impact on the development and adoption of the West Virginia Research Trust Fund?* While interview data is largely used to answer this question, a variety of documents were used to provide context, confirm interviewee's statements and establish a clear timeline of events. These documents included legislation, West Virginia State Code, transcripts from speeches, press announcements, news articles, reports produced by Kentucky's Council on Postsecondary Education and reports produced by the West Virginia Higher Education Policy Commission. The second question this research investigates is: *How have West Virginia's research universities reacted to the West Virginia Research Trust Fund program?* In addition to the documents mentioned above, several other pieces of data were collected in order to answer the second research question. First, the strategic plans for the use of RTF monies that the two institutions developed were examined. Second, these plans were compared with institutional strategic plans developed by Marshall and WVU pre and post the passage of SB 287 in 2008 in order to contextualize them and see how the RTF strategies fit within the strategic direction the universities had already set. Third, information on research and development spending at peer institutions was collected. Fourth, information was also gathered from regional newspapers and institutional news archives about RTF donations and donors. These documents were also used to answer the third research question: *How have actors within Marshall and WVU used the Research Trust Fund to promote closer connections to the market?* In addition, data on the funds raised by Marshall and WVU as part of the Research Trust Fund were examined, along with the

endowments they created with the funds. CVs and publically available salary data were collected for faculty members hired as part of the RTF program. A number of publicly available data sources, supported by interview material, were used to answer the final research question: *To what extent has the West Virginia Research Trust Fund led to expanded commercialization at the state's research universities and increased economic development in their regions?* These include institutional data on commercialization and technology transfer activities, employment and wage data from the U.S. Department of Labor and financial information from the West Virginia State Budget Office. These data sources and their application to answering the above research questions are discussed in greater depth in the subsequent chapters.

Conclusion

Using multiple forms of evidence to converge on the examination of a single case study helps provide reliability and depth to this investigation of how state policies that promote the commercialization of university research impact state economies and universities. The remainder of the study will be organized as follows. Chapter 3 will examine the development of the West Virginia Research Trust Fund and the actors and factors that had the greatest influence on its development. Chapter 4 will examine institutional responses to the program and the extent to which it has encouraged academic capitalism at Marshall and WVU. Chapter 5 will look at the Trust Fund's impact on economic development and the extent to which it has expanded commercialization at the two institutions. Finally, Chapter 6 will discuss the implications of this research for policy and theory and discuss identify directions for future research.

CHAPTER 3

THE DEVELOPMENT OF THE WEST VIRGINIA RESEARCH TRUST FUND

The overarching question this research attempts to answer is: *How do state policies that promote the commercialization of university research impact state economies and universities?* In order to answer that question, this study investigates four questions about the creation and implementation of West Virginia Senate Bill 287 which created the West Virginia Research Trust Fund. The question that is the focus of this chapter is: *Which actors, socio-economic, and political factors had the greatest impact on the development and adoption of the West Virginia Research Trust Fund?* In order to answer this question, semi-structured interviews were conducted with state policy makers that were involved in the development and implementation of the Research Trust Fund. These interviews focused on where the idea for the Research Trust Fund came from, who the key actors were, the importance of support from the governor, the legislature and the state's higher education coordinating board and which social, political and economic factors were most important when drafting and debating the legislation. An analysis of documents related to the creation of the Research Trust Fund was also conducted, including review of legislation, transcripts of speeches, press announcements and news articles.

Theory and Methods

How and why state governments adopt new policies has been studied by political scientists for over four decades (Walker, 1969). One of the key theoretical debates in the field has been

between researchers that argue that policy innovations occur because ideas diffuse from neighboring states and those that argue a state's internal social, economic and political determinants are primary. Berry & Berry's (1990) analysis of state lottery adoption was one of the first studies to combine diffusion and internal determinants into one explanatory framework. Their research utilized event history analysis, an approach that has been adopted by researchers in the field of higher education policy studies as well. Within the higher education policy field, Michael McLendon and others have used event history analysis and a unified diffusion and internal determinants approach to study the adoption of finance strategies (McLendon, Heller, & Young, 2005), performance funding (McLendon, Hearn, & Deaton, 2006), and statewide governance restructuring (McLendon, Deaton, & Hearn, 2007). While event history analysis is a useful tool for predicting policy adoption, though not without its critics (Mintrom, 1997), it is not a useful tool for unpacking the complexity behind why policies do or do not diffuse. In order to capture more of the detail and complexity of the policy adoption process, qualitative approaches have been used effectively. John Kingdon's (2003) research is perhaps the most well-known and his multiple streams model of policy agenda setting has been widely replicated. Based upon the garbage-can theory of decision making developed by Cohen, March and Olsen (1972) this model posits that policies move to the top of political agendas through the advocacy of effective policy entrepreneurs that are able to combine the multiple streams of problems and policy solutions during the opening of a political window.

Although a great deal of theoretical work has been done on policy adoption, little research has been conducted about how and why states adopt economic development policies focused on university research, and even less about the adoption of programs designed to attract star scientists to research universities. Using the available literature, I develop a theoretical

framework that identifies which actors, socio-economic factors, and political factors are most important in the development and adoption of policies that promote the commercialization of university research.

Hearn, McLendon & Lacy's (2009) research on state adoption of programs designed to recruit star scientists, which they call eminent scholars (ES) programs, provides a useful starting point for examining state-level factors that lead to the adoption of such policies. While West Virginia's program is not designed to recruit star scientists exclusively, the main focus of the legislation is on funding salaries for new researchers and associated staff and students. This focus and the fact that Hearn et al. categorize Kentucky's Bucks for Brains program as an ES program supports the relevance of looking closely at their findings. Their research uses event history analysis and looks at the adoption of such policies in twenty states over a twenty-four year period. They acknowledge that using event history analysis leaves unexplored the "black boxes" of individual programs and does not "reveal the reasoning of state officials in developing, funding, and implementing ES programs in particular years," (2009, p.20), two things which this study explores. Their research identifies several factors that contribute to the likelihood of a state adopting such a program, including: low levels of private R&D and patenting activity, strong governors, legislative professionalism, and the existence of a higher education coordinating board. They also find some evidence that higher per capita rates of federal research and development funding also influence states to adopt ES policies. While there has been an active debate in the policy adoption literature about the relative influence of external and internal factors as described above, Hearn et al. did not find evidence of inter-state diffusion in the case of ES policies. They also found that that partisan control of state government did not influence adoption. This comes as less of a surprise. In the Battelle sponsored *Compendium of State and*

Federal Technology Programs, Corbin writes that, "A hallmark of the state cooperative technology programs has been their bipartisan support. There has been a nearly complete absence of partisan conflict over these programs, their mission or their operations," (1995, p. 31). Broad bi-partisan support for science & technology policy at the federal level has also been identified by Slaughter & Rhoades's research at the federal level (1996, 2005).

While Hearn et al.'s work is valuable because it addresses broad state-level factors contributing to the adoption of state policies that attract eminent scholars, it does not answer the question of why policymakers support them. Hart's (2008) research on the adoption of entrepreneurial economic development policy provides some help in filling that gap. Broadly, Hart asks the question of why states pursue entrepreneurial economic development policies that focus on high technology when such policies, "lack obvious political constituencies, create few opportunities to win favorable media coverage, and tend to take more than one election cycle to pay off," (2008, p. 149) especially when compared to more traditional locational economic development strategies that focus on relocating existing firms to generate jobs and material benefits in the short term. Specifically, Hart's research investigates the role that entrepreneurs play in advocating for entrepreneurial economic development policies. In order to answer this question he looked at sixteen historical case studies and conducted both interviews and document analysis. He found that, contrary to his expectations, entrepreneurs played a relatively small role in the policy process. Instead, he found that,

> The views of public officials, particularly governors and their appointees to senior ED [economic development] policy positions, largely determine the emphasis of state ED policy. The executive branch was almost always a key player (and sometimes the only player) in the enactment of the programs that I studied, and it often had the flexibility to interpret ED policy in order to pursue its preferred strategy during the implementation phase, even when it was not very involved in the enactment.…To put it another way, governors and senior executive branch officials seem to act as policy entrepreneurs in shaping (or failing to pursue) entrepreneurial ED strategies (Kingdon, 1995; Sabatier &

> Jenkins-Smith, 1999). This study also yields some evidence that legislative involvement in policy formulation may help ED programs with entrepreneurial attributes to be more durable and resistant to rent-seeking interests during implementation. (2008, p. 163-4)

This places governors and their appointees at the center of entrepreneurial economic development strategies and portrays them as policy entrepreneurs. It also suggests that legislative involvement, while not as central, is important for the long-term success of economic development programs. While his study finds that states do pursue ED policy strategies, alongside more traditional locational strategies, he does not explore in depth what motivates the key entrepreneurs or where the ideas come from.

Hart's research also finds that experts have an important influence on decision makers, arguing that "As expert views on the most effective ED policies have evolved to favor entrepreneurial ED strategies in the past couple of decades, public officials have moved in that direction," (2008, p. 164). Hart specifically mentions the influence of the National Governors Association in promoting entrepreneurial ED policy and writes that, "Experts appear to be one important influence among several…On balance, though, I would speculate…that experts tend to stay true to their professional beliefs and, through their advice to public officials and actions in public capacities, move public policy toward the dominant position in the expert community" (2008, p.164). This also suggests an important role for the expert community as a whole in setting general trends in state economic development policy.

Another important factor to consider, though not discussed explicitly by Hart or Hearn is the role of the federal government in promoting research commercialization. The 1980 Bayh-Dole Act is part of a larger move towards neoliberalism on the part of the United States. A neoliberal economic policy is one which puts forward the idea, "that human well-being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional

framework characterized by strong private property rights, free markets and free trade" (Harvey, 2005, p. 2). The role of the state in neoliberal political system is to support those entrepreneurial freedoms and skills and protect private property rights. The Bayh-Dole Act was an important step in reframing the role of university research and enabled universities and university researchers to view their findings as private property which could be protected, sold and profited from. This reframing of university research was further strengthened by changes to intellectual property laws which expanded the ability of individuals and corporations to aggressively patent things like bacteria and gene sequences (Slaughter, 2010). These changes to policy were supported by elected officials from both political parties, university leaders and the business community. These changes made scientists who could generate research with commercial applications financially valuable to universities, and strengthened the notion that university research could contribute to economic development. State policies to promote commercialization begin to appear after the Bay-Dole Act, suggesting that changes to federal policy, and to some extent university policy, helped put the commercialization of university research onto the radar of state policymakers. This work was aided by policy entrepreneurs, such as those at the National Governors Association or the Business Roundtable who viewed them positively and promoted them as vehicles for state-level economic development.

While Hart's finding that entrepreneurs had limited if any role in developing entrepreneurial economic development policy ran contrary to his own expectations, it aligns with Hearn et al.'s findings that governors and "technocrats", such as professionalized legislative staffs and those that work at state higher education coordinating boards, play key roles as policy entrepreneurs in promoting and developing economic development policies. Kingdon's (2003) well-known multiple streams theory of policy adoption also places policy entrepreneurs at the

center of the policy adoption process. Kingdon describes entrepreneurs as individuals with a, "willingness to invest their resources – time, energy, reputation, and sometimes money – in the hope of a future return. That return might come to them in the form of policies of which they approve, satisfaction from participation, or even personal aggrandizement in the form of job security of promotion" (2003, pp. 122–3). Policy entrepreneurs can be elected officials, government employees, or individuals outside government, but they should have a few key qualities. First, they must have "claim to a hearing" based on their expertise, ability to speak for others, or authority (2003, p. 180). Second, they should have political connections or negotiating skill. Third, they should be persistent. They are important to the policy process because they are able to combine problems and solutions at a time when a political window is open. Persistence is especially important because it is often necessary to work for several years to educate or "soften" policy makers to the issue so that they will eventually be receptive to it.

This research suggests that for an economic development policy promoting the commercialization of research to be enacted, two factors are essential. First, *executive branch support* is a necessity. Without gubernatorial backing for the idea, it will not get off the ground. Second, at least one high level public official in or near the executive branch needs to act as a *policy entrepreneur*. This person can be the Governor, an appointee, or someone else closely connected to the executive branch. Whoever this person is, however, he or she needs to act as a policy entrepreneur and invest time, energy and potentially reputation to ensure the success of the policy. In addition to gubernatorial support and an active policy entrepreneur, legislative and expert support can also be important factors in the success of an economic development policy. Hearn et al.'s finding that legislative professionalism and the existence of a higher education coordinating board improve the chances of a state adopting an eminent scholars program also

supports Hart's conclusion that legislative support and expert advice can play an important role. This research examines the roles played by the Governor, key policy entrepreneurs, the legislature and experts in the creation of the West Virginia Research Trust Fund. In addition to their roles, this research also explores how the views of the Governor and key executive branch officials develop and why they chose to support a long-term economic development policy promoting commercialization that may not provide a short-term political win. This research extends the work of Kingdon and Hart by examining the factors that influence executive branch support of research-based economic development as well as clarifying the role that the legislature plays in the policy development process as both a gatekeeper and a site for competition between institutional interests. It also extends previous research by examining how policy entrepreneurs advocate for policies, not just what characteristics are necessary to be a policy entrepreneur. This research also identifies a temporal element in the policy development process wherein the influence of policy entrepreneurs and other key actors waxes and wanes at different stages.

Methodology

In order to identify the policy entrepreneurs that were critical to the development of the West Virginia Research Trust Fund, and to better understand what shaped their support for it, I conducted semi-structured interviews with seven state officials that were directly involved with the development of the West Virginia Research Trust Fund. Three were from the state's coordinating board, two from the West Virginia Legislature, and two from the governor's administration. In order to further investigate Hart's finding that experts are often important to the policy makers working on economic development, specifically the National Governors

Association. I also spoke with a former employee of the National Governors Association who had worked with the promotion of entrepreneurial economic development policy. Interviewees were identified using a snowball technique beginning with one individual that was known to be closely involved in the process. The interviews, lasting between 36 and 69 minutes were taped and transcribed. The interviews were then analyzed and coded in order to identify key constructs. Codes were initially identified based on the theory identified above, but additional codes were added based on an analysis of the transcripts. An analysis of documents related to the creation of the Research Trust Fund was also conducted, including review of legislation, transcripts of speeches, press announcements and news articles.

Based on the interviews and document analysis, I have constructed a timeline of key events (Figure 3). Every person that I spoke with identified Kentucky's Bucks for Brains program as the model for the West Virginia Research Trust Fund. As a result, events in Kentucky are included in this timeline. While policies and programs promoting the commercialization of university research developed in other states starting in the early 1980s, state funds directed towards research commercialization were not made available in West Virginia's until 2002. Between 1998 and 2006, however, Kentucky made three rounds of investments in their Bucks for Brains program and raised $282 million in private match (Kentucky Council on Postsecondary Education, 2007). Bucks for Brains had also been promoted by Kentucky's Governor Patton and a team of executive, legislative, postsecondary education and economic development leaders from Kentucky at a National Governors Association meeting attended by state teams from Iowa, Missouri, Montana, New Mexico, Utah, Virginia, Wisconsin, and West Virginia (Giltner, 2001).

1997	The Kentucky Postsecondary Education Improvement Act (HB1) is passed and creates the Strategic Investment and Incentive Funding Program to fund six strategic areas of higher education.
1998	Kentucky's Endowment Match program, known as "Bucks for Brains", is established with $110 million from the General Fund in the 1998-00 biennial budget.
2000	An additional $120 million from the state General Fund is added to the Bucks for Brains program
December 3, 2001	National Governors Association Center for Best Practices learning laboratory for states, *Linking Higher Education and Economic Development,* takes place in Louisville, Kentucky.
2002	$120 million from the sale of taxable bonds is added to the Kentucky Bucks for Brains program in the 2002-04 biennial budget.
June 2002	West Virginia Senate Bill 207 Establishes the Eminent Scholars Endowment Trust Fund Act. $8.5 million of state funds are allocated.
December 2005	*Vision2015: The West Virginia Science and Technology Strategic Plan* is released
2007	Battelle Technology Partnership Practice produced the Phase I report entitled *Gap Analysis and Identification of Strategic Technology Platforms* identifying strategic areas of investment for technology based investment in WV.
Summer/Fall 2007	Governor Manchin, his education advisor, the presidents of Marshall and WVU, HEPC leadership and the WV Commerce Secretary travel to Kentucky and meets with Lee Todd, President of the University of Kentucky, and his staff to learn about Kentucky's Bucks for Brains program.
December 2007	Draft RTF legislation prepared by Higher Education Policy Commission staff.
February 13, 2008	A committee substitute was passed out of the Senate Education Committee and reported to the Senate Finance Committee. Transportation technology is added as a key research area.
February 21, 2008	The Senate Finance committee changes the legislation to remove $250,000 for HEPC. Gerontology is added as areas of research concentration.
March 7, 2008	House of Delegates changes the effective date of the legislation. Bill is effective from passage
April 1, 2008	SB 287 is signed by Governor Manchin and the West Virginia Research Trust Fund is created with $50 million in state funding.
December 7, 2009	Report on the Research Trust Fund Annual Summary 2009/10 presented to the West Virginia Higher Education Policy Commission.
January 1, 2011	Report on the Research Trust Fund Annual Summary 2010/11 presented to the Legislative Oversight Commission on Education Accountability
March 2011	Senate Bill 239 passes the legislature. This bill extended the deadline for raising private matching funds from five years (2013) to seven years (2015).
January 2012	WVU meets their $35 million fundraising goal.
January 2012	House Bill 4311 is introduced. The purpose of the bill is to provide an additional $20 million in new funding for the Research Trust Fund. It does not pass.

Figure 3: Timeline of Research Trust Fund Events

These events in Kentucky had attracted the attention of some postsecondary leaders and policy makers in West Virginia and helped set the stage for promoting a similar policy in West Virginia. The critical role that gubernatorial support played, and how policy entrepreneurs in West Virginia worked to secure it, will be discussed in the next section.

Executive Branch Support for the Research Trust Fund

The theoretical framework developed here predicts that executive branch support is critical for the development and successful implementation of economic development policy. Interviews and document analysis support the assertions that Governor Joe Manchin supported the creation of the West Virginia Research Trust Fund and was critical to its success. Governor Manchin demonstrated his support publically in his fourth State of the State address where he announced that,

> The strategies for investment that I'm about to discuss all started when I visited the University of Kentucky last year and learned about that state's "Bucks for Brains" program that provided money to its two major research universities that was matched with private donations to create new opportunities for state-of-the-art research and entrepreneurship. From that seed, an entire tree is now about to be planted in West Virginia…First, as part of our own "Bucks for Brains" initiative, and using one-time surplus monies, we will create a $50 million endowment fund for our two research universities, WVU and Marshall, to stimulate world-class research and development and attract venture capital, which will eventually lead to jobs in emerging high-tech, high-wage industries. The state's investment will be matched, dollar for dollar, by private donations, resulting in sizable funds that will strengthen our most-promising research departments – ultimately leading to business spinoffs, new patents and job creation. (Manchin, 2008)

Including the plan to create a West Virginia "Bucks for Brains" initiative in his State of the State address and identifying $50 million in support for it sent the message to the public and to the legislature that this was one of Governor Manchin's top priorities for the 2008 legislative session. His statement also points to the fact Governor Manchin viewed this as an investment

that would pay off in two key areas; attracting private capital to match the public investment and the creation of new high-wage jobs. This quote also identifies Kentucky's program as a model for West Virginia's investment, a theme that will be explored in greater depth later in this chapter.

Interviews with state officials who were closely involved with the Research Trust Fund also indicated the importance of gubernatorial support. Each individual that I interviewed mentioned the critical role of the governor and that the program would not have been created without his support. In response to a question about who had to be convinced in order to successfully move the bill through the legislature, one interviewee said, "First of all was the governor. The governor had to get behind it and say this is my initiative. He comes out and says this is my initiative, this is how I'm going to do it, talks about it in the State of the State, this is what it's going to be like, this is how it's going to be" (Governor's Administration). The importance of the governor was also discussed by another interviewee when asked if the Research Trust Fund would have been possible without Manchin's support.

> No, I don't think so. I think the fact that the governor knew he had an opportunity to do something and the fact that we convinced him, again, Brian [Noland, Chancellor] and Kelly [Goes, Commerce Secretary] for the most part convinced him, that what Kentucky was doing would really have the opportunity to revolutionize the state's economy and all he had to do was jump on the plane, go over and take a look at it. (Coordinating Board)

This quote raises two other important points. First, the importance of the trip to Kentucky is mentioned again. The "jump on the plane" here refers to a trip that Governor Manchin made in the fall of 2007 to Lexington, Kentucky. He went with members of his staff and cabinet, the presidents of Marshall and WVU and leadership at the Higher Education Policy Commission to Lexington and met with Lee Todd, President of the University of Kentucky and members of his staff to discuss Kentucky's Bucks for Brains and the impact it had had on the university and the

state of Kentucky as a whole. Several interviewees mentioned the importance of this meeting in convincing the governor that creating a Research Trust Fund in West Virginia was a good use of some of the budget surplus. This quote also points out that two people critical to actually convincing the governor to make this investment were Kelly Goes, Commerce Secretary, and Brian Noland, Chancellor of the Higher Education Policy Commission. The role that these two policy entrepreneurs played in the creation of the Research Trust Fund will be discussed in more depth in the next section.

In attempting to answer the question about why the governor supported the Research Trust Fund when he did, a few critical factors emerged from the analysis of interviews and documents. Foremost among the reasons, and mentioned by five of the seven West Virginia interviewees, was the fact that there was a budget surplus. Reflecting the comments made by others, one interviewee said that "It was possible because we had a surplus, and that surplus had not been accounted for. We flew back from KY with a pledge from the governor" (Coordinating Board). While the money was a critical enabling factor for the creation of the Trust Fund, it does not explain why Governor Manchin wanted that investment made. Three of the seven interviewees mention the Governor's desire to do something that would have a significant and lasting impact on the state. One interviewee said that, "I think that, first off, you've got to get into where they were. He believed if we spent that money in long-term programs we'd have budget deficits. He wanted to look at some things that would change where we were going and try to be game changers and that is why he picked those areas" (Legislature). This quote illustrates both that the governor wanted a "game changer" and that he believed one-time funding was the most effective way to do this. If he had created a program whose existence was contingent upon annual appropriations from the legislature, the possibility existed that if the

state's fiscal situation changed, the program would either be cut or the state would have to borrow money to sustain it. Using one-time funding to create the endowment meant that the program was more likely to be financially and politically secure in the future. Another interviewee also pointed to the governor's interest in making a long-term investment, though from a different angle, when he said, "We were not shy about using the word legacy, this could be your legacy governor" (Coordinating Board). By actively deploying the concept of a 'legacy' investment, this suggests that either it was known the governor was interested in creating a program with long-term impact, or that those who supported this policy believed that he did. The mention of long-term orientation by several interviewees suggests that the governor did indeed have that in mind. The fact that 2008 was a the last year of his first term as governor and an election year where he was running for his second term may have played a role in his interest in long-term investments as well. This explanation also provides at least one answer to the question raised by Hart (2008) of why elected officials would support economic development policies that would not pay off during the span of an election cycle.

Another interviewee provides more context about the governor's decision to support the Research Trust Fund by saying,

> Governor Manchin felt like he had paid down debt, he had done a lot of responsible things with the previous surpluses and he was looking for a way to establish things for the future. So he was very much looking for what can we use this money for that isn't a one-off, like we're not going to sprinkle it all over the state, what can we use this money for as a long term economy boosting opportunity? And that is how I got brought into the discussion, '[ ], what would you do with it'? And, you know, the typical approach would be infrastructure, sites, shell buildings, that is something that can be financed any year, so I was really trying to canvas folks for, 'is there anything else out there that we can do' and really toying with early stage capital, you know things like that. Early stage capital is extremely unpopular at the state level because it is so high risk and such a long term, if there is a reward, it is a long term reward, it's not something that's going to happen in a cycle. (Governor's Administration)

This quote reinforces the idea that the governor was interested in creating a program with long-term impact, and that he was thinking about it within the context of the governance decisions he had made in the previous years. Fiscal year 2008 was the third year in a row with a budget surplus and the fact that West Virginia's finances were in order may have helped create a window where Governor Manchin felt he could invest state money in a project with some risk. The surplus provided a pool of funds that could be used, and the Bucks for Brains program in Kentucky provided a successful model that could be adopted in West Virginia. That said, however, it seems unlikely that the program would have come into being without the active involvement of a few key policy entrepreneurs who, when asked "what would you do with it?" were able to provide an answer.

The Importance of Policy Entrepreneurs

Hart observed that, "governors and senior executive branch officials seem to act as policy entrepreneurs in shaping (or failing to pursue) entrepreneurial ED [economic development] strategies" (2008, p. 163). In the case of the West Virginia Research Trust Fund, it appears that the governor and senior officials that were closely connected to the executive branch played critical roles in the development and passage of the legislation. Based on the interviews conducted, the two most important policy entrepreneurs were the Secretary of Commerce and the Chancellor of the state's higher education coordinating board. Both of these individuals had expertise, were part of the Governor's cabinet and were persistent in their support for the Research Trust Fund. While the support of others, including the presidents of WVU and Marshall, definitely played an important role, it seems that without the active investment of these two individuals, the Research Trust Fund legislation would not have come to pass. This section

will look at the role of these two policy entrepreneurs in the creation of the Research Trust Fund, as well as the motivations of the two individuals and their personal and professional interests in the creation of the RTF.

The following quote illustrate the importance of the Secretary of Commerce and the Chancellor in this process, and the importance of them working together.

> Well, as much as Dr. Kopp [President of Marshall University] tries to take credit for it, it is more of seeing what Kentucky was doing and some pretty strong leadership from Kelly Goes [Commerce Secretary] in recognizing that…But really, it was from, you know the Governor's office through Kelly and Brian [Noland, Chancellor] and their seeing that and breaking down some of the, you know, some of the misnomers. Noland could push it from a higher education policy commission perspective and from people that are policy makers; they expect him to push it. But if from the commerce perspective, Kelly Goes is a partner in it; that adds another element that I think is very important. (Legislature)

This quote illustrates the importance of the Governor's Office and the fact that the interviewee saw the Commerce Secretary and the Chancellor as extensions of the Governor's Office in regards to this piece of legislation. It also raises the point that it was the combination of the two that really helped develop support for the policy. Legislators expect the Chancellor to ask for more money for universities in general and for research in particular. If, however, that argument is supported by someone who is viewed as representing the interests of business and economic development, the idea gains greater support.

The importance of the two together also comes out in other interviews. Two of the individuals I spoke with within the coordinating board pointed to the critical role the Secretary of Commerce played in building support for the Research Trust Fund, while also acknowledging the role that that agency played in doing some of the background work. One interviewee I spoke with said,

> It's true that we had been advocating for something in that regard and gotten the Chancellor's ear on a few occasions, probably over a couple year period before there

> was any real action. And where the Department of Commerce comes in is where Secretary Goes began to look at what we were talking about. She became very much an advocate, saying this is the way to grow capacity in the state for the sort of knowledge generation that we were trying to encourage and having more people doing that kind of work. So that is really the genesis of it from my point. (Coordinating Board)

This was echoed by another, who said,

> But from my perspective, the genesis of Bucks for Brains was Kelly Goes, who was then the Commerce Secretary for Governor Manchin. Kelly is an alum of the University of Kentucky, and was deeply in tune with intellectual property law. That was one of her areas of specialty, so this was something she brought to the table when she was named Commerce Secretary. There were a number of natural allies within the state; myself…at the time Dave Hardesty was president of WVU, and Steve Kopp President of Marshall University. And you had a couple of trial runs on this. Prior to the implementation of Bucks for Brains, there was a program the year prior called the Eminent Scholars Fund in which the state provided monies that had to be matched, not that could have been matched by any source, but it was essentially our first dip into this environment. That was also pushed by Kelly, but when Secretary Goes really started on her own to push, that is when Bucks for Brains gained traction. (Coordinating Board)

These quotes reveal that while there was some precedent for state support for research and a group of individuals in the higher education sector that supported research based economic development, it took someone with credibility on the economic development side to increase the legitimacy of the program and give it the visibility it needed to get passed in the legislature. In this case, that person was the Commerce Secretary who approached funding research as an economic development and state competitiveness issue.

Hart's research found, "The views of public officials, particularly governors and their appointees to senior ED policy positions, largely determine the emphasis of state ED policy" (2008, p. 163). That certainly appears to be the case in West Virginia. For the Commerce Secretary, investing in research was seen as a long-term investment that could help diversify the state's economy. For the Chancellor, identifying opportunities to increase funding for higher education, through research or through other ways, is part of his professional responsibility. This

type of program is also capable of generating benefits for the state generally. One interviewee described some of these benefits by saying,

> The commitment of Bucks for Brains was significant because it demonstrated to policy makers, it demonstrated to faculty and it demonstrated to small business that West Virginia was serious about research. That a state like West Virginia would put $50 million into this program was a conversation changer. It impacted the ability of WVU to recruit faculty because they could point to this as the state stepping up and making an investment. It was a conversation changer. The next thing that it did was that it helped to continue a cultural change around the importance of research linked to economic development. A lot of this had already been begun with the first receipt of the EPSCOR award, and then you have the Research Challenge Fund, the Eminent Scholars Program and Bucks for Brains really keeps this in gear. The change of a culture in West Virginia, that West Virginia was a state that was going to compete economically through the resources of our faculty and staff at West Virginia University and Marshall University. (Coordinating Board)

These comments refer to the impact the legislation has had on the state; that it continues the development of research based economic development through both practical means such funding and increased faculty recruitment, and cultural means by indicating that research is important in West Virginia. This sort of change is described in terms of a beneficial cultural shift, not just in terms of strict economic benefit.

For the Commerce Secretary, the professional motivation is to generate economic development in the state. As mentioned above, she was interested in research and technology driven solutions, partly because of her background in intellectual property law. Another rationale for investing in research instead of infrastructure came for one interviewee from observing what other states and regions were doing and comparing it with West Virginia. That person did not believe that West Virginia's public universities were doing enough to diversify the economy and said,

> Higher education is usually an economic engine in a state to get things up and going especially on small business, especially on diversifying your economy. We had seen none of that and we'd really seen no inclination of the universities to kind of say 'okay, that's my responsibility'. Now contrast that with the California system or the Texas system of

> the Massachusetts system or even in Maryland, northern Virginia where they have access to the government agencies, and then we were in Pittsburgh where they've established a whole culture around computer programming that linked up CMU with Pitt with NETL, with early stage financing; it was all around us. At the time I didn't know about UK [University of Kentucky], but now it's at UK and we just weren't seeing any type of coordinated effort and looking at diversifying the economy it just made all the sense in the world to me that we put some incentives for higher education to get out there and step up and really start thinking about it in those terms. (Governor's Administration)

While the differences between the economies of Texas, Massachusetts and California and that of West Virginia make direct comparisons difficult, the point that West Virginia's research universities were not actively involved in commercialization and economic development seems clear. There had been a few start-ups associated with Marshall and WVU before 2008, but most of them were fairly small, with the exception of Protea Biosciences. This perceived gap when compared with other states could very well have factored into the desire to create an economic development policy such as the Research Trust Fund.

Seeing Yourself in the Problem: The Work of Policy Entrepreneurs

One of the areas that other researchers have left relatively unexplored is how policy entrepreneurs work to convince the right people at the right time. Kingdon's multiple streams theory explains policy making in terms of solutions and problems being brought together at the right time by a skillful policy entrepreneur and Hart's work identifies the importance of executive branch leaders in being those entrepreneurs in the realm of economic development policy. What the actual work looks like, though, and how policy makers decide on a course of action is less well understood. While the last section offers some explanation of why the policy entrepreneurs themselves supported the Research Trust Fund, this section will explore in more depth how they convinced the Governor and others of the programs merits.

While the interview data makes clear that the availability of budget surplus was a critical factor in the passage of the Research Trust Fund, and that the timing at the end of Governor Manchin's first term may have played a role, there also appear to be some practical strategies that were applied by the Commerce Secretary and the Chancellor in moving the program from plan to reality. Central among them appears to be helping policymakers, especially the Governor, to really understand, from the inside, how a program can work and achieve its goals. This concept was described by an interviewee who said, "When you are trying to promote the transfer of a good idea, people need to see themselves in the problem" (National Policy Organization). In practical terms, helping policy makers to see themselves in the problem involves a few key elements. First, there has to be an opportunity to learn from peers. This is a challenge for a policy entrepreneur attempting to promote policy transmission across state lines because governors have no immediate peers in their own state. The same applies to executive branch policy advisors, cabinet secretaries, state higher education executive officers and legislative committee chairmen and is a part of the impetus for the existence of organizations like the National Governors Association (NGA), State Higher Education Executive Officers (SHEEO) and the National Conference of State Legislatures (NCSL). Another critical element, though, is that there is common ground beyond holding the same or similar position in another state. Part of seeing someone as a peer, and seeing yourself in their policy solution, is identifying with them. As one interviewee pointed out,

> That said, people are only willing to copy where they can see themselves in it…Michigan will never be like, 'oh I want to be like Kentucky!' It ain't gonna happen. So that was fascinating for me to learn. I thought you'd just be rational about it. You'd look at what Kentucky did and you'd be compelled, but apparently it is not so. So, what I would say about what makes an idea, the spark of an idea, is it this kind of, and this is what Kingdon says, it is this confluence of opportunities. (National Policy Organization)

Although in the specific case of Michigan and Kentucky, Michigan already had policy mechanisms in place to attract eminent scholars and promote commercialization, this statement also suggests that states do not have 49 other peers that they can imitate, but instead, have a much smaller set based on a variety of economic, demographic, historical and cultural factors. An unspoken status hierarchy among states can also be implied. In the case of West Virginia, Kentucky shares a number of West Virginia's historic, cultural, economic and demographic factors. All interviewees mentioned that Kentucky's Bucks for Brains program served as a model for West Virginia's research trust fund and several of them mentioned the importance of the cultural, historical and economic traits that the two states shared.

Another key element of "seeing yourself in the problem" is being able to ask specific questions of peers in the hopes of receiving clear answers. One interviewee described the strategy as,

> I always looked at it as, can I explain it to my mother?...And so the state budget director, the Governor, came out and said here is what I want, and the state budget director said here is how I put it on the budget, and the SHEEO comes out and says this is how I manage it, and then the program is happening and this is how we get the institutions. And so everyone talked about the role they played in both passing this policy, and then implementing it. And so people could start to see themselves in that. (National Policy Organization)

This becomes especially important for policymakers who want to learn from others mistakes, and hopefully sidestep them when they attempt to implement similar policies. This strategy is what NGA used when they brought together policymakers and advisors in Louisville, KY in December 2001 to discuss Bucks for Brains, and it is the same strategy that the Commerce Secretary and the Chancellor used when they took the Governor to the University of Kentucky in 2007. The interviewees that had personal knowledge of that trip credit it with cementing gubernatorial support and funding for a West Virginia Research Trust Fund program.

Legislature as Gatekeeper

Hart's research found that legislative support can play an important role in the success of economic development policy as well. Interviews conducted with those involved in the development of the Research Trust Fund indicate that was the case in West Virginia. A theme that emerged during the interviews and an examination of the legislative process is how many opportunities there are for a piece of legislation to fail. In order for a piece of legislation to successfully negotiate the process, it is essential that at least one strong advocate exist. Policy entrepreneurs alone, unless they are legislators, do not have the necessary power to guide legislation through successfully without the assistance of legislative advocates.

In the case of the Research Trust Fund, the key legislative advocate was Senator Robert Plymale, Chairman of the Senate Education Committee. Senator Plymale was first elected to the West Virginia legislature in 1992 and became Chairman of the Senate Education Committee in 2008. The district that he represents includes Marshall University and borders both Ohio and Kentucky. He is also active in the National Conference of State Legislatures (NCSL) and the Southern Regional Education Board (SREB), and had been exposed to Kentucky's Bucks for Brains program prior to the preparation of the legislation that took place in late 2007.

As one interviewee stated, "…I cannot overstate the power, influence, and importance of Senator Plymale in this process. Governor Manchin got this to move, but Senator Plymale got this implemented" (Coordinating Board). His importance to the process was acknowledged by all of the interviewees. Senator Plymale's importance specifically, and the role of the legislature in general in supporting this piece of legislation, also has a temporal dimension to it as the quote above suggests. While executive branch support is critical to the development and success of economic development policy, "getting it to move" i.e. legislative support, is critical to

implementation. The legislative process requires that a bill be introduced in committee and approved. The Research Trust Fund legislation was introduced in the Senate Education committee which Senator Plymale chaired. In order to better understand the gatekeeper function that the legislature serves, it is useful to take a close look at the progress of the bill from draft to final legislation.

The first step in the process is the drafting of a bill that will be introduced through a legislative committee. This can be done by legislative staff or by external bodies. In the case of the Research Trust Fund, the original draft had been prepared by staff at the Higher Education Policy Commission and then presented to legislative staff for their review. It did not meet with immediate approval. As one interviewee noted:

> They didn't let him [Senator Plymale] see what was being developed. They sort of dropped it on us. And when they dropped it on us we had to completely rewrite it because it was just, it was written entirely from the perspective of the university president...There was very little accountability….there was not really a feedback loop. (Legislature)

The original draft of this legislation did not have any mechanisms in it that would require the two universities to report on their progress or be held accountable for how they money was used. Annual reporting requirements for the two institutions were added to the legislation so that the legislature would be kept up to date on institutional progress towards matching the $50 million in state funds with private donations. After these changes had been made, the bill was introduced in the Senate Education Committee January 22, 2008. While in the Senate Education committee, Transportation Technology and Logistics was added as a fifth area of research concentration to the bill. It is worth noting that Senator Plymale, in addition to being the chair of the Senate Education Committee, is the Director of the Rahall Transportation Institute located at Marshall University. As is the case with all bills that have a cost or fiscal note attached to them, it was then sent to the Senate Finance Committee. The Senate Finance Committee took up the

legislation in February 13, 2008 and made some changes to it as well, removing $250,000 in funding for the HEPC to oversee the management of the Research Trust Fund and adding Gerontology as a sixth area of research concentration. From there the bill was passed to the full Senate where it was read three times and approved for passage. The bill was then transferred to the House where it was read three times and passed. After it had been passed it was taken up for further consideration and the effective date of the legislation was changed. This was then communicated to the Senate, which approved it, and on March 8, 2008 the bill completed legislative action. After that it went to the Governor and was approved on April 1, 2008.

As one can see from the description above, it is possible for legislation to be derailed at several different points during the legislative process. It is for this reason that it is essential to have someone within the Legislature who has the power and ability to shepherd a bill through from start to finish. As stated above, Senator Plymale played a critical role in the implementation of the RTF legislation, though it was Governor Manchin that put it on the state policy agenda in the first place. This is also a period where a number of people, not just the Governor and a key legislator, need to be convinced of the bill's merits. This task brought together a variety of interested parties, including the policy entrepreneurs discussed above. As one interviewee noted:

> And I think that at that point it just becomes a sales job and try and figure out who is going to want to sort of strip out what needs to be in there to keep it effective and make sure it doesn't happen. So at that point it is out of my hands because it's not my bill, higher education is not my field; I was in a completely different department. You know, my role was to keep [Coordinating Board Leadership] positive. [laugh]. And if anybody asked me about it there are certain senators who are more forward thinking and more economic development thinking, and I was happy to sell it to them, talk about UK's [University of Kentucky] success. The university president's engaged. I know President Kopp [Marshall] and Mike Garrison [WVU] both engaged on it and worked the legislature on it; I think that's also important. (Governor's Administration)

This quote illustrates the fact that building support in the legislature is a significantly more complicated process than building the support of one individual. It also requires different

strategies. First, the strategy of helping legislators to see themselves in the legislation was applied. As one interviewee said:

> We had Lee Todd [President of the University of Kentucky] come over and meet with key legislators so we pointed to the Kentucky experience, which was something that resonated with policy makers. One, the states share a geographic identity. We also share a cultural identity. Finally, we share a higher education identity in that the governance changes in Kentucky provided the basis for the governance changes in West Virginia. (Coordinating Board)

The similarities between the two states helped to sell the idea to legislators that were interested in the legislation and had questions about how it would work. At the same time, though, part of what helped the Research Trust Fund legislation successfully negotiate the legislature was that many legislators did not pay particularly close attention to it. Interviewees agreed that there was no serious opposition to the legislation outside of "individuals within WV who had historic skepticism about the ability of higher education to transform our economy" (Coordinating Board). West Virginia has historically relied on resource extraction to provide a lot of the jobs and tax revenue in the state and there is strong support for that, especially the coal industry. The state also has the lowest bachelor attainment rate in the country, 17.1 percent for adults over 25 (U.S. Census Bureau, 2009) which could also account for some of the historic skepticism towards universities as economic drivers. Another interviewee observed that, "I didn't really see a strong opposition to this because I don't think a lot of people understood it. I think there was more misunderstanding, or rather non-understanding than misunderstanding, not knowing what the program was" (Legislature). This lack of clarity did not appear to be a deliberate strategy designed to move the legislation through. One interviewee observed that, "If people had been more critical or been more skeptical, once they heard about the Kentucky success with this, and their ability both at Kentucky and Louisville to raise money, that helped. Having that successful model, that successful precedent I think was very helpful" (Governor's Administration). While it

is impossible to know if West Virginia would have developed the Research Trust Fund if Kentucky had not already had a similar program, the interview data makes clear that the Kentucky example helped convince both the Governor and skeptics in the legislature that this was something that could work in West Virginia.

The Role of Institutional Competition in the Legislative Process

Another element important to the negotiation of the legislature is the politics of institutional competition. While Hart's work on economic development policy has explanatory power for understanding the key actors and elements involved in the development and passage of the Research Trust Fund legislation, it does not explain all elements. The Research Trust Fund is not just an economic development program; it is also a higher education program and as such is subject to the politics of higher education funding. Especially in a small, rural state with 22 higher education institutions, legislators want to know how any higher education bill is going to help their institution and their district.

First, it meant that while the Research Trust Fund was clearly targeted at connecting university research to economic development, and only two institutions, Marshall and WVU, are designated as research universities by the legislature, some consideration of the other institutions needed to be made. As one interviewee said:

> So, there are winners and losers, it does go to major research universities. I mean they threw in a compromise of look, if they can't spend it, then it can trickle down. But if you are an ambitious university like Shepherd [University] or trying to get your feet under you and step up like some of our other universities, then it's kind of tough because okay, this is a big infusion of cash and we're not getting any part of it. (Governor's Administration)

The compromise that was put into the legislation was that the interest that accrued in the fund while the two research universities sought private match would be earmarked for the state's other

public four-year colleges so they could draw it down if they found a match. Of the other nine four-year institutions, only West Virginia State University has any doctoral programs or research expenditures above $1 million per year (NSF, 2010). By December 2012, only $254,241 in state funds had been matched with private money by any of the state's non-research institutions (WVHEPC, 2012c).

Second it meant that competition between the Marshall and WVU was an element in this process. Even though they have different missions, they compare themselves with one another and compete for resources. This competition makes giving funding to one institution difficult, without also giving a similar amount to the other institution. For example, during the 2012 regular session of the West Virginia legislature, West Virginia University requested $1 million to help fund a new School of Public Health, a plan that had been discussed and developed over the course of multiple years. When it became clear that this program would be funded, Marshall advocates (legislators and lobbyists) in the legislature began pushing a last minute plan to secure $1 million in funding for Marshall's medical school. This effort succeeded. Institutional competition also played a role in the case of the Research Trust Fund. Based on the interview data, dividing the $50 million so that WVU had access to $35 million and Marshall had access to $15 million was relatively non-controversial. However, based on the research expenditures at the two institutions between 2000 and 2010, Marshall should not have received that much of the RTF money. If one combines the total research and development expenditures of Marshall and WVU, Marshall contributed, on average, 13 percent of the total. For the Research Trust Fund, the money was split 70/30 between WVU and Marshall. Several interviewees mentioned discussions around the split, but it was never a sticking point of the legislation. However, if the legislation had been intended to benefit only one of the institutions, there would have likely been

more opposition. While there are a number of political, economic and cultural rationales to explain this competition, one interviewee offered up this explanation:

> You know ___ tells this story, because he spent a lot of years outside of the state. Before he came back he was gone I think 13 years. And he tells this story. He says West Virginians are like frogs in a bucket. He said they are all down in the bottom of this bucket together. And as long as they are all at the bottom together they are reasonably happy. They are down there, you know, and they moan and groan to one another about how bad things are, and you know, one of them says 'It's awful' and the other one says 'Yeah it is for me too.' But he said, if one frog gets the idea that maybe he can get out of this bucket, and he starts to climb up over the side, he said all of these down at the bottom get a hold of him and he said they'll pull his legs off before they let him get out of the bucket. And actually, that is very typical. We just are not a self-confident people… And that rivalry between WVU and Marshall, I mean, they are like frogs at the bottom of that bucket. It would *kill them*, either one of them, for the other one to get anything. It's just amazing to me… I mean, there are two institutions, two different missions, two different sets of factors and circumstances, but they are frogs in the bottom of that bucket, don't ever, don't ever forget that, that is really important, and if this legislature, for example, proposed that they had $25 million let's say, and it's like, you know, we've looked at this, WVU has done spectacular things with this money, Marshall has done okay, they've lived up to expectations, but WVU has just done spectacular things, we're going to give WVU this $25 million. Oh my goodness, the building would come down. Whatever they did, they'd have to abide by that original split. They can never change that. There would be a storm unlike anything you've ever seen. (Legislature)

While this interviewee described frogs, this metaphor is usually crabs in a bucket and refers to a tendency towards short-sighted, self-defeating group behavior. It has been used specifically to describe the behavior of underprivileged groups that block the success of community members that want to increase their socio-economic position, though its historic origins go back to Aesop's Fables (Gibbs, 2002). While the interviewee suggests that the frogs-in-a-bucket mentality is something specific to West Virginians the widespread use of this metaphor and historical reference to this type of mentality suggests that this mindset is not unique to the state. It does, however, point to an important element in the political process that has bearing on the development of legislative support, or at least the absence of opposition, necessary to pass legislation such as the Research Trust Fund. The fact that this bill provided some benefit to all

parties, in a way that matched their institutional missions and ability to raise funds, suggests that it was necessary to make sure everyone got something in order to keep the majority from sacrificing their own benefits to prevent the minority from achieving an advantage. In other words, the legislative process acts as a site where plans for resource distribution are subject to political interests. Until all interested parties are at least minimally satisfied with the results of the negotiations, benefits are blocked for all.

The role of institutional competition and the impact it can have on the legislative process was also mentioned by another interviewee who said,

> Concurrent with the introduction of Bucks for Brains there was a piece of legislation, House Bill 3215, which called for the formal separation of the Community and Technical colleges from the colleges and universities. In any traditional legislative year, $50 million going to the universities for research would have been heavily fought by the community colleges. The President of the Senate had deep…connections to the Community and Technical College System…So, in any normal year, the community colleges would have opposed the bill. But, 3215 was introduced. And the community colleges were hesitant to fight Bucks for Brains because if they did, they knew the universities would kill 3215. (Coordinating Board)

While the separation of the two-year colleges from the four-year college in West Virginia had begun in 2001, House Bill 3215 was the final piece of legislation necessary to formally separate the last administratively linked institutions, two of which were part of WVU during the 2008 legislative session. The fact that both pieces of legislation were going through at the same time created a situation where some political compromises were necessary for both bills to succeed.

Discussion

The preceding material explored the question of which actors, socio-economic, and political factors had the greatest impact on the development and adoption of the West Virginia Research Trust Fund. The data examined in this chapter show that the actors identified in the theoretical

framework, the governor and executive branch policy entrepreneurs, are indeed critical to the passage of economic development legislation. Interviewees were unanimous in their assertion that this legislation would not have existed without gubernatorial support. As to why Governor Manchin supported it, there was consensus among the interviewees that he was looking to do something that would have a lasting impact on the state without being dependent upon the Legislature for additional funding in future years. Whether that is because of a personal desire for a legacy or he was looking for something to point to while running for a second term is difficult to say for certain. What does seem clear, though, from the interviews is that the two key policy entrepreneurs, Commerce Secretary Kelly Goes and Higher Education Chancellor Brian Noland, played an important role in convincing Governor Manchin, and others, of the Research Trust Fund's merits. The fact that they brought together both business and higher education interests lent them credibility that they would not have had separately. As to why they supported the legislation, one can infer from the interview data that there was likely a mix of professional interest in increasing funding for research and overall economic development, as well as a belief that West Virginia's higher education institutions could do more for both the economic and cultural benefit of the state.

In terms of political factors, the theoretical framework developed here also posited a role for the legislature and for experts. While Hart's (2008) research found a role for the legislature in the development of economic development policy, the picture in West Virginia appears to be somewhat complicated by the fact that the Research Trust Fund is also higher education policy. This activates a wider group of interested parties that has geographic winners and losers, creating a situation in which higher education policy is not necessarily as widely embraced as economic development policies are. It appears that in this case, the RTF succeeded in the Legislature for

several key reasons. First, it had a strong advocate, Senator Plymale, who introduced the legislation and was able to shepherd it through the process. In this sense he can be viewed as a policy entrepreneur himself, though in a more limited sense. Second, due to the number of interested parties, a certain amount of compromise was needed in order for the legislation to succeed. Third, and related to compromise, it appears that the presence of other higher education bills going through the Legislature, specifically HB 3215 may have had a chilling effect on some likely opponents to the Research Trust Fund. Finally, the fact that some legislators did not really understand what the Research Trust Fund was may have limited opposition as well. Experts, specifically those associated with the National Governors Association, appear to have played a role in the development of the Research Trust Fund, though somewhat far removed. One interviewee mentioned that representatives from West Virginia's Office of the Governor attended a NGA meeting about Kentucky's Bucks for Brains program in December 2001. While the idea may have generated interest at that point, the legislation itself was not developed until six years later under the administration of a different governor. Finally, and perhaps unsurprisingly, a critical socio-economic factor in the passage of this legislation was the availability of funding. Only the existence of a budget surplus in 2008 made the Trust Fund a possibility at all.

While it is difficult to draw broad conclusions from one case study, this examination of the West Virginia Research Trust Fund is able to shed some light into the "black boxes" left unexamined by the research of Hearn et al. (2009) and Hart (2008). While both are able to provide some explanation of the factors that influence the adoption of the policy, neither are able to address the reasons why state officials support them. This case study suggests that a mixture of personal and professional reasons motivate governors and executive branch policy

entrepreneurs. In this case, those motivations appear to coalesce around a desire to create policy that will have a long-term economic and cultural impact on the state of West Virginia. In particular, language around cultural change and the broadening of opportunity was used when describing the rationale for and impact of the Research Trust Fund. The poverty, low educational attainment, and historic reliance on resource extraction to drive the state's economy are all socio-economic factors that likely influenced development of policy aimed at creating a culture of research that fosters economic development.

This research also unpacks the importance of the Legislature in the development and passage of research-based economic development legislation. The legislative process can be very hazardous and without a relatively powerful sponsor it is often difficult for legislation to pass. As pointed out by Slaughter & Rhoades (1996) and others (Bozeman, 2000), economic development policy tends to have broad bipartisan and popular support. Despite the broad support for such policies though, institutional and regional loyalties and the power of the constituencies around them also play an important role in the final shape of economic development policy and the distribution of associated resources. In this case, although WVU accounts for 84 percent of all R&D expenditures at public universities in West Virginia, they only received 70 percent of the RTF funds. Senator Plymale's support was critical to the success of the legislation, however, and it was clear to the involved parties that his loyalty to Marshall had to be considered when deciding upon the division of the funds.

Finally, this research also identifies the importance of the temporal dimension in the policy process. The process around the Research Trust Fund program can be split into three phases: the development phase, the legislative phase, and the implementation phase. Table 3 summarizes the importance of different actors and factors at different phases in the process. The

chapter has focused on the development and legislative phases and discussed the importance of the different actors in the two stages. The influence of the governor, while critical in the development stage, diminishes over time. To an extent the executive policy entrepreneurs continue as proxies for the governor in the legislative phase, thus insuring that (in this case) his influence does not diminish too far.

Table 3: Critical Factors/Actors in the WV RTF Policy Process

Critical Factors/Actors	**Policy Phase**		
	Development	*Legislative*	*Implementation*
Available Funding	High	High	Low
External Example	High	Moderate	Low
Governor	High	Moderate	Low
Executive Policy Entrepreneurs	High	High	Moderate
Legislative Policy Entrepreneurs	Low	High	Moderate
University Leaders	Moderate	Moderate	High
Experts	Low	Low	Low
Donors	Low	Low	High

Funding is, not surprisingly, critical during the development and legislative phases; without money there is no program. While it is not possible to derive general rules from a single example, it is likely that funding is a critical element for nearly every proposed economic development programs. In this specific case having an external example was a very important factor in the development phase (convincing the Governor) and moderately important factors in the legislative phase (convincing some legislators). Policy entrepreneurs in the case of the Research Trust Fund are also moderately important in the implementation due to their oversight roles, but that need not be the case elsewhere.

Worth noting is the total absence of researchers in these phases and the moderate importance of institutional leaders in the development and legislative phases. Although the

presidents of WVU and Marshall accompanied the Governor to Kentucky and advocated for the program during the legislative session, they were not the ones driving the development and adoption of this program. Instead, the executive branch, with support from advocates in the legislature, drove the adoption. While this is not different from what Hart (2008) found in his research, it does speak to the overall power dynamic between the state and universities. Also worth noting is the significant control given to donors in the legislation. Without donor funding, the state funding is inaccessible to the institutions. These dynamics will be explored in greater detail in the next chapter.

CHAPTER 4

INSTITUTIONAL RESPONSES TO THE WEST VIRGINIA RESEARCH TRUST FUND

Having explored the actors and factors that influenced the development and passage of the Research Trust Fund legislation in the previous chapter, this chapter examines the institutional responses to the program after it was created. Although states have developed policies and programs that promote university research as a vehicle for economic development, it is important to evaluate the impact that those policies have on the institutions, as well as the impact those efforts have on the state. Chapter 5 will examine the Research Trust Fund's economic and cultural impact. This chapter focuses on the impact that the program has had on West Virginia's two research universities, Marshall University and West Virginia University. Specifically, it examines the organizational response to the Research Trust Fund and seeks to answer two questions:

1. How have West Virginia's research universities reacted to the creation of Research Trust Fund program and attempted to meet its goals?
2. How has the Research Trust Fund promoted closer connections between West Virginia's research universities and the market?

The institutional reactions to the RTF legislation will be analyzed using organizational theory, specifically a theoretical framework that combines neo-institutional and resource dependency theory. The activities of actors within the two universities that promote closer connections to the market will be analyzed using the theory of academic capitalism. Applying a theoretical framework that explains both the behavior of universities in relationship to other actors in their organizational field and one that explains the behavior of individuals within the institutions

provides a powerful explanatory tool for understanding university reactions to state policies that encourage raising private funds for research and promote the commercialization of research. Applying this theoretical framework also helps clarify how different forms of power operate in and on universities in the organizational field around research universities. This type of analysis is particularly useful as state governments become more involved in funding university research and attempting to position universities and university researchers as contributors to state and regional economic development. This analysis also provides insight into the efficacy of different university strategies in responding to these policies and offers preliminary lessons for states and universities that are considering or engaged in these types of policy changes.

Theory and Methods

Two theoretical frameworks are applied in order to answer the questions about the behavior of universities and university actors identified above. First a combination of neoinstituitonalism and resource dependency theory is utilized in order to analyze the organizational responses of Marshall and WVU. Second, Slaughter & Rhoades' (2004) theory of academic capitalism is used to analyze how the Research Trust Fund has promoted closer connections between West Virginia's research universities and the market.

Organizational Theory

Neoinstitutional theory emphasizes rules, norms and legitimacy and argues that within highly structured organizational fields, rules and norms can constrain innovation and push organizations to emulate one another (DiMaggio & Powell, 1983; Greenwood & Hinings, 1996; Larsen, 2000). DiMaggio and Powell write that, "Strategies that are rational for individual organizations may

not be rational if adopted by large numbers. Yet the very fact that they are normatively sanctioned increases the likelihood of their adoption" (1983, p. 148), arguing that emulating what are perceived as the successful behaviors of other organizations may actually decrease the competitive ability of individual organizations. DiMaggio and Powell identify three forms of isomorphism: coercive, mimetic and normative. In looking at state policy's influence on research universities, the coercive pressure that can be applied by the state plays an important role, but normative and mimetic forces are at work as well and will be discussed in greater depth below. Resource dependency on the other hand focuses more on power relations between organizations and their environment and the need for organizations to locate reliable resource streams and argues that they will differentiate themselves from others and find niches that enable them to secure stable funding (Pfeffer & Salancik, 1978). The theoretical position that combines these two argues that competition for resources is a critical factor in understanding organizational behavior, but that the strategies organizations employ to pursue resources is shaped by environmental and organizational norms and expectations (Huisman et al., 2002; Kraatz & Zajac, 1996; Van Vught, 1996).

In order to better understand the critical resources and norms that have an influence on West Virginia University and Marshall University, the concept of organizational fields is applied. In this study, the two universities operate in distinct but overlapping organizational fields. Rather than focusing on a narrow definition of an organizational field as only consisting of "disparate organizations in the same line of business" (DiMaggio & Powell, 1983, p. 148), I refer to Scott's somewhat broader definition which defines an organizational field as,

> a group of organizations producing similar products or services (much like the concept of population as employed by the ecologists or industry group as employed by economists) but include as well their critical exchange partners, sources of funding,

> regulatory groups, professional or trade associations, and other sources of normative or cognitive influence. (1991, p. 173)

Due to the fact that the Research Trust Fund provides universities with state funding only when they secure a private match, this definition of an organizational field has greater explanatory power. The organizational field for each institution includes several state actors: the state legislature, the Office of the Governor, and the state's higher education coordinating board (WVHEPC). These three state actors have formal influence over university access to resources and expectations about how they should behave. They can use resources to both censure and reward the universities. Although unexplored by DiMaggio and Powell, private donors control critical resources in the organizational fields of the two institutions. Peer institutions also play a role in these organizational fields and exert a mimetic influence. Although Marshall and WVU do not consider one another peers for planning and comparison purposes, due to the small size of the state and close relations between higher education institutions, they are part of one another's organizational fields as well. University faculty also feature in both organizational fields because of their role as both the actors producing the research the RTF policy attempts to create and the role that their norms and values play in innovation and commercialization.

Combining these two theories into one analytic framework enables us to investigate the external power relations that put financial and political pressure on the two universities as well as the influence that norms and expectations have over them. Neoinstitutional theory tells us that norms and values within an organizational field shape organizational behavior in a way that leads to isomorphism. This suggests that the universities will imitate successful peers, even if that imitation is not really rational and puts them at a competitive disadvantage. Resource dependency theory, on the other hand, emphasizes the importance of power dynamics and the resource control in shaping an organizational field and the behavior of organizations within it.

When combined, these frameworks suggest that the behavior of Marshall and WVU will be influenced by both the expectations that key actors in their organizational field have of them and the authority that they have over them. It also suggests that options for organizational change will differ between the two institutions based upon their relative power positions in their organizational fields and how expectations of them differ.

Academic Capitalism

While the combination of neoinstitutional theory and resource dependency is useful for examining the behavior of organizations within a field, Slaughter and Rhoades' (2004) theory of academic capitalism provides a useful tool for critically analyzing the activities that take place within the institutions. The theory of academic capitalism describes the changes to the relationship between higher education institutions and the larger society in the context of the developing global knowledge economy and analyzes how groups of actors within higher education institutions are, "using a variety of state resources to create new circuits of knowledge that link higher education institutions to the new economy" (2004, p. 1). The new economy, also referred to as the knowledge or information economy, is built upon the idea that knowledge is a, "critical raw material to be mined and extracted from any unprotected site…then sold in the marketplace for a profit" (2004, p. 4). Academic capitalism identifies a number of ways that universities attempt to facilitate the transformation of research into capital including strengthened management, the creation of interstitial organizations that occupy critical intersections between universities and the market, partnering with intermediating organizations at local, state and national levels that advocate for the expansion of STEM research and the integration of universities into regional economies, and the development of a reward and prestige

system for university researchers based upon the commercial viability of research. While the theory of academic capitalism makes clear that the level of penetration varies by institution and department, it suggests a number of indicators that can be investigated to evaluate how far the university, or parts of it, has moved towards embracing it.

Methodology

In order to understand the organizational responses to the Research Trust Fund at Marshall and WVU, several pieces of data were collected. First, the strategic plans for the use of RTF monies that the two institutions developed were examined. These plans were required by the legislation and serve as indicators to both internal and external stakeholders of the institutions general values, as well as their specific institutional goals and how they planned to use these RTF monies to achieve them. Second, these plans were compared with institutional strategic plans developed by Marshall and WVU pre and post the passage of SB 287 in 2008 in order to contextualize them and see how the RTF strategies fit within the strategic direction the universities had already set. This provides both a better historical understanding of how the two institutions wanted to develop and how they have shifted their orientations over time. Third, the private donations received by the two institutions were categorized by type of expenditure to see how successful the institutions were in achieving the goals they identified in their strategic plans. Information about the donations and donors was also gathered from regional newspapers and institutional news archives. Finally, interviews were conducted with individuals in the West Virginia Legislature, the Office of the Governor and the state coordinating board that were involved with the development of the program and evaluation of institutional progress towards meeting the goals outlined in their strategic plans.

In order to understand the extent to which the RTF monies have been used to promote closer connections to the market several pieces of data were analyzed. First, institutional strategic plans for the Research Trust Fund program were analyzed through the lens of academic capitalism. In particular, plans to distribute funds towards research areas with high commercialization potential, the creation of interstitial organizations and strengthened academic management were identified. Second, all private donations to the two institutions were categorized by source and expenditure category to see how they were distributed among stakeholder groups. This information was collected from the annual reports that Marshall and WVU are required to submit to the West Virginia Higher Education Policy Commission. Third, publically available salary data on all new hires made with RTF monies was examined to see if their compensation differs significantly from their peers. Academic capitalism would suggest that greater rewards go to faculty researchers who are able to attract outside funding, especially from the private sector, and whose work leads to increased revenue for the institutions. The CVs of new faculty were also examined for market-related activities such as patenting, licensing and involvement in start-up companies.

The Organizational Fields of the West Virginia Research Trust Fund

In order to better identify the norms, values and resources that impact the reactions of Marshall and WVU to the WV Research Trust Fund, a closer look at their organizational fields is required. By taking Scott's definition of an organizational field, "a group of organizations…their critical exchange partners, sources of funding, regulatory groups…and other sources of normative or cognitive influence," (1991, p. 173) and applying it specifically to the RTF we can define the key actors in WVU and Marshall's organizational fields as their peer institutions, the West Virginia

Legislature, the Governor's Office, the state's higher education coordinating board (WVHEPC) and major donors. The norms and values of groups within the universities, specifically executive leadership and the faculty, will also be considered.

DiMaggio and Powell's (1983) well-known work on institutional isomorphism in organizational fields argues that as organizational fields become more highly structured, institutions begin to resemble each other more and more, even as a closer resemblance becomes irrational from a competitive perspective. They observe, though, that, "organizations compete not just for resources and customers, but for political power and institutional legitimacy, for social as well as economic fitness" (1983, p. 50). They further refine their argument by identifying three analytically, though not always empirically, distinct types of isomorphism: coercive, mimetic and normative. Coercive isomorphism occurs when an organization is under external pressure to conform to expectations from another organization upon which they are dependent, mimetic isomorphism is a reaction to uncertainty in the organizational field, and normative isomorphism occurs as a result of group struggles for professionalization. Organizational changes at WVU and Marshall as a result of the Research Trust Fund legislation exhibit elements of all three types of isomorphism. In this case, faculty have the ability to drive normative isomorphism as they struggle to maintain or expand professional control, while state government actors and donors have the ability to exert coercive pressure because of their regulatory control and provision of funding. Meanwhile, the behavior of peer institutions, especially out-of-state peers with very high research Carnegie designations that WVU would like to more closely resemble, encourages mimetic isomorphism for West Virginia's research universities as they seek to identify strategies for change as a result of the uncertainty created by the Research Trust Fund.

Like DiMaggio & Powell, Pfeffer & Salancik (1978), also argue that the behavior of organizations is shaped by the context in which they are embedded. They argue, however that the relationships between organizations are dictated primarily by power dynamics and the control of critical resources. The more important a resource is to institutional survival, the more influence the organization that controls it has over the focal organization. In the case of the Research Trust Fund and West Virginia's two research universities, different critical resources are controlled by donors, the state and peers. Donors are especially important because they control both their own funds and the universities' ability to draw down the public funds that have been allocated. The state coordinating board has some power because it develops and oversees the rules that determine whether a private donation meets the standards defined by the legislation and may therefore be used to match the state money. The Legislature has power in this situation because it controls the RTF funding and is the gatekeeper for any additional funds that may be allocated in future rounds. The political nature of this process means that the institutions have some influence over state actors as well. If the program is a success, that success reflects upon the state actors that developed and funded the program, just as a failure reflects poorly upon governmental stewardship of state money and may impact future election prospects. Peer institutions have power in this situation as well because Marshall and WVU are in competition with them, and each other, for top-tier researchers and students, two groups that the RTF is designed to attract. In the implementation phase of the RTF program where institutions are seeking private match, donors are especially critical, whereas during the development of the legislation and the development of any future legislation, state actors are the most critical.

The next section outlines the power that these key actors, the Legislature, the Office of the Governor, the higher education coordinating board, donors, peers and faculty, have over

funding and norms at the two institutions. After outlining their power and positions within the organizational fields of WVU and Marshall, their influences on organizational reaction to the legislation at the two universities will be examined. This will be supported by an examination of strategic plans, changes to strategic plans, funds raised, and institutional progress in achieving their goals.

The West Virginia Legislature in the Organizational Field

The West Virginia Legislature has significant influence in the organizational fields for both Marshall and WVU due to their control of state resources and their ability to exert coercive power to set norms and expectations. The Legislature controls all of the state appropriations for higher education. Higher education funding in West Virginia is not done by formula, as it is in some states, but is based upon historical funding, special requests and political influence. As discussed in the previous chapter, the Legislature also functions as a gatekeeper for legislation and the legislative process is one in which several hurdles must be overcome in order for proposed legislation to become law. This process itself is a form of resource control and the fact that institutions and their allies must negotiate there for funding highlights the influence of the Legislature in resource control. In addition to control of state resources, the Legislature also has the coercive power to establish formal expectations for Marshall and WVU and codify it in state law. An example of this is West Virginia Senate Bill 595, passed in 2008, that created *Vision 2020: An Education Blueprint for Two Thousand Twenty*. This plan identifies state goals for higher education and designates Marshall, WVU and the West Virginia School of Osteopathic Medicine as research institutions and all other four-year institutions as state colleges. This is in contrast to the Marshall's Carnegie Classification, which is a Master's-Large institution. This

power to classify is particularly relevant in the case of the Research Trust Fund because it places the two institutions in a similar organizational niche (research universities), despite their significant differences in capacity to fulfill that mission. While it presents Marshall with the opportunity to access research funds unavailable to other institutions, it also sets it in comparison to WVU, a situation where they have a significant competitive disadvantage.

The political allegiances of individuals in the Legislature are also a factor in the Legislature's power in Marshall and WVU's organizational fields. While the Senate Education Chair has an important influence over educational policy that impacts all higher education institutions, the fact that Senator Plymale is the chair is particularly important for Marshall because he represents the district where it is located. Several interviewees mentioned his importance as an advocate for the Research Trust Fund legislation in general and for the Marshall's funding in the program specifically. Senator Plymale was also lead sponsor on SB 595 that created *Vision 2020*. Other members of the Legislature have important ties to one or both universities as well, for example the Senate Finance Chair who also represents Morgantown, WV where WVU is located.

The coercive and fiscal power of the Legislature is somewhat tempered, however, by the fact that the universities also have resources which legislators may want. These may come in the form of jobs and votes in their districts, football tickets, or accomplishments that district representatives can tout. This reinforces the importance of the Legislature as a locus for competition over resources as well as negotiation over expectations and norms. Specifically regarding the RTF program, however, the Legislature is critical to securing funding for any future rounds and has the authority to change the terms of the program, should they choose to do so.

The Office of the Governor in the Organizational Field

As discussed in the previous chapter, Governor Manchin played a critical role in advocating for the creation of the Research Trust Fund by identifying resources and setting expectations, both for the universities and for the Legislature. By including the program in his 2008 State of the State Address, he signaled to the Legislature, the universities, and the voting public that this was a program that he supported. The language he used to describe the program, however, revolved around job creation, indicating what he hopes the program will achieve, though he has no power to control that. In addition to the bully pulpit and significant influence in the Legislature, the governor has the power to line item veto anything in the Legislature's budget bill. This gives the person in that office significant resource control over this type of program and the two research universities. The political capital necessary to use the line item veto, like other forms of capital, is limited however. While the governor's position in the organizational field is significant, in this case, his power was deployed most heavily during the program's development phase and to a lesser extent during the legislative phase. Although there is a finite amount of coercive power the governor can exert on the institutions in public, the person holding the position can certainly use his or her power to influence the way the universities are viewed, which in turn can have an impact on both institutional legitimacy and resources. In this case, the governor's influence in the organizational field, both coercive and fiscal, was employed in the development stage by directing $50 million to the Research Trust Fund and setting the expectation that the two institutions would conduct "world-class research and development and attract venture capital, which will eventually lead to jobs in emerging high-tech, high-wage industries" (Manchin, 2008).

The Coordinating Board in the Organizational Field

The West Virginia Higher Education Policy Commission (HEPC) is a coordinating board rather than a governing board, and as such, has limited direct authority over the state's research universities in most areas. Their statutory authority includes approving changes to presidential pay, approving increases to tuition over five percent and approving building projects that cost more than $1 million. In regards to the Research Trust Fund, their influence is larger and impacts both expectations and resources. The HEPC created the rules governing the program and has sole authority to approve private donations. They do not have any regulatory authority over institutional expenditures from the Trust Fund once they have been approved, however. HEPC also collects annual reports from the institutions on their progress towards meeting RTF goals, and reports them to the Legislature. In general, the agency serves as an intermediate layer of authority between the legislative and executive branches of state government, and the universities. Also, as the agency that distributes state research dollars, they have some control over the flow of resources to the universities as well. Most of the upper level administrators in the agency have experience with research universities, either through their doctoral training or previous employment at a higher education institution and are generally supportive of expanding research in West Virginia and reinforce that expectation through publications which highlight the research functions of the state's higher education institutions and researchers.

Donors in the Organizational Field

Donors exert significant resource control in the organizational field of the Research Trust Fund because they control both their own funds and as well as university access to the $50 million in state funds available to them. Their expectations of the two universities are also important, if less

visible. In the case of the Research Trust Fund, most donors have personal, professional or familial connections to the institutions and are often alumni or longtime residents of the area. Although the legislature set six broad research areas and two main categories of expenditure (salaries for new professors and research support staff including student scholarships or basic infrastructure directly related to the six research areas), donors have the ability to decide where exactly they want their donations to go. Those decisions are shaped by their personal values and their perceptions of the institutions, values and perceptions that may or may not align with those of the faculty or of university leadership. This positions donors to act as critical gatekeepers for RTF monies, which in turn impacts institutional legitimacy in the eyes of the Legislature and other actors in the organizational field. The inability to raise private funds hurts the legitimacy of the RTF program, as well as the two institutions. This in turn may reflect poorly on the state officials that advocated for it. Although they had little to no role in its creation, this group's role in implementation is critical.

Peer Institutions in the Organizational Field

Peer institutions, and institutional perceptions of them, exert a mimetic force in the organizational field for Marshall and WVU, though it appears to operate differently on the two institutions. As discussed previously, Marshall and WVU are different types of institutions and would not be considered peers of one another if they were not located in the same state. Though both are considered research institutions by the West Virginia Legislature, Marshall is not a research university according to the Carnegie Foundation. Prestige and ranking are important to higher education institutions' ability to attract faculty and students. The factors that are used to assess faculty and student quality, such as publications and external funding for faculty and

standardized test scores and high school grade point average for students in turn impact how institutions are ranked by *U.S. News and World Report* and others. Institutions, especially those

Table 4: R&D Expenditures at WVU and Marshall Peer Institutions

WVU Peer Institutions	R&D Exp 2010 (thousands)	Marshall Peer Institutions	R&D Exp 2010 (thousands)
West Virginia University	*154,936*	*Marshall University*	*24,501*
University of Connecticut	237,908	University of South Alabama	35,500
University of Florida	681,548	University of Arkansas at Little Rock	11,007
University of Georgia	230,803	University of Arkansas Main Campus	113,909
University of Hawaii at Manoa	303,085	University of Idaho	87,207
University of Iowa	444,034	Southern Illinois University Edwardsville	31,781
University of Kentucky	359,944	Morehead State University	2,145
University of Louisville	189,090	Oakland University	12,856
University of Massachusetts-Amherst	169,143	Missouri State University	7,770
University of Maryland-College Park	451,415	University of Missouri-Kansas City	30,163
University of Missouri-Columbia	238,500	University of Mississippi Main Campus	110,020
North Carolina State University - Raleigh	360,795	East Carolina University	23,995
University of New Mexico-Main Campus	211,771	University of North Carolina at Greensboro	22,436
University of Nevada-Reno	95,423	Western Carolina University	2,376
SUNY at Buffalo	349,670	University of North Dakota	76,560
University of Tennessee	291,787	Wright State University-Main Campus	48,575
Texas A&M University	689,624	West Chester University of Pennsylvania	3,052
University of Utah	379,200	University of South Dakota	30,616
Virginia Commonwealth University	197,709	East Tennessee State University	9,869
Virginia Tech	398,169	Eastern Washington University	3,266
University of Vermont	129,856	University of Wyoming	55,319
Average of WVU Peers	**312,590**	**Average of Marshall Peers**	**35,921**

Source: WVHEPC, 2009; NSF, 2012

that are already in the upper echelons, are engaged in an ongoing competition with one another for prestige and the students, faculty and funding that help generate it.

As Table 4 illustrates, WVU and Marshall are situated differently in relation to their peer institutions. For WVU, they are third from the bottom in terms of R&D expenditures and aspire to be a Carnegie Research Very High ranking, a distinction which all but two of their peers, the University of Nevada – Reno and the University of Vermont, have. Over half of their incoming freshmen each year come from out of state, which also pushes a more outward looking mindset. Marshall, meanwhile, is at the median among their peers for R&D expenditures and has no explicit reference to their peers in the mission statement, referring instead to how they serve "the state and the region" (Marshall University Board of Governors, 2004b). A list of the peer institutions for Marshall and WVU is included below. In terms of resource, peer institutions may be competition for faculty, students or federal research funding, but in general their influence is largely mimetic and is stronger for WVU than for Marshall.

Faculty in the Organizational Field

While the academic faculty at Marshall and WVU are part of the institutions themselves, identifying them as distinct force in the organizational field is useful for two reasons. First, they are the group that the Research Trust Fund legislation is primarily designed to act upon. Though they are not the only group involved in the success or failure of the Research Trust Fund program, they are the labor force that produces the knowledge that may lead to patents, start-ups, licensure income, etc. and attracting them is the main thrust of the legislation. Second, the norms of the academic labor force are a powerful isomorphic factor at the universities. Although I was unable to speak to faculty at Marshall and WVU, research on faculty values tells us that the types

of norms that are embodied and exerted by the faculty are by no means monolithic. Recent research by Johnson (2012) has found that two sets of norms, which he dubs traditionalist and commercialist, exist simultaneously in university departments. Traditionalist faculty maintain a value system wherein "original contributions to knowledge [are] the most esteemed scientific pursuit (Cole and Cole 1973; Merton 1973; Zuckerman 1977; Hermanowicz 1998)" (Johnson, 2012, p. 74). This value system has been in place for decades (Merton, 1973) and is still strong, despite the development of a commercialist value system which has been emerging since the 1980s. The commercialist values, rather than setting original contributions to knowledge as the pinnacle of achievement, "reconstruct the goals of science to reflect fidelity to societal rather than professional problems" (Johnson, 2012, p. 106). These opposing moral orders, one oriented towards scientific peers and new knowledge, the other orientated towards the broader society and commercialization, exist simultaneously within the departments that he examined. The fact that even within these departments, located at some of the most prestigious and commercially oriented universities in the country, a traditionalist value system remains strong suggests that the norms of the faculty play a powerful role in the extent to which commercialization takes place. At institutions such as WVU and Marshall with less well-established commercialist cultures, traditionalist norms may exert an important force in the organizational field, despite the will of the Governor and the Legislature. Johnson writes that,

> Commercialization is sanctioned by law and championed by proselytizers, but it is not a shared presumption in the collective consciousness of the academic profession. Nevertheless, the sociopolitical legitimacy of commercialization – bolstered by the combined weight of legal mandate, corporate and university interests, and economic uncertainty – renders it resistant to cultural contestation. (2012, p. 271)

This quote draws attention to the opposing norms and values that can be activated by a policy that promotes the commercialization of university research, and the implementation challenges that may arise, despite its promotion by entities with power over legitimacy and resources.

The Institutional Impact of the Research Trust Fund

Having mapped out the key groups in the organizational field around the Research Trust Fund, the next step is to look at how the influence of these actors can be seen in the institutional reaction to the program at WVU and Marshall. Several pieces of information will be used to track the organizational responses to the RTF at Marshall and WVU. First, institutional strategic plans developed before the Research Trust Fund was established and those developed during the period 2008 to 2012 will be examined. These documents signal to internal and external stakeholders the values and goals of the institutions. Second, the strategic plans developed for the Research Trust Fund program itself will be examined. Third, institutional progress towards meeting the goals outlined in the strategic plans will be examined, specifically the acquisition of private funds and the types of endowments that were created with them. Any changes that were made to institutional RTF plans will also be examined. Private fundraising for the Research Trust Fund is also compared with historical research funding to see how new donations fit within existing funding steams. This document analysis is supplemented with information acquired from interviews and news articles about the Research Trust Fund and organizational changes at Marshall and WVU related to the RTF program.

The Research Trust Fund at West Virginia University

West Virginia University is the state's flagship institution and the only university with major research capacity in the state. In 2010 their research and development expenditures accounted for 79.5 percent of all (public and private) higher education research and development (R&D) expenditures in West Virginia, a figure that has fluctuated no more than 1.3 percent up or down since 2004 (NSF, 2012). Nationally, they ranked 116 in R&D expenditures in 2010, a drop from their highest rank of 112 in 2007 and 2008, though their expenditures have increased steadily from $85 million in 2002 to $155 million in 2010.

According to several interviewees, institutional commitment to research has been increasing at WVU for about a decade. The strategic plan developed by WVU in 2005 focused on five goals: attracting high-quality students, recruiting and retaining high-quality faculty committed to the land-grant mission, enhancing the educational environment for student learning, promoting discovery and exchanging knowledge and ideas, and improving the health, economy, and quality of life in West Virginia (West Virginia University, 2005). In general, these goals are oriented towards WVU's role within the state. The strategic plan developed in 2011, *WVU2020*, also has five goals, but focuses more explicitly on research and is increasingly oriented towards comparison with national peers. The plan also lists three aspirations: attain and maintain the highest Carnegie research ranking by 2020 (Research University – Very High Research Activity), double the number of nationally ranked programs, and have graduates that are "among the nation's leaders in career readiness" (West Virginia University, 2011b). How these goals will be measured or achieved is not discussed in the plan. The Carnegie classification system places doctoral granting institutions into three research tiers based upon both the aggregate and per-capita research activity as measured by R&D expenditures, number of science

and engineering research staff and doctoral conferrals. Based on these measures, Carnegie places 108 doctoral-granting institutions in the very high research activity category and 98 in the high research activity category. Annual science and engineering R&D expenditures for the universities in the very high category range from $2.4 million to $1.67 billion, with a mean of $329 million and a median of $255 million, whereas expenditures in the high research activity category ranges from $897,000 per year to $265 million, with a mean of $50.9 million and a median of $36.1 million (Carnegie Foundation for the Advancement of Teaching, 2011). West Virginia University's R&D expenditures put it close to the boundary between the two categories and considering that eighteen of their twenty peer institutions have the highest Carnegie classification for research their goal is not surprising and fits with what neo-institutional theory would suggest. Interviewees also stated that Jim Clements, who was selected as President of WVU in June 2009, has also pushed to make research a more important part of the institution's mission. WVU's ability to double their nationally ranked programs is much less clear due to the fact that they had no ranked doctoral programs in 2005-06 (Committee to Assess Research-Doctorate Programs, 2011). How one would measure the college readiness of graduates is also unclear. Although there is a lack of clarity about how to measure and achieve their goals, this shift in orientation points towards increasing awareness of peer institutions and a shift in direction from looking inward to how they serve the state, to looking outward at how they can increase institutional prestige in relation to flagship institutions in other states.

When WVU developed their plan for the Research Trust Fund (RTF), they decided to focus their efforts on four of the six categories identified in the legislation: 1) energy and environmental science, 2) nanotechnology and material science, 3) biological, biotechnological and biomedical sciences, and 4) biometrics, security, sensing and related identification

technologies. All four of these areas are ones in which WVU has established research programs supported by external research funds. Their plan for the use of RTF monies was to use up to $17.5 million in the biological sciences, up to $15 million on energy and environmental science, up to $10.5 million in nanotechnology, and up to $8 million in biometrics (West Virginia Higher Education Policy Commission, 2011). Those goals reflect the external support WVU has in those areas with the biomedical sciences receiving the largest external support ($57.4 million in FY11), followed by energy and the environment ($30.9 million), nanotechnology and material science ($7.4 million), and biometrics ($5.3 million) (WVU, 2011). The plans were developed by a committee of faculty, administrators and members of the WVU Foundation after consideration of existing research initiatives, the potential impact of these funds, and the opportunity to raise matching funds in the different research areas. When asked about WVU's research plan, one interviewee said,

> I believe that WVU had a pretty good plan, particularly since they were set up to take money from anybody and everybody that was related to STEM. Now they had some particular areas that they wanted to grow, but within those areas, you could fund any kind of endowment you wanted. It could be for student scholarships, it could be for hiring faculty, it could be for anything that was allowed under the statute. (Coordinating Board)

What the plans for expenditure and the quote above point to is a plan that was designed to be broad enough to capture funds from donors interested in a variety of different aspects of the university or university research. The plans for fund raising were also aligned with existing research strengths and funding levels and designed to expand them.

Between March, 2008 and January, 2012 the West Virginia University Foundation received 1210 qualified donations and pledges totaling $35 million, thus completely matching the share of the RTF monies allocated to them by the Legislature within the timeframe identified in the original legislation. These funds have been put into 86 separate endowments organized

into five generic types of gifts: 12 chairs or professorships, 14 undergraduate research scholarships, 15 graduate fellowships, 43 broad-based research support funds, and two library endowments (WVHEPC, 2012). Table 5 shows the funds raised over time at WVU and at Marshall (West Virginia Higher Education Policy Commission, 2011; WVHEPC, 2012c).

Table 5: Private Gifts & Pledges to Match WV Research Trust Fund

By Date:	*WVU - $35m available*	*MU - $15m available*	*Total - $50m available*
12/14/09	$3,489,233	$742,100	$4,231,333
11/30/10	$8,031,084	$742,100	$8,773,184
11/1/11	$21,866,264	$8,936,734	$30,802,998
6/30/12	$35,000,000	$9,192,244	$44,192,244

It is clear from the table that both institutions got off to a slow start during their first two years. Part of the reason for that was the recession. An interviewee from the Legislature said that, "When it came time to consider extending the time period, as far as I can remember, there wasn't a single person who had any problem with that at all, you know. They said things like, well you know it's really been a tough economy, it's not a fair test for the universities. We need to give them a little more time." The impact of the recession on fundraising was mentioned by three other interviewees as well and sheds some light on the low fundraising in the first two years and the Legislature's decision to extend the deadline by two years. Another reason for difficulties in the first two years that was mentioned was the existence of administrative challenges that impacted fund raising. An interviewee at the coordinating board observed that,

> When this legislation was passed our economy was booming, we were in a very different period then we find ourselves presently. So the discussions around raising $50 million and endowed chairs focused upon research was something that people were extremely excited about and the initial thought was that it would not take the full five years to raise these funds, we'd raise these funds in a year and a half and we'd be back for another round…Within six months, the wheels fell off; WVU scandal regarding degree issues came to fruition, they had a change in administration, an interim president, and then another two years before President Jim Clements came into place. So, administrative challenges there, some administrative challenges related to personality at Marshall related to the president that were not there when the bill passed.

The scandal regarding degree issues that the interviewee refers to involved Heather Bresch, daughter of Governor Joe Manchin and friend of then WVU President Mike Garrison. Independent investigators found that Ms. Bresch had not earned the MBA she was awarded, the degree was eventually rescinded and President Garrison, along with several others in his leadership team, resigned as a result (Associated Press, 2012). Issues about President Kopp's personality and the problems with fundraising plans were mentioned by three other interviewees as well and will be discussed in the next section.

After President Garrison was fired and a search had been conducted, WVU hired James Clements as president in 2009. Changes were made to their RTF plan in December 2010. The three changes that they made were to add forensic science as an area of research under biometrics, to add a library endowment that supports the acquisition of research materials for the four areas in the original plan, and to remove the language limiting the maximum donations they could receive in one of the four research areas to $17.5 million, thus, "allowing WVU to maximize private investment regardless of focus area" (WVHEPC, 2012) and enabling them to concentrate funds in whichever of their four identified research area is of the greatest interest to the donors.

Figures 4 and 5 summarize the funding levels of the endowments created at WVU with the Research Trust Fund. Figure 4 illustrates how the RTF endowments are distributed by type. The largest endowment category is research support (46 percent), followed by endowed chairs and professorships (28 percent) and graduate student support (21 percent). Figure 5 illustrates how the RTF donations are distributed by college. The College of Engineering received half of the total funding pledged or gifted to WVU, followed by the School of Medicine with 27 percent.

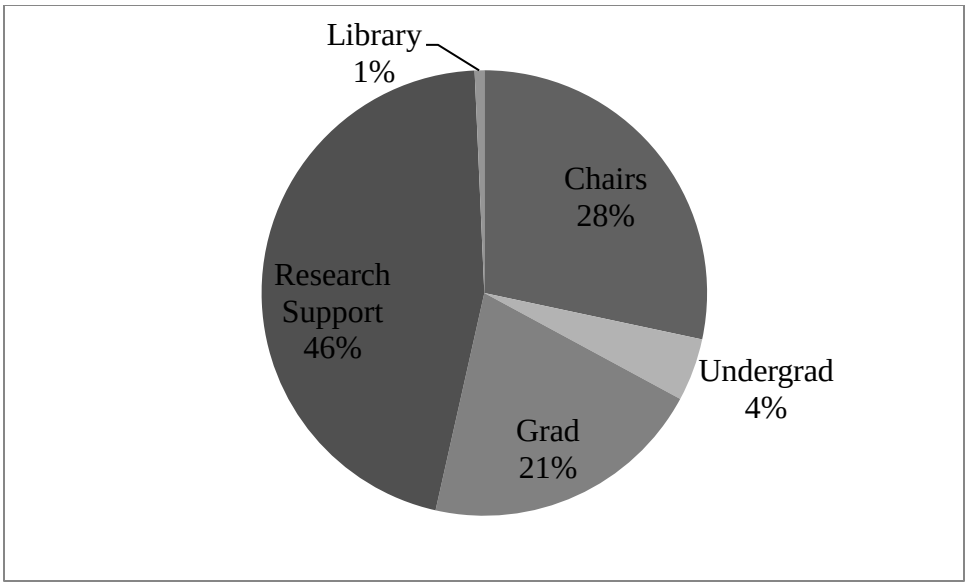


Figure 4: RTF Funding by Endowment Type at WVU

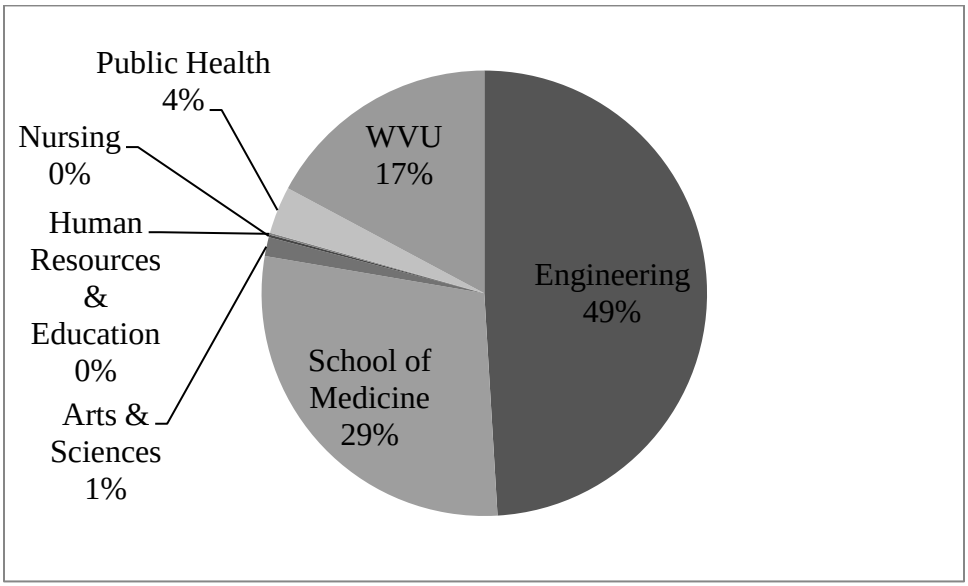


Figure 5: RTF Funding by Recipient College at WVU

The 17 percent allocated to WVU as a whole came in the form of a $5 million gift to provide support for talented graduate students in any of the four research areas identified by the university in the RTF plans.

Table 6 lists all major (over $200,000) private donations to WVU that have been matched with state funds. The two largest endowments were created by gifts from individuals with a

Table 6: Major Donations to RTF Research Endowments at WVU

Research Endowment	Purpose	Donations as of 6/30/12	Locus
Benjamin M. Statler College of Engineering	Research support	$10,000,000	College of Engineering and Mineral Resources
WVU Ruby Scholars Graduate Fellowship Program	Graduate scholarships	$5,000,000	WVU
Christopher Cline Chair in Orthopedic Surgery	Chair	$2,000,000	School of Medicine
Robert E. Murray Chair of Mining Engineering	Chair	$1,000,000	College of Engineering and Mineral Resources
Quad/Graphics Research Chair in Internal Medicine	Chair	$1,000,000	School of Medicine
William J. Maier, Jr. Chair of Research	Chair	$1,000,000	School of Medicine
Stuart M. and Joyce N. Robbins Distinguished Professorship in Epidemiology	Chair	$1,000,000	School of Public Health
George B. Bennett CEMR Research Opportunity Endowment	Research Support	$1,000,000	College of Engineering and Mineral Resources
Benjamin M. Statler College of Engineering	Undergraduate scholarships	$1,000,000	College of Engineering and Mineral Resources
John T. and June R. Chambers Chair of Oncology Research	Chair	$750,000	School of Medicine
Alexander Bland Osborn Professorship in Hematological Malignancies Research	Chair	$630,000	School of Medicine
Mike Ross Family Pediatric Diabetes Research Endowment	Research Support	$400,000	School of Medicine
WVU Hospitals Evidence Based Practice Research Professorship in Nursing	Chair	$350,000	School of Medicine
Branson-Maddrell Endowed Professorship of Orthodontics	Chair	$350,000	School of Medicine
George M. & Mary Freda Vance Medical Scholarship-Fellowship	Graduate Fellowship (post-doc)	$350,000	School of Medicine
James A. & Ruby Romano Department of Civil and Environmental Engineering Endowment	Research Support	$350,000	College of Engineering and Mineral Resources
Norma Mae Huggins Cancer Research Endowment	Research Support	$307,000	School of Medicine
The James H. Walker, MD Chair in Pediatric Cardiology	Chair	$300,000	School of Medicine
Verizon WV Fund for Biometrics	Research Support	$250,000	College of Arts & Sciences
Oleg D. and Valentina P. Jefimenko Library Resources Fund	Library	$200,000	Library

history of giving to West Virginia University. The $10 million endowment to support research at the College of Engineering came from Benjamin M. Statler (class of 1973) as part of a $34 million gift to the university that also included $1 million for undergraduate engineering scholarships. The College of Engineering and Mineral Resources was renamed the Benjamin M. Statler College of Engineering and Mineral Resources as a result of that gift (WVU Today, 2012). The second largest gift was from the Hazel Ruby McQuain Charitable Trust and was used to endow graduate scholarships. According to WVU, "The retired president of Ruby Enterprises, Inc., Mrs. McQuain engaged in philanthropic endeavors of benefit to the University and local organizations for more than 20 years, including an $8 million gift toward construction of Ruby Memorial Hospital, which was named after her late husband, J.W. Ruby" (WVU Today, 2011).Of the next eleven large donations, nine are to fund chairs or professorships, eight of which are in the fields of medicine and health science.

WVU's original plan for the Research Trust Fund was to use up to $17.5 million in the biological sciences, up to $15 million on energy and environmental science, up to $10.5 million in nanotechnology, and up to $8 million in biometrics. This presents a combined fundraising target of $51 million, even though only $35 million in state funding was actually available to them through the program. WVU acknowledges that in their plan by stating, "The total funding exceeded the $35 million from the Research Trust Fund. Recognizing that private donations will reflect the interest of the donors, no research area may receive more than $17.5 million in private donations within the first two years" (WVHEPC, 2009, p. 25). This suggests that from the beginning, the plan at WVU was to ensure that no single research area would receive more than half of the available funding, though they changed this in 2010. Within each of their four target areas, a number of specific goals were identified. Within the area of energy and environmental

science, the institution's plans focused on their Advanced Energy Initiative (AEI), with the plan of hiring four administrators (an AEI Director at $225,000/year and three associate scientific directors at $114,000/year each) in 2009, investing in research infrastructure by late 2010 ($330,000) and developing plans to recruit six tenure track and four research faculty. In the area of nanotechnology and materials science, their plan was to build on their existing NSF-funded WVNano Initiative. They hoped to move the project towards status as an interdisciplinary research center and outlined specific plans to hire a permanent scientific director ($130,000/year plus $90,000/year for administrative support), invest $200,000 in shared facilities, fund five graduate student fellowships and ten undergraduate STEM scholarships, provide salary supplements to increase the salaries of endowed professors, and provide $100,000 in "mission support" (2009, p. 28). Plans for biological, biotechnological and biomedical sciences focused around building capacity at the Health Sciences Center (HSC) by funding supplements that raised the salaries for 12 endowed faculty positions, investing in core facilities and supporting students, postdoctoral fellows and research staff with up to $9 million in an endowment which was expected to generate $360,000 annually. The plan for the final research area, biometrics, focused on bringing in qualified personnel with a goal of three endowments intended to provide supplementary research and discretionary funds for endowed chair supplement (one for $100,000/year and two for $50,000), three postdoctoral fellowships ($90,000/year each), five graduate student fellowships ($30,000/year each) and ten undergraduate fellowships (at $2,000/year each).

If these funding goals had been met, WVU's RTF monies would have been used to support, in whole or in part, five director or associate director positions, at least 25 new faculty positions, at least 13 graduate students and at least 20 undergraduates, in addition to investments

in infrastructure to support research. This plan presents a vision for the university that is focused on developing stronger human capital, largely through hiring and supporting faculty and students and to a lesser extent on strengthening executive management through hiring highly paid administrators in two of the four research areas. As it turns out, they have been able to create endowments which are intended to fund 12 chairs or professorships, 14 undergraduate research scholarships, 15 graduate fellowships and two library endowments, in addition to the 43 endowments that are designated to provide on-going research support to different departments. The endowments that have been created with the funds raised do not entirely match up with the vision outlined in WVU's original plan, but the difference is more of degrees then of kind. Similar to the plan, the majority of the funds were raised in engineering and medicine, though engineering ended up receiving more. Biometrics only received one private donation, which after public match will create an endowment of $500,000. Like biometrics, nanotechnology received only $100,000 in private donation which will go to an endowment for research support in nanobiotechnology. Among the major gifts, only two support student scholarships, while the remainder, including the library endowment, provide support for research, either through direct funding or support for faculty positions.

While the actual endowments created differ from those outlined by WVU, the influence that donors would have on the process and the need for flexibility was articulated in their plan from the beginning. The work of building support in the Legislature and the Governor's Office had already been taken care of with the help of policy entrepreneurs from those two groups. In the implementation phase which consists of both plan development and fundraising, WVU took a broad approach that supported research across the institution and was flexible enough to appeal to donors with a wide variety of interests. The plan for the Research Trust Fund also dovetails

with the institutional master plan, *Vision2020*, and its target of reaching Carnegie's highest research classification. The result of this effort was that WVU was able to raise $35 million in private funds in less than four years, a shorter time period than was outlined in the original legislation and three years more quickly than the amended legislation allowed for. WVU and members of the legislature began advocating for a second round of funding during the 2012 session of the West Virginia Legislature and will likely increase their efforts during the 2013 session.

Interviewees affiliated with the HEPC and WVU all had positive things to say about WVU's success in raising matching funds. Within the institution, one interviewee stated that the program had "boosted the institution's self esteem" and "demonstrated to our donors and our alumni that the state had really made a commitment to higher education, a commitment to WVU, and I think that…they were very grateful for that, very excited about it." This suggests that the state funding led to increased confidence on the part of private donors and that by developing and executing a plan that appealed to a wide variety of donors, WVU was able to succeed in meeting the first goal of the legislation, raising private funds to aid their research mission. It also seems that the goal of increasing institutional prestige is one that private donors, who tend to have institutional affiliation before donating, and institutional actors, who have a vested interest in raising money, can agree upon. Engaging donors' expectations of WVU and connecting them to fundraising, may have helped WVU to raise money and meet the goals established by the Legislature. An alternate view was expressed by an interviewee who was asked about the impact of the RTF program on the way WVU is viewed by others. The interviewee stated that it "Didn't change the view of WVU that much because WVU has always been thought of as a research institution" (Legislature). This suggests that a positive view of WVU's research potential already

existed, and the Research Trust Fund merely helped to reinforce that view. The extent to which the program has had a positive impact on the state as a whole and in meeting the economic development goals of the Legislature will be examined in the next chapter. Marshall's organizational reaction to the Research Trust Fund and their very different experience in negotiating this process will be described in the next section. This will be followed by a discussion of the theoretical implications of the two different institutional reactions.

The Research Trust Fund at Marshall University

Established as a normal school in 1867 by the West Virginia Legislature, Marshall University is West Virginia's other research university. In 2011, approximately 10,000 undergraduate and 3,900 graduate students enrolled there. The institution offers a range of master's programs but offers only one Ph.D. (biomedical science), though they do also offer two Ed.D. programs, a Pharm.D., a Psy.D. and terminal degrees in physical therapy and nurse anesthesia. In 2010, they ranked 252nd nationally in terms of R&D expenditures with $24.5 million.

Marshall University's response to the Research Trust Fund provides an interesting counter example to that provided by West Virginia University. While WVU focused on attracting administrators, researchers and students across four fields where they already had either strong or growing research programs, Marshall's plan concentrated their efforts in two areas; biological sciences and transportation. Rather than focusing on broad research efforts across the university, their plan sought to direct funding to two institutes, the Marshall Institute for Interdisciplinary Research (MIIR) and the Rahall Transportation Institute (RTI). Of the eight key personnel at RTI, only two are also teaching faculty at Marshall. MIIR is a research-only unit funded through the Marshall University Research Corporation and will be discussed in more

detail below. Marshall's challenges in raising funds can be largely attributed to this narrow focus, although personnel issues play a part as well.

The major focus of Marshall's RTF plan was to create an endowment for MIIR. According to Marshall's 2010 Trust Fund report, MIIR focuses on,

> The development of applied research from discovery-to-discovery (i.e., genesis of new business ventures). It is designed to operate as a self-sustaining and self-generating enterprise that will stimulate economic development, expand the intellectual infrastructure of WV and increase employment opportunities in the applied research sector. (West Virginia Higher Education Policy Commission, 2011, p. 20)

Rather than using existing departments, MIIR was developed as a separate research institute where an as-of-yet nonexistent $36 million endowment "will support a nucleus of non-tenured scientists in an earning and entrepreneurial culture in which external support will provide 50% of their funding for compensation after five years" (2011, p. 20). The researchers at MIIR will focus on "biomedical/biotechnology/bioenergy/bionanotechnology and transportation technology logistics," (2011, p. 21), research areas which fit specifically within two of the research areas (biological sciences and transportation technology) outlined by the legislature and with potential to overlap with two others (energy or nanotechnology). Plans for the unit were outlined in 2005 and 2006 during Marshall's strategic planning process and subsequently adopted by the university's Board of Governors. The plans for MIIR described on Marshall's website state that it should operate as "a separate academic unit apart from the present constellation of colleges and departments" wherein "it should have its own promotion and tenure expectations/guidelines, the locus of tenure should be entirely within the institute and non-transferable" and "if the enterprise fails, tenure appointments dissolve," (Marshall University, 2006). Though the idea for MIIR predates the Research Trust Fund legislation, the RTF program was seen by Marshall as a way to attract money for the endowment they envisioned for the unit.

Although repeated requests for information were rebuffed by upper-level administrators responsible for research at Marshall, document analysis and interview data indicates that the idea for MIIR originated with Marshall's President, Stephen Kopp. Planning for MIIR began the first year of Kopp's presidency, 2005, and his support for the institute is clearly visible in the "President's Vision" section of the MIIR website. Kopp's active involvement in MIIR was also mentioned by several interviewees, with one interviewee mentioning that Kopp spent part of the visit to Kentucky to learn about Bucks for Brains touting MIIR as a superior concept. Another interviewee had this to say,

> The challenge at Marshall is that President Kopp had alienated key donors. Marshall's depth and base of alumni is thinner than west Virginia University's, so his ability to fund raise was difficult in comparison to that of the president of West Virginia University to begin with, but then when you factor in some personality conflicts and challenges, you have donors that say we are not going to gift to Marshall University as long as this person is president. He then established something called MIIR, Marshall Interdisciplinary Research Institute, that was going to be the basis of all of his efforts on Bucks for Brains, hired some strategic researchers to lead that initiative. It fell flat on its face. None of the folks he brought in to lead MIIR are still there. The concept of MIIR alienated his faculty, whereas West Virginia University Bucks for Brains was an effort that has poured money into research opportunities available to faculty and the goal was to bring in bright faculty stars and Marshall is we are going set something up outside of the faculty, bring in a non tenure–track individual to run the thing. So Marshall Bucks for Brains alienated the faculty because this was a standalone new entity that was getting all the attention, resources, etcetera, and the main faculty were withering on the vine. (Coordinating Board)

This quote highlights several issues related to Marshall's fundraising issues. First, it speaks directly to the fact that the President's expectations for the Research Trust Fund, funding MIIR, did not align with the faculty's expectations. It also raises the point that how forces operate in an organizational field can be influenced by individual personalities, and that personality can both attract and repel resources.

As seen in Table 5 above, between March 2008 and November 2010, Marshall raised just $742,100 in private funds. Like WVU, Marshall University officials revisited their fundraising

plans in 2010 and were much more successful in raising funds in 2011. According to Marshall's 2012 report to the HEPC, "In November 2010, the Marshall University Board of Governors approved a Research Trust Fund Addendum (Appendix One) that broadened the recognition of Biomedicine/Biotechnology as a focus for donor activity across the University, and further included aspects of Engineering, Environmental Science and the Physical Sciences" (WVHEPC, 2012). These changes specifically added engineering (a safety engineering program, mechanical

Table 7: Research Trust Fund Endowments at Marshall University

Research Endowment	Purpose	Donations as of 6/30/12	Locus
Cline Endowment for Translational Sports Medicine Research	Research support	$5,000,000	Sports Medicine Research Center (not yet built)
Marshall Institute for Interdisciplinary Research (MIIR)	Research support	$2,064,923	MIIR
Maier Endowment for Dementia Research	Research support	$1,000,000	School of Medicine (SOM)
Zacharias Research Endowment for OB-GYN	Professorship	$400,000	School of Medicine
Pew Endowment for River Research	Faculty start-up funds	$215,000	College of Science (COS)
Rahall Transportation Institute (RTI)	Research support	$150,000	RTI
Fletcher Mechanical Engineering Endowment	Founding Chair, Dept. of Mechanical Engineering	$125,000	College of Information Technology and Engineering (CITE)
BrickStreet Endowment for Safety Engineering Research	Research Support	$100,000	College of Information Technology and Engineering
Endowment for Summer Undergraduate Research in Chemistry	Undergraduate research support	$93,661	College of Science (Chemistry Department)
Tarter Biological Sciences Student Research Scholarship Endowment	Undergraduate or graduate research support	$27,660	College of Science (Biology Department)
Eiselstein Memorial Scholarship Endowment	Undergraduate research support	$16,000	College of Science (Chemistry Department)

engineering, and bioengineering) and mathematics and physical sciences to their target areas. As of June 30, 2012, Marshall had raised $9,192,244, 61.2 percent of their $15 million total. In FY2009 and FY2010, Marshall was able to raise $692,100 for MIIR and $50,000 for the Rahall Transportation Institute (RTI) to be used for on-going research expenses (Marshall University, 2011). FY2011 and FY2012 were much better for Marshall, but the private donations have moved far away from the original plans established by the university as seen in Table 7.

Of the nearly $9.2 million in private donations raised by Marshall for the Research Trust Fund, just under 25 percent of it was raised for MIIR and RTI as Marshall had outlined in their initial plan. Figure 6 identifies the money raised at Marshall by endowment type. Unlike WVU, 90 percent of Marshall's fundraising has gone into research support, while 8 percent is faculty funding in the form of endowed chairs or start-up funds and 2 percent provides support for students, though that, too, is to support research rather than provide direct scholarships. Figure 7 illustrates the distribution of funds by recipient unit at Marshall. The largest recipient unit is a sports medicine research facility that has not been built, but which received a $5 million donation from the Cline Family Foundation in July 2011.

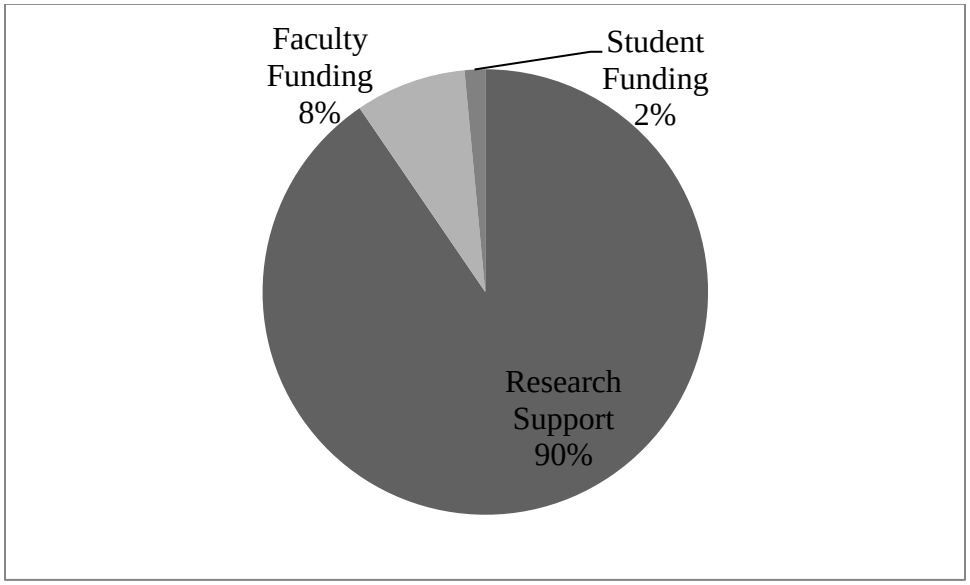


Figure 6: RTF Funding by Endowment Type at Marshall University

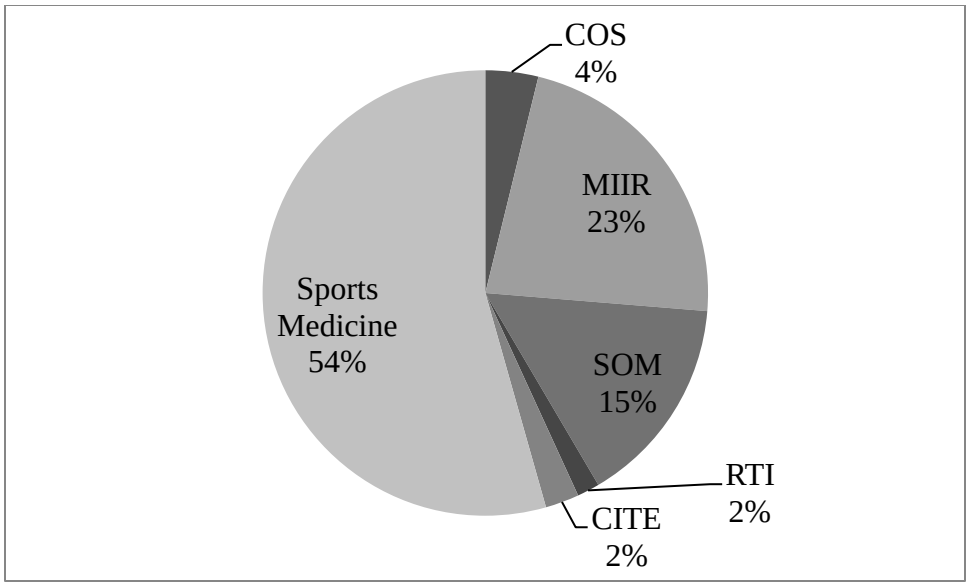


Figure 7: RTF Funding by Recipient Unit at Marshall University

According to the Marshall University Research Corporation, "The Cline Family Foundation was established by Christopher Cline, a successful coal operator, entrepreneur and philanthropist. A native of southern West Virginia, Cline attended Marshall" (MURC, 2011). MIIR was the second largest recipient with 23 percent, followed by the School of Medicine (SOM) with 15 percent, the College of Science (4 percent), the College of Information Technology and Engineering (CITE) and RTI.

This information makes clear that Marshall's plan to focus the majority of their fundraising efforts on MIIR was not successful. Interview data and an analysis of news articles and releases about the Research Trust Fund at Marshall provide greater context for these difficulties. The problems with raising funds for MIIR appear to fall into two broad areas: personnel issues at the institution and lack of donor interest. The theoretical framework applied in this analysis makes clear that different isomorphic forces pressure higher education institutions to resemble each other, even if it is not rational, and that universities must negotiate the expectations and norms of other organizations in their field while attempting to secure the

resources that ensure the wellbeing of their organization. The situation at Marshall is one where the pressure from organizational leadership to emulate start-up companies or other commercialization oriented organizations did not align with the view of Marshall University that was held by donors or faculty at the institution. By changing direction after two and a half years, Marshall was able to realign the views of donors, faculty and leadership in order to capture the private funds necessary to draw down the state match and move closer to the legislature's goal of funding research that is central to the mission of the state's two research universities.

One interviewee described the focus on MIIR as both poorly aligned with the intention of the program and a strategic error when they said:

> The idea was to strengthen the departments, was to set up endowments that supported engineering, supported physics, that supported chemistry, and that you intersperse those people among people you already have and you build strength in those departments. You know, a core focus of capacity building, and that is good across the board. That is the way Louisville did it, that is the way UK did it, and that is the way WVU did it. Marshall took a different approach. While Marshall has had some success, they have had a handful of good people, I am afraid at the end of the day, we don't have that capacity building going on in the departments. I think the departments are still fighting with the institute over, you know, you guys took all the money off the table and the departments are still standing there wanting. They can't even offer a PhD program in the chemistry department or the biology department. And that is going to hold them back as a research university. (Coordinating Board)

One of the major problems with MIIR that this quote highlights is that it created animosity on the part of the faculty in the College of Science towards the administration and towards MIIR because it focused all of the RTF monies on a unit outside of the science departments. Another interviewee at the coordinating board said that, "I know there were some bad feelings at Marshall when all of the money was going to MIIR. And they were not shy about saying so." Rather than using the funds to strengthen departments where research capacity already existed, Marshall chose to put the new resources available from the RTF program into their new unit. The interview data suggests that faculty objections to MIIR were largely because it diverted resources

away from the College of Science. Objections may also be linked to the organization's structure (no tenure, self-funding salaries, commercialization focused) but it was not possible to tell from the existing data. Part of the problem with raising funds for the MIIR concept may also have been that there is nothing like it in West Virginia. As one interviewee from the coordinating board observed, "New, no history whatsoever, didn't know if it was going to be successful; hard to get people to donate money. And they went along that way for a while and weren't getting any donations to speak of." Without any sort of history or any unit in the organizational field that actors were familiar with that they could compare MIIR, too, raising funds proved difficult. This also points to a difference in the expectations of the institution held by upper-level administration that supported MIIR and donors that were less interested in it.

A second challenge with MIIR has been the rapid turnover of key staff members, including the original Director, Eric Kmeic, his wife Jennifer who was hired to be Marshall's Associate Vice President for Economic Development, and Joan Wilson, Senior Scientist. All three of these individuals began work at MIIR in 2009 and all three were gone by the end of 2011 (Hohmann, 2011). Dr. Kmeic and his wife were recruited to Marshall from the University of Delaware, and that is where they returned to after leaving Marshall. A member of the Governor's administration commented on Marshall's fundraising challenges by saying, "I think they have run into few stumbling blocks. Losing your major researcher is hard. And his wife, I mean they brought them in as a team. The idea was she could commercialize it, that was her background and he was going to sit in the lab and invent things." An interviewee from the Legislature observed that, "the fact that the person that they brought in to be the lead person that embraced, that wanted a faculty position at the end, and tenure, and you know, and that's really been not discussed much." Both of these comments point to the fact that, for whatever reason,

the personnel that were recruited to lead MIIR and the commercialization efforts at Marshall did not find the situation to their liking. As of June 2012, MIIR's staff consisted of one Senior Scientist (a researcher that had started as a postdoctoral fellow when Kmiec came in), one postdoctoral fellow and one research technician.

Implications

The organizational responses by WVU and Marshall to the Research Trust Fund have a number of theoretical and practical implications. As DiMaggio and Powell (1983) point out, isomorphic behavior does not necessarily lead to competitive advantage. WVU has been successful in meeting their fund raising goal of $35 million and the general reaction by donors, the Legislature and the Coordinating Board has been positive to what they have done. In terms of surpassing their peers in research expenditures and reaching the institutional goal of achieving a Carnegie Research Very High classification, they have not succeeded, presumably because their peers are also pursing increased R&D funding as well.

In terms of how forces within the two organizational fields impacted the institutions, several interesting dynamics can be observed. One overarching finding is the role of private donors in the field and how the Legislature in effect ceded control over state funds to the private sector. Although the Legislature defined the research areas where endowments could be created and for what purpose, they were fairly broad. This meant that while the Legislature developed the RTF program around the concept of private match for public monies, because the universities were unable to access the state funds without private match, they in effect doubled the impact that private donors could have. This control over resources gave donors coercive power to establish expectations of the institutions with their donations, which they used in a variety of

ways. On the one hand, donors mostly put their money into engineering and medicine. These are fields with high commercialization potential, they create very specialized knowledge, and the people that work in them are well remunerated. On the other hand, several large donations went into areas of medical research that could have both a public (curing diseases) and a private (patenting) benefit. Some of the largest donations also focus on areas with more explicit profit potential, such as mining engineering and translational sports medicine research, which are less oriented towards solving pervasive social and medical problems.

Donor expectations of the universities also played an important role in shaping the institutions' abilities to capture funding. WVU, already better positioned than Marshall in terms of alumni base, fundraising capacity and research infrastructure, took a broad approach that enabled donors to fund endowments in a variety of areas, all of which could be connected to improving the overall quality of the institution. This created alignment, however tenuous, between the expectations of the donors, institutional leaders, and state actors and the strategy worked well for them. It is not clear how faculty felt about the plans for RTF monies, but no interviewees reported negative reactions on the part of WVU's faculty, while several spoke about negative reactions at Marshall. In the case of Marshall, however, the expectations held by upper administration did not align with donor expectations and they were forced to change plans and allow donor interests (that Marshall will develop a research cluster in sports medicine research) to supersede institutional goals (that MIIR will be self-sustaining).

Also worth noting is the absence of plans to expand commercialization activities at either institution (with the exception of MIIR), despite the explicit goals of, "(1) Research-based economic development and economic diversification; and (2) Increased potential for patenting, licensing and related technology transfer and commercialization of scientific and technological

research in the state" identified in the legislation. When asked about the Research Trust Fund's impact on commercialization and technology transfer at the two institutions, five of seven interviewees acknowledged that it has had a limited impact so far, while two were not sure. The reasons for the limited impact included: it was too early to tell (all), good researchers are not necessarily good at commercialization (Governor's Office, Coordinating Board), and complacency on the part of institutional Governing Boards (Legislature) and/or institutional leadership (Governor's Office, Coordinating Board). The measurable impacts of the Research Trust Fund program, including its impact on commercialization and technology transfer, will be discussed in greater depth in the next chapter, but from a theoretical perspective, the barriers to increased commercialization identified above fit with Johnson's (2012) finding that while commercialist values have legitimacy and are on the rise, traditionalist values remain strong at research universities, especially those without strong cultures around commercialization. The relative strength of these two sets of values on a campus is something future policymakers might want to consider when developing policy promoting commercialization in the future.

In terms of practical implications, looking at the two different institutional strategies developed by WVU and Marshall provides a number of lessons for universities or policymakers that are attempting to capture private funds that can be used to fund research and economic development. First, involving executive and academic leadership as well as faculty at the institution is helpful for developing strategies for fundraising. Marshall's situation illustrates the problems that can arise when plans for expanding research are separate from an institution's research core. Second, understanding what donors value and how they see the institution can be critical for successfully raising money. WVU's broad based approach enabled donors to provide funds for a broad range of initiatives including libraries, undergraduate scholarships, general

research support and endowed chairs. The broad approach also meant that donors were able to intersect with a variety of interest areas, from building greater health care capacity near a corporate facility, as was the case with the Quad/Graphics Research Chair in Internal Medicine (Rudder, 2008), to providing an undergraduate scholarship for a talented physics student. This let the donors put their stamp on the institution, while fitting everything under the umbrella of expanding STEM research. How coherently these various STEM initiatives will work together is another matter. WVU's plans explicitly focused on building clusters around core research areas, which they were more or less able to do. Marshall's research investments are somewhat less coherently focused. Practically, however, negotiating between donor interests and the interests and abilities of university administrators and researchers can be a delicate business. A member of the Governor's administration offers a perspective on this by saying,

> You can't take away from the donor the ability to fund that which the donor is interested in. I think then it becomes the responsibility of the university, or the challenge to the university to make that funding fit with the bigger picture of becoming a better research university…So if you say it's going to be cancer research and you don't think of yourself as a cancer research university, I think it's time to start assessing what your strengths are, what your abilities are to capitalize on that funding. Because it is all new money for you, and so why would you say, 'oh, god, I don't want your money because its cancer and I really thought I was going to do dementia,' but where is the common ground between? Because I think when you get to a sophisticated enough research level, there is common ground between those two things. And I think that is the challenge universities have when they are dealing with donors, and I think that is one of the reasons why it is important to structure the funding.

Whether this is, in fact, possible is an open question. This quote speaks to the coercive power of the state to set expectations that may or may not be realistic from the perspective of faculty. It also points to the power relations at work in this field. The quote puts the power in the hands of the donors and places the responsibility for figuring out a way to capture the donor's resources on the universities. The donor's funding gives him or her decision making authority, while universities are put into a position where they must be reactive and flexible in order to make the

donor happy and gain access to their funds. Because universities are organizations with multiple missions, there is space within those multiple missions to argue that the donor's goals help further research, teaching, service, or some combination. The question of what the potential consequences of such a flexible, reactive approach are for faculty is raised by this research, but unfortunately not answered beyond the case of MIIR which lost its core researchers in less than three years.

These two universities clearly took different approaches to responding to the Research Trust Fund legislation and, in turn, had different levels of success in meeting its goals. WVU recognized the power of the donors early on and built a comprehensive strategy that moves them incrementally towards their institutional goal of higher research ranking, while also enabling them to meet the fundraising targets set by the legislature. Marshall attempted to use the RTF monies to achieve their institutional goal of developing MIIR, but was not successful because their goal did not align with the interest of their donors or of their faculty. Neither institution paid particular attention to the economic development goals of the legislature. This is likely to become a factor in seeking future funding, however, because raising the money is only the first step in meeting the expectations of the legislature. The second step, however, and what will be critical for future funding, is being able to articulate how this investment is benefitting the state and creating jobs, because job creation is one of the most valuable currencies for politicians. This will be discussed in more depth in the next chapter. The next section looks at the activities at Marshall and WVU from the perspective of academic capitalism in order to assess the extent to which the Research Trust Fund has favored activities that promote private over public good and reward closer connections to the market at the two universities.

Academic Capitalism and the Research Trust Fund

While the combination of neoinstitutional theory and resource dependency is useful for examining the behavior of organizations within a field, Slaughter and Rhoades' (2004) theory of academic capitalism provides a tool for critically analyzing the activities that take place within the institutions. The theory of academic capitalism describes the changes to the relationship between higher education institutions and the larger society in the context of the developing global knowledge economy and analyzes how groups of actors within higher education institutions are, "using a variety of state resources to create new circuits of knowledge that link higher education institutions to the new economy" (2004, p.1). Academic capitalism identifies a number of ways that universities attempt to facilitate the transformation of research into capital including strengthened management, the creation of interstitial organizations that occupy critical intersections between universities and the market, and the development of a reward and prestige system for university researchers based upon the commercial viability of research. While the theory of academic capitalism makes clear that the level of penetration varies by institution and department, it suggests a number of indicators that can be investigated to evaluate how far the university, or parts of it, has moved towards embracing it.

If the values of academic capitalism were well established at the two institutions, one would expect several things to be taking place. First would be that administrators and researchers within the universities would be investing these RTF monies in ways that would prioritize private over public benefit. Second, one would expect the funds to be concentrated in fields that are likely to generate revenue from patenting or technology transfer. Third, one would expect the money to be used to differentiate between groups by rewarding work with profit potential rather than promoting equality. Fourth, we would expect funds to be used to create interstitial

organizations that create bridges between the university and the market. Finally, we would also look for some of the funds to be used to create new management positions, likely highly paid, that would serve to build more connections between the universities and the market.

Academic Capitalism and Senate Bill 287

The legislation creating the Research Trust Fund, West Virginia Senate Bill 287, is broadly supportive of creating connections between universities and markets, but does not specifically promote the activities that Slaughter and Rhoades identify as components of academic capitalism. That said, the legislation does, in effect, put donors in control over $50 million in public resources by requiring private match before the public funds can be released to the two public research universities. The logic of the legislation as outlined in section §18B-18A-1 (Legislative findings; purpose; and intent) is that the economic future of the United States is dependent upon increasing the "quality, quantity and productivity of its citizens who are engaged in scientific and technical fields of study" and that if that does not happen, "lower standards of living, dependence upon foreign intellectual capital and international insecurity" are some of the potential consequences. Just as the legislation draws a connection between the strength of the national economy and increases in these fields, so too is the West Virginia economy tied to increased research capacity at WVU and Marshall. The Legislature finds that while the two universities have received "significant private donations….the additional investment of both private donations and state moneys is critical to recruiting world-class scientists, researchers, research staff, technicians and professional degree graduates." The legislative strategy for attracting these additional investments is to make $50 million in state funds available as an incentive for private donations in areas that the Legislature identifies with the "long-term goals

including, but not limited to, the following: (1) Research-based economic development and economic diversification; and (2) Increased potential for patenting, licensing and related technology transfer and commercialization of scientific and technological research in the state."

With its explicit focus on attracting private funding for research, SB 287 is designed to build connections between West Virginia's research universities and sources of private wealth. It also connects this funding to expanding research that will expand the state's economy and lead to commercialization. It does not, however, require that donations come from industry, that new positions be filled by those with a history of commercialization, or require the creation of interstitial organizations. In this sense, the legislation clearly promotes academic capitalism through closer connections between universities and private capital and the encouragement of increased connections between research and the market, but does not specify how that should take place or encourage specific activities at the universities. This broad approach enables a range of institutional responses which could be placed on a continuum from highly aligned with what academic capitalism describes to a more limited intersection with academic capitalism. The ways in which Marshall and WVU responded to SB 287 fall in different parts of that range, with WVU's response representing a more moderate form of academic capitalism and Marshall's a more extreme version. These institutional strategies will be discussed below.

Academic Capitalism at WVU

In looking at how RTF monies have been allocated at WVU, a pattern of limited academic capitalism emerges. An examination of how funds are distributed across the general categories shows that library funding received the lowest level of support, less than 1 percent of total donations, followed by undergraduate scholarships which attracted 4 percent, while the area that

attracted the greatest level of funding was general broad-based research support in engineering and medical research. However, the area with the second largest donation is funding for graduate fellowships, making up 21 percent of total funding, with the lions share coming from the Hazel Ruby McQuain Charitable Trust to create a merit-based Ruby Scholars program intended to fund graduate students in each of the four research areas. Without that single large donation, funding for endowed chairs, the majority of which were created in medicine, would have been the second largest category with over $8 million in private funding. Academic capitalism predicts that the university would direct funds to reward those groups and disciplines with the closest connections to market. Because investing funds in undergraduates is likely to provide the least financial benefit for the institution, they are the least likely to receive these funds. That is the case here, with the exception of just over $1 million endowed for undergraduate scholarships in engineering, a field that already has very porous boundaries between the public and private sectors. Academic capitalism also predicts that graduate students would not receive many funds unless they were also connected to the market activities. The fact that graduate scholarships are focused on areas important to the West Virginia economy, specifically the energy industry and engineering, and based on merit-based rather than need-based scholarships is in-line with academic capitalism and patterns observed in other states (Bastedo & Gumport, 2003). That said, the proportion of the money going to scholarships is higher than would be expected by an institution with a highly academic capitalist orientation. The money allocated for endowed chairs also presents a picture of moderate academic capitalism. Most of the chairs are created to focus research on health areas that are public health issues for people in West Virginia, specifically dentistry, nursing, pediatric cardiology, internal medicine, and cancer research. Research in these fields can certainly help solve public health issues. At the same time, healthcare is a booming

industry and pharmaceutical patents can generate massive revenues. Also, much more money goes to engineering and orthopedic surgery than to nursing or dentistry. In many cases, the endowments were created with large gifts from single donors that have a familial or historical tie to the institution or to the specific medical issue. The broad-based research support is more mixed, with some of it coming from individuals who want to support areas of on-going research that relate directly to the health problems of the state (such as cancer research or support for quality of life nursing research) and some coming from energy companies and going to support research in areas of interest to them (such as the Alpha Natural Resources Endowment for Energy Research). The fact that the legislation was structured in a way that funds were only available to fields connected to the West Virginia economy shows that the Legislature's values were broadly aligned with academic capitalism from the outset, though they did not dictate specific strategies, such as requiring commercialization or the creation of interstitial organizations.

One of the goals of the Research Trust Fund is to attract "world-class scientists, researchers, research staff, technicians and professional degree graduates" (*Directed Research Endowments,* 2008, §18B-18A-1-a). In order to achieve that goal, one of the two areas of allowable expenditure for Research Trust Fund monies is to, "(1) To pay the base salaries of newly endowed department chairs, new professorship positions, new research scientists and new research staff positions" (*Directed Research Endowments*, 2008, §18B-18A-6). One of the critical elements for promoting technology transfer at a research university is a supportive university culture that includes consideration of technology transfer in hiring and promotion (Palmintera, Joy, & Lin, 2007; Palmintera, 2005). This is a break from the more traditional standards for hiring and promotion at research universities which focus on the institutions an

individual has attended, their record of academic publication and their ability to secure external funding, particularly from the federal government. Patenting is, however, still a relatively anomalous behavior for academic scientists and an activity that only between 9 and 16 percent of faculty engage in (Johnson, 2012; National Science Board, 2004; Stephen, Shiferaw, Sumelland, & Black, 2007).

In order to evaluate the success of WVU and Marshall in meeting their faculty recruitment goals, data on new hires made with RTF monies were collected. These data include CVs and publically available salary data. As discussed above, revenue generated from the RTF endowments has been slow to accumulate. As a result only a few hires have been made with RTF monies at WVU. At West Virginia University, Laura Gibson, Ph.D. is supported by the Osborn Professorship created by an RTF endowment (WHEPC, 2011). She is the Associate Center Director for Translational Research at the Mary Babb Randolph Cancer Center at the WVU School of Medicine. The fact that translational research focuses on moving research to the market as quickly as possible reinforces the notion RTF funds are directed towards activities aligned with academic capitalism. In addition, two new faculty members with expertise in biometric security have been hired and are partially supported by the Verizon WV for Biometrics RTF endowment.

Of the hires made with RTF funds, only Dr. Gibson's complete CV was publically available. Since part of the purpose of the RTF is to recruit new faculty that will have an impact on economic diversification in the state, it is worth taking a close look at Dr. Gibson's CV to see how she fits that profile. According to her CV, acquired from the website of the WVU Robert C. Byrd Health Sciences Center, Dr. Gibson was actively involved in four National Institute of Health (NIH) grants with total direct costs of over $19 million through June 30, 2011. In the

decade prior, she had been involved in five other NIH grants, one Department of Defense grant and one WV EPSCoR grant. Of the 34 articles she has listed on her CV, she is listed as first author on five and second author on three. It is also worth noting that Dr. Gibson has been at WVU continuously since 1982 when she enrolled as an undergraduate, and has been employed there since 1991 when she completed her Ph.D. in the Department of Genetics and Developmental Biology.

For comparison purposes, the CV's of the only other faculty members holding named chairs at the Mary Babb Randolph Cancer Center at WVU were also examined. Dr. Scott Remick holds the Laurence and Jean DeLynn Chair and Dr. Michael Ruppert holds the Jo and Ben Statler Chair of Breast Cancer Research. Dr. Ruppert holds an MD, Ph.D. from Johns Hopkins and a B.A. from WVU. Dr. Remick holds an M.D. from New York Medical College, a B.A. from State University College at Oswego (NY) and completed a residency in internal medicine at Johns Hopkins University and a fellowship in oncology at the University of Wisconsin Clinical Cancer Center. Dr. Ruppert has ongoing research support from one National Cancer Institute (NCI) grant of $175,000 and has previously received support from seven NIH grants and one US Army grant. He lists forty manuscripts (13 first or second author), two book chapters and two patents on his CV. Dr. Remick lists ongoing research support from one NCI grant with a direct contribution of $500,000 and previous research support form sixteen federal NIH or NCI grants, eighteen pharmaceutically funded grants, 58 clinical trials and 152 peer-reviewed articles (36 first or second author). Annual salaries for the three for 2011 were: Gibson - $241,334, Remick - $162,846, Ruppert - $197,487. Gibson's salary is also roughly $15,000 more than the salary of the Microbiology department chair where she also holds a position and more than $100,000 above the other full professors in the department who had a median salary of

$125,000. While it is not possible to make generalizations from one case, a few emerging trends are visible from this data. First, if the goal is to recruit from outside the state, RTF is not doing it yet. Second, there is a clear salary premium associated with the faculty member hired with RTF funds. Whether that is connected to the higher level of grant funding that she has or other reasons is not clear from the data. Without further information it is difficult to draw firmer conclusions.

In terms of strengthened executive management, the plans that WVU outlined for their use of funds included plans to hire a director for the university's Advanced Energy Initiative at a salary of $225,000. The person holding the position was promoted internally and salary information was not publically available. A clear example of strengthened executive management, though not directly connected to this legislation, is the salary package negotiated by WVU's president that moved his salary from $475,000 in 2010 to $775,000 for 2013 (Bumgardner, 2012).

Academic Capitalism at Marshall University

The creation of MIIR and the (attempted) use of public funds to endow it, while requiring faculty members to raise half of their salaries from external funds, is clearly an example of academic capitalism. MIIR was designed as an interstitial organization where research could be commercialized and brought to market and the reward system in place there was designed to reward the researchers who could raise funds to support their work. The collection of salary data for the researchers at MIIR was not possible because that information is not publically available, an interesting finding in and of itself. Due to the way Marshall has structured MIIR, the researchers who work there are not state employees and therefore salary information is not available from the State Auditor's Website. This in and of itself is an indication of academic

capitalism because it points to the blurring of the boundaries between the public and the private through the creation of a unit which operates as a part of a state university while at the same time having some of the protection afforded a private enterprise. A Marshall spokeswomen told a newspaper reporter that she "believes Eric Kmiec's salary is $175,000," though his salary was not public information because he was hired by the Marshall University Research Corporation (Hohmann, 2011). This is noteworthy and supports the argument that use of public monies at Marshall can be categorized as academic capitalism. As discussed above, interviewees mentioned that there is some resentment on the part of faculty at the College of Science regarding MIIR and the concentration of RTF funds there. One other new faculty hire, Dr. Mindy Yeager Armstead, was announced at Marshall in fall 2012. Dr. Armstead has been hired as an aquatic ecotoxicologist and research support for her will be provided by the Pew Endowment for River Research, part of Marshall's RTF monies (WVHEPC, 2012c). No previous salary data was available for her.

Discussion

While it is difficult to draw generalizable conclusions from the two universities in this case study, their contrasting reactions to the Research Trust Fund nonetheless present some interesting patterns. While Marshall and WVU have different donors, peers and faculty in their organizational fields, the state actors are the same and they are peers of one another by virtue of being in the same state. In this situation, the expectation that they should be able to meet the requirements of the legislation is the same for both, but expectations about how exactly they will do that differ. For West Virginia University, there appears to be general agreement between the actors in the organizational field about what WVU should be doing, specifically that they should

be increasing their level of research. It also appears that their plans for the Research Trust Fund have proceeded relatively smoothly. Their more moderate form of academic capitalism is not unusual and they do not pursue anything radical. Expectations of Marshall are less clear. The Legislature expects it to behave like a research university, despite its significantly weaker capacity. Its peer institutions encompass a wide range of research capacities and they are situated right in the middle. Upper-level administration, however, has been attempting to move Marshall in the direction of more radical academic capitalism by creating an interstitial organization, MIIR, that is focused on commercialization and which has no tenure. One reason for this may be to carve out a research niche separate from WVU, who they will never be able to match in terms of sheer capacity. Problems arose however, with the founding scientists leaving after a short time, frustration on the part of the faculty (though the actual consequences that has on fundraising are unclear), and a lack of interest on the part of most donors. The lack of initial fundraising success for MIIR forced the Board of Governors to change direction and go with what donors are interested in: engineering and sports medicine. The theoretical framework used here would explain this as an example of conflicting expectations and norms that have frustrated Marshall's attempts to carve out a unique niche in the organizational field.

Overall, WVU's plans for the use of RTF monies were built around existing research strengths and increasing the level of support for units within the university that already have a strong research core and significant levels of outside support. While their original plan was to spread funds around at relatively even levels across their four research areas, they actually attracted much more support for engineering and medical research, fields with high potential for commercialization, and relatively little in the other two areas. They had to broaden their formal plans to accommodate this, but this did not move far from their initial strategy. The university's

plans also included creating endowments to benefit a variety of actors within the university: undergraduates, graduate students, post-doctoral researchers, administrators, and faculty. All of these groups will receive funding through the RTF endowments, though the majority will go to faculty holding endowed chairs and professorships. This pattern aligns clearly with their goal of receiving a Carnegie classification of Research University Very High in order to more closely resemble their peers. While there is evidence of academic capitalism at WVU and disproportionate rewards for those faculty and administrators that are closer to the market, it does not seem to be outside the norm of what is happening at their peer institutions. In fact, the university changed its policy so that faculty receive 40 percent of licensing revenue (up from 30 percent) and those in the College of Engineering can receive credit for patents filed when considered for promotion and tenure, thus encouraging commercialization. This pattern could be described as a form of moderate academic capitalism that redistributes resources so that faculty members who bring in external funds are rewarded while still providing broad-based support for research across the institution. At the same time, the broad-based support outlined in WVU's RTF plan still operates within the constraints established by the Legislature which require the money to be invested in the six STEM and STEM-related fields they identified in the legislation.

Marshall's organizational strategy, on the other hand, attempted to concentrate the majority of its state funds into a quasi-private unit of the university that was led by researchers brought in from outside the state. While they were able to attract some funding for it, other areas were more attractive to private donors and the university was forced to change its strategic plan. They fact that the director and senior researcher left MIIR within two years of starting also suggests that the unit itself is not operating as successfully as the administration would hope, even if all of the circumstances leading to their departure are not known. One interpretation of

this is that Marshall has focused their efforts on carving out a technology transfer niche as a way to differentiate themselves from WVU rather than competing for ranking against out-of-state peer institutions. The push for this new unit, however, appears to have had limited support from donors and generated frustration on the part of university faculty. The difficulties Marshall has had in acquiring funding for MIIR also point towards broader challenges faced by regional institutions with relatively small investments in research. First, is the problem of competing for resources against an institution like WVU that has a larger and more established research mission. The Matthew Effect may be in operation here as well with WVU receiving more funds because they already have more funds and have been successful in certain research areas. This is in tension, though, with the "frogs-in-a-bucket" mentality evidenced in the previous chapter, as well as the political realities wherein institutional advocates ensure that their institutions receive funding regardless of success in meeting objective targets. Second is the problem of trying to set an agenda which lacks sufficient internal and external support. While some donors believed in MIIR enough to donate to it, the largest donations that Marshall received were based on the interests of the donor and did not fit within the strategic plan they had established at the beginning. Also, by pursuing a more radical form of academic capitalism that depends upon a newly-created market-oriented unit staffed by researchers brought in from the outside, Marshall may have lost the support of their core faculty, without whom developing an economic development model based on technology transfer will be difficult.

Although the different levels of research capacity already in place certainly helped WVU to be more successful at fundraising than Marshall, I argue that the alignment of norms and expectations between donors and administrators around WVU's plans was a major factor in their success, just as conflict over expectations about Marshall's use of RTF funds hindered their

fundraising attempts. Whether faculty frustration with Marshall's plan led to fundraising issues, or whether WVU's faculty members actually support their plans, is unclear. It does seem, however, that the more modest form of academic capitalism WVU is employing is working better than the more radical form that Marshall has been pursuing. What is also clear is that only a relatively small percentage of the funding either institution has received is going into technology transfer or commercialization activities. Instead, the use of funds at both institutions seems to be heavily influenced by the personal interests of major donors. Also worth noting is that despite the legislature's inclusion of gerontology as a research area, neither institution pursued funding there. Transportation and logistics also received only limited support, while biomedical research and engineering have received the lion's share of the funding. This is partially due to the personal interest of donors, but also likely connected to the fact that both institutions have medical schools and have spin-off corporations in the biomedical/biotech field. It is also important to note, that the areas receiving financial support are not areas with high levels of student enrollment.

This research also points to some of the difficulty inherent in steering university research with state policy. Matching programs have the benefit of doubling the state's investment, but the drawback of making the funds harder to direct. While the fact that over 80 percent of the state money has been matched is a net positive in terms of institutional resources, it is not clear that the legislature intended to provide $5 million for sports medicine research when the created the legislation. While this chapter has focused on the organizational responses to the Research Trust Fund program and their relative success, the next chapter will focus on the impacts of the program more broadly, looking specifically at its economic and cultural impact on the state and the geographic regions around WVU and Marshall

CHAPTER 5

MEETING ITS GOALS? THE ECONOMIC & CULTURAL IMPACT OF THE WV RESEARCH TRUST FUND

The last chapters examined the development of the West Virginia Research Trust Fund, the factors and actors that were critical to its development and passage, and the organizational response of the two universities to the program. This chapter examines the broader economic and cultural impact that the program has had on the state of West Virginia, specifically focusing on the question: *To what extent has the West Virginia Research Trust Fund led to expanded entrepreneurial activity at Marshall University and West Virginia University and increased economic development in their regions?* In order to better contextualize the West Virginia Research Trust Fund program, a review of federal and state government involvement in university research and technology transfer was conducted. This provides a historical and conceptual framework for understanding the role of governments and universities in research-based economic development. It also sheds light on the key indicators of success and the political, social and cultural elements that lead to successful promotion of technology transfer.

In this chapter a history of government involvement in technology based economic development will be provided first. Second, successful examples of university driven economic development will be examined and a set of key indicators and best practices identified. Third, West Virginia's progress towards expanded entrepreneurial activity as a result of the Research

Trust Fund will be examined. This will be followed by a discussion of the impact the RTF has had on the state and the theoretical and practical implications.

The Role of Government in the Promotion of University-Based Economic Development

On February 4, 2011 President Obama released an updated *Strategy for American Innovation*. The first lines of the document read:

> America's future economic growth and international competitiveness depend on our capacity to innovate. We can create the jobs and industries of the future by doing what America does best – investing in the creativity and imagination of our people. To win the future, we must out-innovate, out-educate, and out-build the rest of the world. (National Economic Council, Council of Economic Advisors, & Office of Science and Technology Policy, 2011)

Throughout the *Strategy for American Innovation*, innovation, through scientific research and changes to policy, is promoted as the critical element to ensuring the economic competitiveness of the United States. Without innovation, and specifically without innovation deployed for the benefit of the United States, it will not be possible for the country to "win the future." The role that government should play in innovation systems is described as that of "innovation facilitator" where, "the appropriate role for government can be understood by clarifying the precise circumstances where markets, despite their many strengths, will not produce a sufficient stream of innovations on their own" (National Economic Council et al., 2011). One interpretation is that this means government provides financial support for promising research and shoulders the risk for those investments so that private capital can move in later and help move these innovations to market. An alternative interpretation is that the public is asked to pay twice for the research and development; once for the R&D, then again for the commercial products of that research. Meanwhile, the public is also asked to pay to support higher education with taxes, and through ever increasing tuition and fees.

While a heavy federal reliance on university research to aid United States competitiveness is not new, the landscape shifted with the passage of the Bayh-Dole Act in 1980. From World War II through the early 1970s the federal government funded a great deal of fundamental research, especially through the Department of Defense. This relationship provided a steady flow of research from universities to the federal government, which in turn helped to sustain defense contractors and related industries and helped drive the American economy during the postwar period. What the Bayh-Dole Act did was enable small businesses, universities and other non-profit organizations to retain title to innovations created using federal funds and encouraged them to file patents and license their innovations, thereby expanding the number of individuals and organizations that could benefit financially from university research (AUTM, 2010). The Bayh-Dole Act was then amended in 1987 by President Reagan so that federal agencies were required to promote commercialization, "by granting to all contractors, regardless of size, the title to patents made in whole or in part with Federal funds" (Reagan, 1987), thus ensuring that large corporations would benefit as well. Etzkowitz & Leydesdorff (1997) argue that the end of the Cold War and decreased funding from the Department of Defense in the United States precipitated the development of a "triple helix model" where government, industry, and universities collaborate and universities are expected to contribute more directly to economic development agendas. This model encourages universities to become more entrepreneurial and to collaborate with and seek funding from industry, while taking more direction and less money from state sources.

State Governments, Universities and Economic Development

The early 1980s also saw a turning point in the way state governments act towards universities to promote economic development. During the 1960s and 1970s most state economic development policies focused around locational strategies that relied upon providing incentives to firms so they would locate in a particular state (Plosila, 2004). The role of higher education institutions or the development of entrepreneurial cultures did not factor into most discussions. That changed in the early 1980s when states competed to attract the Microelectronics Computer Consortium (MCC) and the Semiconductor Technology and Enterprise Corporation (SEMATEC). Both of these groups were recruited to Texas with packages that included traditional locational elements, such as site improvements and tax abatements, combined with, "such unheard of elements as endowed university chairs, university linkages and connections, and access to talent pools," (Plosila, 2004, p. 115). These competitions started a shift in the way states approached economic development and led to the emergence of direct links between science and technology and economic development in many state governments during the 1980s and 1990s. Georgia's Advanced Technology Development Center (ATDC), Connecticut Innovations, Inc., Pennsylvania's Ben Franklin Partnership Program and Ohio's Thomas Edison Program are all examples of state technology-based economic development efforts that emerged during this time.

Not all efforts to connect governments, universities, and firms in Etzkowitz's triple-helix model have been successful, though. One reason for that Plosila identifies in his analysis of historical trends in state science- and technology-based economic development is a difference in how universities and legislators defined "economic development". He writes that,

> When legislators heard university leaders say, in the midst of high unemployment and economic problems in the early 1980s, that they planned to help with economic development, legislators assumed that meant job creation…A more negative view is that universities simply thought state science and technology programs were a new source of

> money to be used just as they had used federal basic research grants, without expectations of direct job generation or direct economic impact. When speaking about contributing to economic development, university leaders typically did not mean job creation directly… University leaders saw their role as educating for the future and forming a state talent pool better prepared to seek and secure employment. (2004, p. 118)

This difference in the definition of economic development may have contributed, directly or indirectly, to a decrease in state funding to some of the university-based economic development efforts begun in the 1980s. Many states, however, were able to work through these issues and the 1990s saw an institutionalization of the linkages between state science and technology initiatives and economic development. This institutionalization meant the emergence and maturation of state science and technology offices, the development of statewide science and technology plans as well as the emergence of technology councils made up of representatives from technology trade associations, state government, universities and industry. These emerged at the state level in places like Oregon, Arizona, Maryland, New York, Rhode Island, and Georgia, as well as the city (New Orleans, Kansas City) and regional (central Pennsylvania) levels (Plosila, 2004, pp. 119–120). This maturation phase meant that, "By the year 2000, almost all states saw the linkages and understood the importance of connecting their science and technology programs and efforts with their economic planning, policies, and programming" (2004, p. 120). Despite that development, however, states are by no means equally far along in the development of successful university-based economic development initiatives. States like Georgia, Massachusetts, North Carolina, Ohio and California have been actively engaged in these initiatives for two or three decades. West Virginia, on the other hand, has only been investing state resources in university research-based economic development initiatives for the last ten years. Neo-institutional theory would suggest that late-adopters like West Virginia are imitating more successful peers in order to cope with uncertainty, what DiMaggio and Powell (1983) refer

to as mimetic isomorphism. They argue however that even though mimetic behavior is normatively sanctioned, it may not actually be a beneficial strategy. This raises questions about the possibility of states like West Virginia succeeding in growing their new economy sectors in areas that other, more established states, have already staked out.

Innovation Clusters

One of the main goals of university research-based economic development initiatives from the perspective of state policymakers is the development or expansion of new economy sectors and the subsequent creation of new jobs. Research on the development of new economy innovation clusters also points to some of the challenges that states face in developing strong connections between scientific innovation and economic development. The creation of regional clusters of innovative businesses is viewed by state and federal government as one of the most important routes to economic prosperity. However, research on entrepreneurial cluster formation suggests that some of the important elements are outside of the direct control of state governments. Feldman and Francis (2004) find that one of the most critical factors in the creation of innovation clusters is the existence of entrepreneurs with connections to the region. They write that "entrepreneurship is inherently a local phenomenon" (2004, p. 132) where individuals attempt to fill a niche or exploit an opportunity in a region they live in or have strong connections to. They also find that "venture capitalists say they bet on the person and not the technology, with the idea that a skilled entrepreneur can make a business work" (2004, p. 134). Unfortunately, they observe that most public sector investment focuses on the plan rather than the individual. The implications for state policy are that governments may be best served by focusing their efforts on "…the potential in homegrown industries. Instead of relying on attracting successful firms from

other regions through financial incentives…providing a hospitable environment for entrepreneurs to create new firms" (2004, p. 135). They also argue that policy should focus on supporting local entrepreneurs who are close to innovations because, "Innovations without entrepreneurship cannot result in regional development…Entrepreneurship without innovation cannot result in technological change" (2004, p. 131). This suggests that state policies like the Research Trust Fund provide an important piece of the puzzle, but that other elements, particularly the existence of entrepreneurs and an entrepreneurial culture, are also essential. Following DiMaggio and Powell's argument, this also suggests that imitating one successful strategy, without consideration of the larger context, may not lead to success.

The implications for state policy described above are also echoed by a report from the National Governors Association that states:

> The most common pitfall for state policymakers is to attempt to create new clusters where there are no preexisting advantages to build upon… Every cluster can leverage technology for product or process innovation—and gain market competitiveness. Every cluster can add to the economic growth prospects for the state. (NGA, 2002, p. 8)

The message for states here is that they need to focus on their existing strengths rather than putting their efforts into recruiting from outside. The NGA report also argues that,

> Although knowledge creation is a critical first step in the wealth-creation process; knowledge creates no wealth unless it is used. While universities have made enormous strides since the passage of the Bayh-Dole Act more than two decades ago, most still see themselves as passive economic assets rather than proactive partners for economic development. (2002, p. 9)

This reflects Feldman and Francis's assertion that entrepreneurs are critical to wealth creation because they bring knowledge to the market and Plosila's observation that universities leaders do not necessarily see their role in economic development in terms of actual job creation. Johnson's (2012) work makes clear that faculty members, even those with a strong commercialist orientation, see their role as knowledge creators, not job creators. These issues, along with the

evidence presented by Bozeman (2000) and others that technology-based economic development rarely creates jobs, suggest that states attempting to use such policies as job creating mechanisms may face serious challenges.

Universities and Economic Development

The sections above provide an overview of the elements that are critical to the success of regional innovation economies. This section reviews case studies of universities that have been identified as key contributors to their regional innovation economies and identifies both the indicators that are used to judge success and the elements of the universities that have helped them to be successful.

A review of the literature identified three studies conducted in the last decade that are particularly useful for this analysis: *Innovation U.: New University Roles in a Knowledge Economy* (L. G. Tornatzky, Waugaman, & Gray, 2002), *Accelerating Economic Development Through University Technology Transfer* (Palmintera, 2005), and *Technology Transfer and Commercialization Partnerships* (Palmintera et al., 2007). All three take a case study approach and examine universities that have been successful in technology transfer and the commercialization of university research. The standards of success that were identified included: research & development expenditures over time, invention disclosures, executed licenses, options and agreements, royalty income, patents filed and awarded, and number of start-ups. Palmintera et al. (2007) also analyzed measures of research efficiency, including new patents awarded, new licenses & options and number of start-ups per $1 million in research expenditures. It is worth noting that job creation is not listed as a success factor, despite the fact that it is often the argument used to justify expanding technology transfer activities on campuses.

Innovation U. and *Accelerating Development* examine an overlapping set of fifteen large research universities: Carnegie-Mellon University, Georgia Institute of Technology, Massachusetts Institute of Technology, North Carolina State University, Ohio State University, Pennsylvania State University, Purdue University, Stanford University, Texas A&M University, University of California – San Diego, University of Pennsylvania, University of Utah, University of Wisconsin, Virginia Tech and Washington University. While these universities all have successful technology transfer programs, their successes may be difficult for smaller or more regionally focused institutions to replicate. *Technology Transfer and Commercialization Partnerships* focuses on a set of ten such institutions to see what makes them successful. The institutions in that case study include: Alfred University, Brigham Young University, Florida A&M, Iowa State University, Montana State University, Rensselear Polytechnic Institute, Springfield Technical Community College, University of Akron, University of Central Florida and University of North Carolina – Charlotte. Of these ten institutions, seven are engaged in technology transfer activity and reported that data to the Association of University Technology Managers (AUTM). The technology transfer outputs of these institutions (patent applications filed, patents issued, licenses and options executed, and startups) was compared with their R&D expenditures to develop technology transfer productivity metrics using AUTM data from FY2005. In that year, the patent applications per million dollars of R&D expenditure ranged from 0.20 to 2.63, patents issued per million ranged from 0.01 to 0.48, licenses and options executed per million ranged from 0.05 to 0.91 and startups per million ranged from 0.01 to 0.16.

An analysis of the twenty-four institutions included in these three studies reveal five key elements that need to be in place for a higher education institution to have a successful technology transfer program. Those five elements are: 1) strong networks with funders and

industry (both formal and informal); 2) A supportive university culture that includes consideration of technology transfer in hiring and promotion; 3) strong leaders (presidents, deans, chancellors, etc.) that value and promote commercialization; 4) a technology transfer strategy that is built around core institutional competencies; and 5) excellent personnel handling technology transfer at the institution. In addition to these five elements, a theme running through all three studies is the recognition that technology transfer is a geographically local activity. This is consistent with the research around innovation clusters and state science policy discussed above and reinforces the importance of connecting institutional research competencies to regional industries.

Key Elements in Research Based Economic Development

What this research suggests is that for states to be successful in building innovation clusters around research and technology transfer, several pieces need to be in place. First, successful states will focus their efforts on existing industries and issues within the state rather than attempting to bring in industries or clusters from elsewhere. Second, states should focus their efforts on identifying and supporting entrepreneurs, not just focusing their efforts on the research side. While the research side is important, it is the entrepreneurs that actually bring innovations to market, and if those individuals do not exist in the state, they may take the research and apply it to problems elsewhere. Third, universities, industry and government need to have a common set of expectations and understanding about their roles in the innovation process. This includes both state government and federal funding agencies. Most of the state and regional success stories would not have been possible without federal funding, and a willingness on the part of local industry to respond to federal research and development needs. Other key elements that

Feldman & Francis identify include: “supportive social capital, venture capital, entrepreneurial support services, and actively engaged research universities” (2004, p. 132). How exactly these elements are provided can vary by state or region, so long as the critical elements are there and the division of responsibility is understood by all parties. Finally, universities need to have, or be working to develop, the five elements identified above. Without those elements, it is difficult for universities to turn research into innovations in a way that benefits both the institutions and their regional economies.

The Economic Impact of the Research Trust Fund

The review of the literature above makes clear that funding for research is fundamental to research and innovation-based economic development, but that it is one of several important pieces. Another important element identified in the literature is the existence of strong networks between universities, industries and funders. The Research Trust Fund facilitates the creation of those networks by requiring a private match in order for Marshall and WVU to draw down the public funds. The goal, as identified in Senate Bill 287, is that donors will, “support certain priority areas of study consistent with each participating institution's long-range strategic plan for research” (*Directed Research Endowments*, 2008, §18B-18A-1-b) This should, in turn, lead to “achieving long-term goals including, but not limited to, the following: (1) Research-based economic development and economic diversification; and (2) Increased potential for patenting, licensing and related technology transfer and commercialization of scientific and technological research in the state” (Ibid.) The previous chapter shows that while Marshall and WVU have been successful in raising private funds, the connections between those fundraising efforts and their long-range research plans and strategies for increasing commercialization are not always

clear. This section will explore the impact of the RTF program on regional economic development. While drawing direct lines between the creation of the Research Trust Fund and changes to the economy of West Virginia is difficult because of the number of other factors involved, it is possible to track some of the key indicators of successful university contributions to regional knowledge economies and see how they have changed since the creation of the program.

In order to assess the potential impacts of the Research Trust Fund program on research-based economic development and commercialization of university research, several pieces of data are analyzed here. First, data on patent applications submitted by university researchers and university affiliated spin-off corporations are examined for the three years prior to the passage of the legislation (FY2006-2008) as well as the three years after (FY2009-2011) in order to provide some baseline comparisons. Data on licensing activity and technology transfer during that period are also be examined. Information on the development or expansion of spin-off companies affiliated with the two universities was also collected. Though it is difficult to draw direct connections between the legislation and licensing and technology transfer activity, the information provides important context and suggests whether activity, or the potential for activity, has increased as a result of the legislation.

In order to assess the potential impact of the Research Trust Fund on regional economic development, data on regional job growth are also analyzed. Data on job growth are collected by the United States Department of Labor and are examined from FY2006 through FY2011. I look specifically for growth among scientists and technicians working in fields connected to the RTF legislation in order to examine economic diversification and growth in the targeted sectors. While this timeframe is short for fully analyzing the impact of the legislation on economic

development in the state, it provides preliminary data on the economic impact of the legislation and affiliated job growth. Finally, in addition to the data identified above, interview data are used to provide context to the information described above. Research on technology transfer and regional innovation clusters indicates that social and cultural aspects of universities, departments and regions are critical to success. Therefore, interviewees were asked to share their views on the success of the Research Trust Fund and the impact it has had on the economy and culture of West Virginia.

Technology Transfer at WVU and Marshall

One of the express goals of the Research Trust Fund is to increase the potential for "patenting, licensing and related technology transfer and commercialization of scientific and technological research in the state" (*Directed Research Endowments*, 2008, §18B-18A-1-b-2). Research informs us that creating a successful program of technology transfer and commercialization at a university involves a supportive culture, excellent staff and connections with industry in addition to adequate research funding. Tables 8 and 9 provide an overview of commercialization and technology transfer activity at WVU and Marshall for the period FY2006 through FY2011 (WVHEPC, 2012b).

Table 8: Technology Transfer Activity at West Virginia University

	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Invention Disclosures Filed	55	44	38	33	32	51
U.S. Patent Applications Filed	11	9	29	24	25	33
U.S. Patents Issued	2	4	3	4	8	4
License Agreements	20	19	7	11	7	1
Start-up Companies	3	0	4	3	2	0
License Royalty and Associated Income	$19,902	$38,507	$72,240	$149,709	$147,218	$148,531

Table 9: Technology Transfer Activity at Marshall University

	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Invention Disclosures Filed	5	6	13	7	13	3
U.S. Patent Applications Filed	4	4	3	2	2	1
U.S. Patents Issued	0	0	0	0	1	1
License Agreements	1	4	0	0	1	1
Start-up Companies	1	3	0	0	1	1
License Royalty and Associated Income	$0	$973	$1,939	$4,388	$11,531	$1,720

For comparison purposes, productivity metrics (technology transfer outputs per million dollars of R&D expenditure) were calculated for Marshall and WVU. The higher education institutions that Palmintera et al. (2007) examine in their study all ranked below the top 50 in R&D expenditures according to the National Science Foundation, but were in the top ten nationally in at least one technology transfer category relative to their research expenditures. In terms of U.S. parent applications filed per million dollars of R&D expenditure, WVU ranged from 0.06 patent applications per million in FY2007 to 0.2 in FY2008. Marshall's patent application productivity ranged from 0.08 per million in FY2010 to 0.2 per million in FY2006. The average for the institutions in Palmintera et al.'s study was 1.13 patent applications per million. WVU's license agreement productivity ranged from 0.05 per million in FY2010 to 0.16 per million in FY2006, while Marshall's ranged from 0 to 0.17 per million. The institutions in Palmintera et al.'s study averaged 0.35 licenses and options executed per million of R&D expenditure. This comparison highlights the gap in technology transfer activity between West Virginia's research universities and institutions of equal size that are excelling in technology transfer. It also shows that in terms of patent application productivity, Marshall is leading WVU despite their lower levels of R&D expenditure.

The data in Tables 8 and 9 do not provide a clear picture of the impact that the Research Trust Fund may be having on invention disclosure, patents, license agreements and royalties, and start-up companies. The data for WVU shows a general upward trend in U.S. patent applications filed from FY06 through FY11 and an increase in invention disclosures filed between FY09 and FY11, though FY11 levels are still below FY06. WVU also shows an upward trend for license royalty and associated income, though the period FY09 to FY11 is essentially flat. At the same time, license agreements decreased steadily at WVU over the six year period. Marshall's activity in the areas identified does not show any clearly discernible pattern.

One of the reasons for the lack of discernible impact is the relatively short time horizon. While the Research Trust Fund was created in 2008, only the interest from the investments may be expended. Due to the slow start in institutional fundraising and the economic recession of 2008 to 2011, the institutions have only recently had funds available for expenditure. In FY2013, WVU will have $1.8 million from their 86 RTF endowments to spend (WVHEPC, 2012, p.19). Marshall's available funding is estimated to be close to $450,000. The view that it is currently too early to evaluate the impact of the Research Trust Fund on technology transfer was shared by the interviewees as well. When asked about the whether the two research universities had met the expectations of the Legislature, an interviewee at the Legislature responded that:

> I don't know that we've given it ample time because remember, in order to, they've had trouble raising the funds. Those things really need five to seven years to mature and to start looking at having enough intellectual property to create patents and jobs and so I think that this one you have to be very patient.

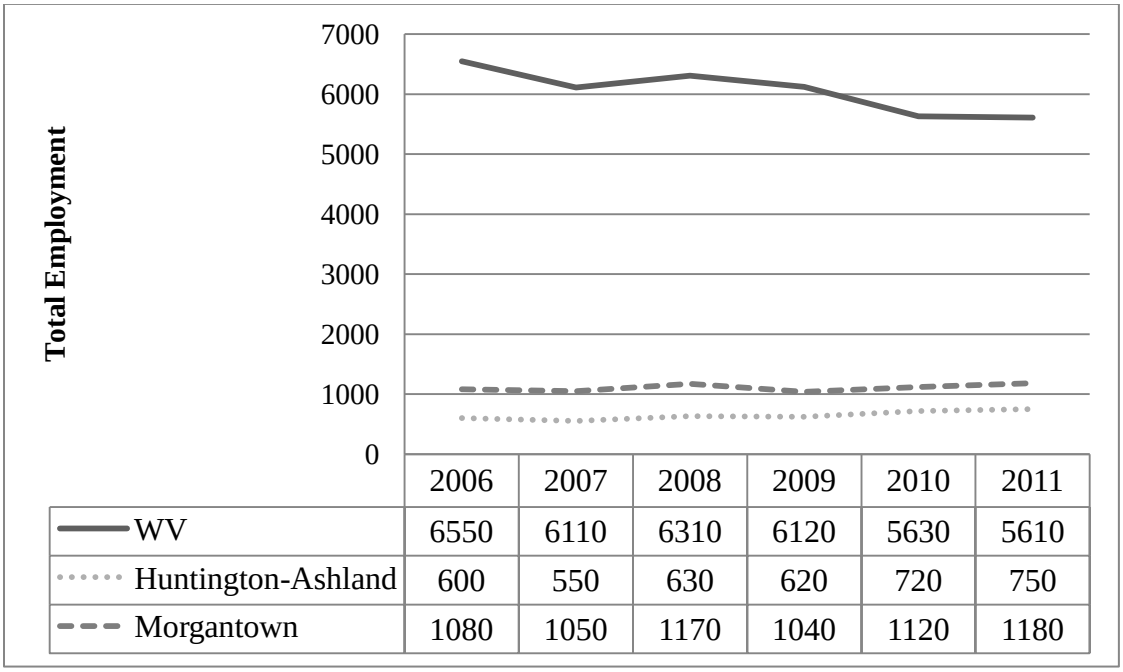
This was echoed by an interviewee from the coordinating board who stated that, "I think that five to ten years out is where things get much more exciting than they are today. Right now it is nice to see the momentum." These sentiments were also reflected by a member of the Governor's administration that said, "The momentum has to keep going, but it certainly has made a good

start in that area. In terms of direct economic impact on the state, we're not there yet." While it seems likely that the economic impact will increase over time, a more critical view of these comments is that since the interviewees all played a role in the program's creation, they have a vested interest in its success. By using an extended time horizon for the evaluation of the program's success, one need not address the programs shortcomings in the present.

Job Growth in Targeted Areas

Although the RTF program is designed to have an impact on the state's economic growth and diversification over the long term, an analysis of economic data from the period 2006-2011 was conducted to see if changes to employment or wages could be identified. Data on employment and wages was collected from the U.S. Department of Labor's Bureau of Labor Statistics Standard Occupational Classification System (SOC). Because the only salaries that can be paid using Research Trust Fund monies are those of university researchers, technicians or graduate assistants, data for jobs in SOC 19-0000, Life, Physical, and Social Science Occupations, were examined. As Feldman & Francis (2004) and Palmintera (2005) have observed, entrepreneurship and technology transfer are local activities. For that reason, data on the Huntington/Ashland Metropolitan Statistical Area (MSA) where Marshall University is located, and the Morgantown MSA where West Virginia University is located, were examined. More specific information on scientists and technicians employed in the biological sciences, physical sciences and medical fields were sought, but the data appear to have been inconsistently reported at the metropolitan level and were not useful. These data were then compared with state level data to identify how trends at the state level compared with trends in scientific employment in the Huntington/ Ashland and Morgantown MSAs.

Figure 8 shows the trends in scientific employment in the state of West Virginia and the Huntington/Ashland and Morgantown MSAs in the period 2006 to 2011 (BLS, 2011). While scientific employment in the state of West Virginia declined 14.4 percent overall in the state between May 2006 and May 2011, it rose 25 percent in the Huntington/Ashland MSA, and increased 9.3 percent in the Morgantown MSA during the same time period. Looking at the figures broken into two time periods, 2006-2009 before the Research Trust Fund and 2009-2011 after, even sharper growth is revealed. Between 2006 and 2009, scientific employment in Huntington/Ashland grew 3.3 percent and in Morgantown declined 3.7 percent. In the 2009-2011 post-RTF period, scientific employment grew 21 percent in Huntington/Ashland and 13.5 percent in Morgantown.



	2006	2007	2008	2009	2010	2011
WV	6550	6110	6310	6120	5630	5610
Huntington-Ashland	600	550	630	620	720	750
Morgantown	1080	1050	1170	1040	1120	1180

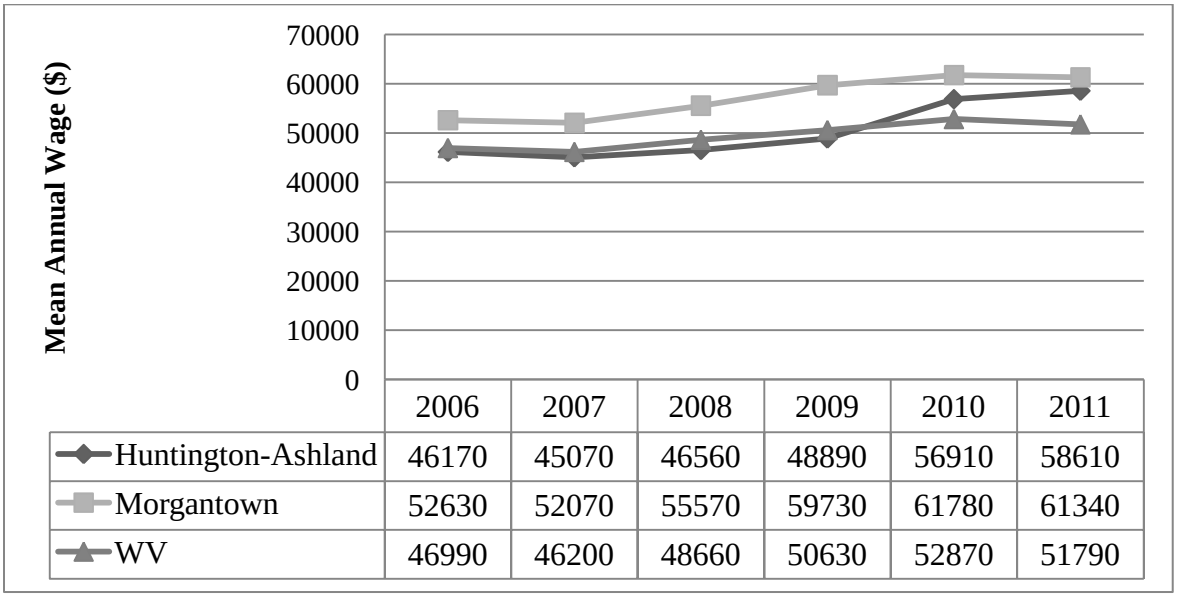
Figure 8: Scientific Employment in WV, Huntington/Ashland & Morgantown

While it is not possible to prove that the creation of the West Virginia Research Trust Fund caused the increase in scientific employment in the areas around the state's two research universities, it is worth noting that employment grew in those areas while declining in the state

as a whole. Over the same period of time, total employment in all sectors declined 0.9 percent between 2006 and 2009, and declined 0.6 percent between 2009 and 2011.

Data on annual wages were also examined. Part of the rhetoric used by Governor Manchin and others about investing in the Research Trust Fund is that investing in research leads to high-paying jobs. Research by Bozeman on technology and economic development (TED) programs found however that "the job creation evidence from evaluations of TED programs almost always disappoints (the more careful the study, the more it disappoints) and the relatively few jobs that are created are generally not ones for which lower- and lower-middle wage earners qualify" (2000, pp. 177–78). This is supported by data from the Bureau of Labor Statistics that shows that nationally, the mean annual wage for those working in Life, Physical, and Social Science Occupations was $67,470, compared with the mean annual wage of all occupations at $45,230 (BLS, 2011)

Figure 9 illustrates the wage data in scientific occupations between 2006 and 2011 across West Virginia and in the two MSAs identified above.



	2006	2007	2008	2009	2010	2011
Huntington-Ashland	46170	45070	46560	48890	56910	58610
Morgantown	52630	52070	55570	59730	61780	61340
WV	46990	46200	48660	50630	52870	51790

Figure 9: Wages in Scientific Occupations

Between 2006 and 2011, wages rose 10.2 percent for scientists across the state. Over the same time, annual wages increased 27 percent in Huntington/Ashland and 16.5 percent in Morgantown. Looking at the 2006-2009 and 2009-2011 time periods, wages grew more during the latter time period in Huntington/Ashland and grew more in the earlier time period in Morgantown and in the state as a whole. Annual wages across all sectors grew from $31,440 in 2006 to $36,220 in 2011, an increase of 15.2 percent. So, while wages rose more slowly for workers in scientific occupations across the state as a whole than they did for professions overall, they increased slightly more in Morgantown and almost 12 percent more in Huntington/Ashland. Again, it is difficult to draw direct connections between the Research Trust Fund and changes to scientific wages, but it is clear that those working in these fields earn well above the state average for annual income and their incomes grew more than all workers or scientific workers in other parts of the state.

Another part of the rhetoric around the Research Trust Fund has been diversifying the economic base of the state through research and technology transfer. In order to get a sense of how employment in scientific fields in West Virginia has changed over time, the percent of people working in the state who work in scientific fields was examined by region and over time. In 2006, 0.92 percent of workers in West Virginia were in the Life, Physical, and Social Science Occupations. In 2011, 0.80 percent of workers across the state worked in those fields. In Morgantown, the percentage grew slightly from 1.93 percent in 2006 to 1.98 percent in 2011, while in Huntington/Ashland it went from 0.54 percent to 0.69 percent. This suggests that while the percentage of workers in scientific fields is decreasing for the state as a whole, some very slight improvements in the geographic areas most directly impacted by the Research Trust Fund can be observed, although attributing them directly to the RTF program is difficult.

Changing the Conversation

The indicators examined above do not show a connection between the West Virginia Research Trust Fund and an improvement to the economy of West Virginia or the regions around Marshall and WVU. The interview data, however, presents an alternative narrative that emphasizes the ways in which this investment has changed the conversation about research in the state and laid the groundwork for future developments. That narrative will be discussed in this section. We do know that over $44 million in private funds have been raised by WVU and Marshall which means the total amount in the Trust Fund is in excess of $88 million. The interest from that money is being used to support four faculty members in whole or in part and is providing graduate scholarships for two students at WVU. Institutional technology transfer initiatives, encouraged by the legislation, exist at both institutions, but it is difficult to see a direct connection with the RTF program. In terms of an impact on diversifying the economic and creating jobs, employment in scientific fields has increased very slightly around the two universities, but it is not clear in which specific professions or how much change, if any, can be attributed to the RTF program.

As mentioned by some of the interviewees earlier in this chapter, it may be too early to judge the impact of this program. The revenues generated from the funds are just starting to accrue in large enough amounts that salaries and scholarships can be supported from them. Also, fundraising efforts were hampered in the first two years by the start of an economic recession, as well as some decisions at Marshall that made fundraising difficult. Despite these issues, however, interviewees remained mostly positive about the program and suggested that despite the lack of clear measurable successes, the investment in the RTF had "changed the

conversation" in West Virginia about research and its importance. This theme and the potential cultural impact of the RTF on the state will be explored in this section.

When asked about the impact of the RTF, an interviewee at the coordinating board responded that,

> First is that it changed the conversation within the policy realm of West Virginia about the ability of our institutions to drive economic development. The commitment of Bucks for Brains was significant because it demonstrated to policy makers, it demonstrated to faculty and it demonstrated to small business that West Virginia was serious about research…so it helped to continue that cultural change. A cultural change that I see ultimately that came to fruition with the acceptance of the Tech Park. We never would have been in a position to accept the Tech Park if we had not laid the seeds of our institutions as facilitators of economic development and a redevelopment of West Virginia's economy. And then, the other thing that it did was it really put an onus on the institutions about fund raising.

This quote identifies a number of impacts that the Research Trust Fund is having on West Virginia. First, the investment of state money serves a signaling function that lets policy makers, faculty members and business owners know that West Virginia supports research-based economic development. Second, this quote situates the Research Trust Fund within a series of state government investments in research. West Virginia's Research Challenge Fund was created in 2004 and invests $4 million of state lottery funds in research annually (WVHEPC, 2008). The Eminent Scholars Program was created in 2007 with $10 million in state funds that WVU and Marshall each matched with $5 million in private funds. The West Virginia Regional Technology Park (Tech Park) is a former Dow Chemical Company Research Park located in South Charleston that was acquired by the state in February 2010 for the purpose of creating a research and innovation hub for the area. All of these, from the perspective of this interviewee, are part of a cultural change that improves the climate for research and innovation in West Virginia.

The importance that this type of investment has on faculty recruitment was mentioned by another interviewee from the coordinating board that said,

> It is still very early in the process. They are only beginning to get the endowments in a place where they are generating spendable cash. But it has sent a message, I think, to the academic community that the institutions are much more serious about research, competitive research and the national interest than they perhaps saw them in the past. WVU now is advocating to be a Research Intensive Very High university, they want to get on that Top 100 list. And that is an aspiration that faculty being recruited will say, yeah, I like that commitment on behalf of the university system. And we are in better shape financially than many states, so it has created this dynamic there where I think it is having a very positive impact.

This comment points out that even though the Trust Fund is just starting to generate spendable funds for the institutions, the existence of the investment has helped in faculty recruitment efforts. Though not directly connected to RTF, the number of faculty at WVU has increased from 2,936 in the 2007-08 academic year to 3,219 in 2011-12 (WVHEPC, 2012). One interviewee confirmed that the program has helped faculty recruitment when they said,

> So it is a real, a very competitive advantage for us in the marketplace for faculty; the state's willingness to make this kind of an investment, so that is a huge recruiting plus. And of course in those focus areas, the faculty obviously see it as a great source of revenue and demonstrates to them the university has, not deep pockets, but deeper maybe than other universities in other states, so obviously the simple availability of funds is a big plus. (Governor's Administration)

Although the recession that began in 2008 put a damper on fundraising at the two institutions, state funding for higher education was not cut during the 2008 to 2012 period, except in 2010 when state funds were cut and backfilled with federal funds provided by the American Recovery and Reinvestment Act (ARRA). While state funding levels are low in West Virginia compared to neighboring states (Marks, 2011), the fact that they did not receive the cuts that other states did appears to have provided some competitive advantage in faculty recruitment. This is further supported by university announcements to hire 30 additional faculty before the fall 2012 term (Crum, 2011).

Another area of positive impact mentioned at WVU was the development of better connections between university administrators and donors. An interviewee observed that:

> I definitely see and hear a lot more talk about entrepreneurialism and tech transfer, but I think that would have happened, I think it is part of the overall zeitgeist anyway in higher education and a lot of people are talking, and have been talking about those things for the last five or ten years. I think that would have happened, and I think that discussion would have happened here anyway. What RTF did I think is, because the money obviously has to come from private sources, no federal grants would be used to match and so forth, there was a lot of, in cultivating the donors, in going out and talking to the people whom made the contributions that raised the money. I think what we got back from them, a lot of whom were in industry, a lot of them had been very successful in terms of creating their own companies or developing their own new products and commercializing them; we got that feedback from them in the course of talking to them and cultivating them as RTF donors. So I think that was a very useful mechanism. My guess is that was the intention and it worked. And so around the specific gifts that they gave and the specific donations that they made, there was this discussion about their experience as entrepreneurs, and their experience as, in business and in industry, and the RTF gave us a great way to have that conversation with them, get their input and learn from their experience. Certainly entrepreneurialism and tech transfer are themes that people even outside of the RTF focus areas are now thinking about and talking about here, and I think the whole university realizes that we need to do a much better job of that. And I think part of it gets tied up in our land grant mission as well. (Governor's Administration)

This quote highlights several important themes. First, that university interest in technology transfer has been growing for some time and would have come to WVU with or without the creation of the Trust Fund. What the Trust Fund did, however, was create an incentive for university administrators to have focused conversations with donors. While the goal of those conversations was certainly to raise money, it also appears to have had a side benefit of generating conversations around entrepreneurialism that helped expand institutional knowledge at WVU on the subject.

There is also a feeling amongst the interviewees that there are two areas of concern with the policy. First, six of the seven state level interviewees felt that the program needed additional funding. While it is not surprising that individuals associated with the state higher education agency and WVU are in favor of increased funding, comments from individuals at the

Legislature and the governor's administration are informative. A member of the governor's administration said:

> But you are trying to build capacity; you are trying to build a reputation. I mean this is a drop in the bucket. This isn't the, you know, half a billion dollars that Kentucky has raised. This is hey, we're here, you know, we're serious about this, this is your drop in the bucket, find your talent, motivate it, push it out, get the stories going, you know, get people thinking we can do it here.

This sentiment was echoed by an interviewee at the Legislature that said, "Those things really need five to seven years to mature and to start looking at having enough intellectual property to create patents and jobs and so I think that this one you have to be very patient in. I think it would take another round of money and support on that from that end." This connects with the issues raised earlier in this chapter that more time is needed to properly assess the program's impact and adds the point that more money is also critical for the program's success.

The second area of concern is that the institutions may not have the expertise with technology transfer necessary to achieve the Legislature's economic development goals. An interviewee at the Legislature says, "I don't think that, personally, I don't think that our research, the two research institutions, are that far along, that they understand the commercialization. And I don't think that our research corporations at the two institutions know how to facilitate that." That sentiment was echoed by an interviewee at the coordinating board when they were asked about university focus on technology transfer and entrepreneurialism. The interviewee responded that, "that portion of it has been more…serendipitous is not the right word, but there have been a few opportunities that have come along and they have tried to provide assistance, but I don't think we have the infrastructure in place yet to do that, in a major way." Both of these quotes point to concerns about the interest and ability of the institutions and their research corporations to move more aggressively towards technology transfer. This sentiment was shared by an

interviewee from the governor's administration that said, "Let's face it, higher education is usually an economic engine in a state to get things up and going especially on small business, especially on diversifying your economy. We had seen none of that and we'd really seen no inclination of the universities to kind of say okay, that's my responsibility." The same interviewee acknowledged, however, that there were other gaps in the innovation infrastructure in West Virginia, such as a lack of angel investors and entrepreneurial business executives.

Discussion

At this stage, the economic impacts of the West Virginia Research Trust Fund are limited and the extent to which it has expanded entrepreneurial activity at the two institutions is difficult to assess. Part of the reason for this lack of visible success is that it is early in the process. By November 2012 WVU's endowments had just started to generate spendable interest and Marshall still had roughly one-third of their funding left to raise. More broadly, though, this type of program is just one piece of the research and innovation-based economic development puzzle. One interviewee summarized this by saying,

> There is also a lack of, not even angel, but pre-angel investment, to help people get those patents, to get between the discovery and the ability to get angel investment. They need probably a million or two dollars to get there. And we don't have that investment community. We don't have a whole lot of angel investors, and we don't have a whole lot of venture capitalists, so capital is in short supply. And quite frankly, most of the faculty don't have a very good idea of whether or not what they've discovered will make money or not. I was pleased to hear [ ] say the other day, he says I know I am not a businessman. I belong in the lab doing things, he says, but I would like to license this technology or create a business and be the technical advisor, get someone else to run the business and I'll be the technical advisor. That is what they should be doing. College professors usually make lousy businessmen. (Coordinating Board)

Whether professors actually make lousy businessmen or women, Johnson's (2012) research shows that the desire to start business is something few faculty members have. This suggests that

if West Virginia wants to move more heavily into this type of economic development, they will need to start looking at the other pieces of the puzzle as well. This raises an important question: with excellent research scientists and savvy entrepreneurs in short supply in the world, how does West Virginia compete with California, Massachusetts, North Carolina or Georgia to attract them? The literature suggests that innovation is very regional and that successful states and geographic regions within states need to focus on developing home-grown entrepreneurs with expertise in local industries rather than competing with other areas to attract them. Marshall's experience with attracting the Kmiecs from Delaware to West Virginia, only to have them move back to Delaware in less than three years suggests that attracting outside researchers may not have the long-term impacts one would hope for anyhow. The literature also suggests that the timeline for this type of economic development is longer than five years. Feldman and Francis write that, "Daniel Patrick Moynihan (1927-2003) is credited with saying that no one without 40 years to spare should get involved in urban renewal; this insight may be extended to considerations of regional economic transformations" (2004, p. 134) This was echoed by an interviewee from the governor's administration that said,

> I think, I mean from my perspective looking back at the last five years that the story has changed; people are starting to talk about it more. We have the Tech Park which generates a lot of buzz, you know you have some successful companies, you have the Bucks for Brains, people are talking about it, they've at least thought about it because they matched it. It's incremental, but everybody says it took the Research Triangle twenty years to be an overnight success. It's a fair point.

This quote speaks to both the need to view the success of investments in research and development in the long-term, as well as the difficulties of measuring what will lead to success in the short term. In the absence of more concrete accomplishments, the fact that more people in the state are talking about research and technology-based economic development is seen as a positive. This quote also points to the multiplicity of factors that can impact whether such a

policy is successful or not, and the multiple interpretations of how to evaluate success based upon how one defines it. It is clear from the interviews that everyone who advocated for the program views the RTF program as a good investment. Since money has been raised and the other benefits will be measured on a longer time horizon, there is unlikely to ever be a negative consequence for the advocates as a result of this investment of state funds.

The theoretical framework developed in Chapter 4 posits that organizations imitate their peers because it is normatively sanctioned, even if that behavior does not result in long-term benefits. That tendency towards isomorphism, however, is mediated by power relations and the need to secure adequate resources streams to maintain organizational fitness. Applying the same framework to the state as a whole raises the question of whether investing $50 million of public funds into the West Virginia Research Trust Fund is an example of state actors imitating a successful policy from another state that may not be rational from an economic standpoint. Relative to an overall state budget of $14.19 billion in FY2008, or to state funding for higher education of $430 million, $50 million of excess revenue invested in the RTF program is a relatively small investment. Nonetheless, that money could have been invested in other areas.

Up to this point, just short of five years after the program was created, the primary benefit of the state's investment has been as a tool to increase private donations. The number of student scholarships given and faculty members hired are in the single digits and the increases to scientific jobs in the areas around Marshall and WVU are measured in tenths of a percent. The scholarships have gone to high ability students and the individuals hired for the faculty positions are highly specialized and well compensated. From this perspective, the public benefits generated by this investment of public funds are limited, at best. This raises the same question posed by Bozeman (2000) in his research, of who benefits from this type of economic

development program. The short-term answer at this point is a few individuals benefit. The expectation, however, is that in the long-term these individuals and others who will receive funding from the RTF program, will go on to do things (make discoveries, start companies) that will improve the West Virginia economy and have a wider positive impact. Unfortunately, there is no guarantee that if start-ups are created and research is commercialized, that those activities will create jobs in West Virginia instead of Pennsylvania, California, or Hyderabad.

The research literature on what makes innovation clusters successful and how universities can contribute to economic development points towards the importance of numerous factors in success including the existence of entrepreneurs, available investment capital, and formal and informal connections to local industries. In the case of the Research Trust Fund, it is not clear that the technology transfer environment is sufficiently robust to enable the transformation of the state's economy. While there are a few technology transfer success stories in the state, up to this point, there have been no clear examples that have grown out of the RTF program. They may yet come, but they are not in place yet. This again raises the question of whether it is really rational for West Virginia to make an investment of this kind. That is likely a question that will have to be answered after the fact once it is possible to identify clear positive returns on the investment. In the meantime, there appears to be no public reaction to the Research Trust Fund beyond news articles about institutional fundraising connected to the program. Technology transfer and commercialization are rarely mentioned. If institutional leaders and policy makers push for additional funding for the program, they will likely need more than success in fundraising to convince the Legislature to allocate additional funds.

Another issue this raises is the asymmetry of information about these types of programs. Whether the Research Trust Fund program ever leads to job creation or technology transfer,

institutional leaders will see the program has a success because it provided them with $50 million in state funding that they were able to use to help leverage $50 million in private funding. Many in the Legislature are also likely to view the program as a success because they were able to double the state investment by requiring a private match. The state's coordinating board will advocate for it because promoting university research is part of their mission, whether it leads to technology transfer and jobs or not. The challenge is likely to come during future requests for funding when the merits of the Research Trust Fund, and the political influence of its supporters, will be weighed against the other programs that need funding at the same time. Due to the way the program is structured, however, no formal analysis of the program's impact, beyond institutional success in fundraising and narratives descriptions of how the funds connect to institutional research plans, will be required. So, while the program was publically touted by Governor Manchin and others because the state's investment was expected to lead to "business spinoffs, new patents and job creation" (Manchin, 2008), it is unlikely that the truth of that claim will be evaluated until someone asks for more money.

CHAPTER 6

CONCLUSIONS

This research seeks to answer the question of how state policies that promote the commercialization of university research impact state economies and universities. In order to answer that question, I have closely examined the development, implementation and impact of one state program, the West Virginia Research Trust. By looking at the program from its genesis through the first four and a half years of its implementation, a number of impacts have been identified. The impacts that the program has had on West Virginia and the state's two research universities are influenced by several critical factors. The impacts and the factors influencing them will be discussed below.

The West Virginia Research Trust Fund came into being because of the existence of a budget surplus and the advocacy of well-positioned advocates in state government, especially the executive branch. Although the coalition supporting the program included executive leadership from the two research universities, interviewees identified two individuals on the governor's cabinet, the chancellor of the state's higher education coordinating board and the secretary of commerce, as the most important policy entrepreneurs. These individuals worked to convince Governor Manchin of the merits of investing in university research, and once his support was assured, worked to convince the chair of the Senate Education Committee and others in the West Virginia Legislature. One of the critical factors that helped them to convince others in the state Legislature of the Trust Fund's merits was the existence of a very similar program in the neighboring state of Kentucky. The legislation creating the RTF program, West Virginia Senate

Bill 287, was assisted through the legislative process by the advocacy of the Senate Education Chair, Senator Robert Plymale, who helped shepherd the bill through the multiple stages necessary for passage. Once the bill was passed, however, responsibility for its implementation shifted to the institutions and the West Virginia Higher Education Policy Commission, the body responsible for providing updates on the programs progress to the Legislature.

Several aspects of this process appear to have had significant impacts on the implementation of the program itself and its relative success. First is the make-up of the coalition that supported the development of the program. Just as Hart (2008) was surprised that entrepreneurs had little role in advocating for entrepreneurial economic development policy, it is interesting that the advocacy role of university presidents seemed to be limited and university researchers appear to have had no direct role in advocating for this policy. Instead, it was the commerce secretary, who had a background in intellectual property, and the chancellor of the state's higher education coordinating board. It also appears from the interview material that it was the support of the commerce secretary, someone whose professional function is to increase economic development, which lent credibility to the proposal and moved it out of the realm of merely another request for money from the state's higher education institutions. It is no surprise when the chancellor, or a university president, asks for more money for higher education. Having someone with less obvious motivation to propose research funding argue that this program can lead to economic development provided critical credibility.

The makeup of this particular advocacy coalition appears to have had some consequences for the way the state's two research universities responded to the Research Trust Fund program. University leaders supported the policy but were not the central advocates for it. Despite their secondary role, the end result was a piece of legislation that kept a close eye on fundraising, but

did not formally track technology transfer or economic development activity. The absence of accountability measures connected to economic development may be due to the difficulty in measuring the program's impacts and clearly connecting the RTF funds to new jobs, new patents and new licensing revenue. It may also be that way because those working to create the program knew that this sort of investment mat not actually lead to more jobs and new start-ups. Either way, it also illustrates the notion that you measure what you value. While requirements about what endowments were allowed to fund, and in which research areas, were written into the legislation, the oversight over university actions is rather limited. Institutional responsibilities include submitting donations to the state coordinating board for approval and producing annual reports on progress, but little else. If nothing is ever commercialized as a result of the program, there are no negative consequences.

Under academic capitalist regimes, higher education institutions reorient from serving a broad public good to restructuring themselves so that publicly-funded research and intellectual property is sold in the marketplace for private gain. One of the consequences of the Bayh-Dole Act was to encourage universities to behave as private actors and keep some of the revenue from the marketplace for themselves. The Research Trust Fund program requires universities to go out and acquire private funding in order to access public funds. While those funds go into endowments and become part of the university, the mindset that is promoted is one that makes resource acquisition its primary focus. Both universities have been able to acquire resources, WVU more successfully than Marshall, but the commercialization and economic development side is left without much attention. The potential benefits of funding research are stated up front in order to gain support, but the complex nature of successfully promoting technology transfer and developing innovation clusters around university research is left almost completely

unexamined. No one advocating for this policy would benefit by highlighting the complexity and uncertainly of research-based economic development, and there are no negative consequences if it does not succeed. As long as the money is raised, the program can be considered a success; perhaps not so much of a success that it will be funded again, but a success nonetheless.

The consequences for organizational responses on the part of the two research universities to the program are that they can, more or less, pursue their own interests without much regard for legislative or gubernatorial intent since it is unlikely they will be asked to report out on the jobs created by the Research Trust Fund. That has left the universities free to develop research plans that reflect the goals and priorities of university administrators and donors. What we see by comparing Marshall and WVU's approaches and relative success, setting aside historical differences in fundraising ability, is that a broad-based plan which supports university research in multiple departments and the overarching goal of increasing institutional prestige is more successful than one which focuses on a narrow plan which has the support of executive leadership, but few others, and prioritizes funding interstitial units rather than the academic core. Applying a combination of neo-institutional and resource dependence theories to the organizational responses helps elucidate the role that underlying norms and values play in this attempt to increase university resources. Looking at organizational responses from that framework, what we can see at WVU is an alignment between the expectations of university leaders, donors and state government representatives about what the institution should be doing. WVU's broad plan enabled them to acquire resources from donors that were interested in everything from mining to physics scholarships to libraries and connect them under a common vision of the university. Marshall on the other hand wanted to focus their RTF donations on building an endowment for MIIR. For the most part, though, donors were not interested in

providing funds for that and Marshall's Board of Governors had to change the scope of the plans for the Research Trust Fund program. This suggests that academic capitalism is becoming normalized in research universities outside of the top tier, but that it is normalized in specific ways. University administrators, legislators and faculty are in agreement about using public and private funds to support STEM students and faculty at higher levels than those in the social sciences or the humanities, while funding an endowment for a unit devoted to commercializing bio and nanotechnology research appears to have been more controversial. In either case, though, STEM faculty and students make up a relatively small portion of these faculty and student population, but receive the bulk of the RTF funds. It also appears that relatively little input from students, parents or faculty entered the discussion when the RTF program was developed and funded.

Another element which is important for the RTF program but remains under examined in the literature is the role of donors in shaping university research agendas. WVU began with a broad plan and had to make some adjustments to it, but the core of the original plan, distributing funds across multiple colleges and departments, remained largely unchanged. Marshall, meanwhile, had to make some significant changes to their plan, expanding from funding two institutions external to the academic core of the institution to funding those units alongside sports medicine, engineering, and undergraduate research in biology and chemistry, because donors were not interested in funding what Marshall's administration and Board of Governors wanted them to fund. This suggests that donor interests have the potential to significantly influence the research direction of an institution, especially if the institution has relatively low levels of R&D expenditures like Marshall. At both institutions, the majority of large donations came from wealthy individuals with ties to the institution. Also at both institutions, large donations ($5

million for translational sports medicine research at Marshall and $4.6 million for graduate student scholarships at WVU) forced the institutions to broaden their scope of what they expected the RTF program to do. Corporations did make some large donations, but there did not seem to be any clear examples of a corporation providing funding for an endowment in a research area directly connected to their industry. This suggests that if the intention behind this type of program is to support the "triple-helix" of industry, government and universities, it may not succeed. Although one interviewee mentioned that big donors may work in an industry that has interest in university research, the donations seemed to be more motivated by personal interest than corporate profit. Another aspect of donor-university relations that also connects to the theoretical framework combining neo-institutional and resource dependency theories discussed above is the role that personality can play. Several interviewees mentioned that Marshall University's president had alienated key donors, which in turn had a negative impact on fundraising. While it is difficult to quantity that impact, the fact that several interviewees mentioned it makes it worth considering.

A practical question that this research addresses is whether the Research Trust Fund has actually led to increased commercialization and economic development. In the short-term, the answer is no. This program and others like it, however, are probably best viewed over a longer time period in order to answer questions about their impact. It will be particularly interesting to see which departments, are successful in producing research with commercial applications as the program develops. Those questions also probably need to be considered within a broader context that includes an evaluation of the technology transfer and commercialization infrastructure in the state as a whole. As discussed in Chapter 5, the five key elements that need to be in place for a higher education institution to have a successful technology transfer program are: 1) strong

networks with funders and industry (both formal and informal), 2) A supportive university culture that includes consideration of technology transfer in hiring and promotion, 3) strong leaders (presidents, deans, chancellors, etc.) that value and promote commercialization, 4) a technology transfer strategy that is built around core institutional competencies, and 5) excellent personnel handling technology transfer at the institution. In addition to these five elements, a focus on regional industries and needs appears to be a critical element in building successful innovation clusters. While this research has focused on the development of the a state policy that promotes commercialization and how it impacted the state's research universities and economy, a closer examination of the technology transfer cultures and structures at Marshall and WVU would provide another level of insight into the institutional factors impacting the program's success or failure. In terms of building a broader research infrastructure in the state through policy, there were two programs created before the Research Trust Fund, the Research Challenge Fund in 2004 and the Eminent Scholars Endowment Trust Act in 2007. Viewed in that context, the RTF program was part of a larger series of initiatives to build research infrastructure. It does not appear, however, that commercialization, or the potential of the state's two research universities to engage in commercialization, were critical factors. Interviews conducted about the RTF program showed an interest on the part of state-level actors in commercialization, but some disappointment with the activity on the campus-level as well as some skepticism about campus interest and ability to really expand technology transfer. Focusing on the research funding, without really considering the campus culture around technology transfer may impede the ability of the RTF program and others like it to be successful in meeting the goals of elected officials, job creation and economic development, because those are not institutional priorities.

Ultimately, it appears that creating a program like the Research Trust Fund may be as much intended to serve a political end as a practical one. Hart (2008) asked why politicians invest in long-term economic development programs that may not pay off during the course of an election cycle. In the case of the Research Trust Fund, it appears that the long-term economic development goals fade from importance somewhat as long as the program continues to meet short-term fundraising goals that provide positive press for the universities and which elected officials can take credit for. Although interviewees explained the Research Trust Fund's requirement of 1:1 match of public with private funds in terms of imitating Kentucky or doubling the state investment, it also serves to provide an on-going series of small victories. Each major donation can be, and has been, accompanied by a press release, a photo-op and often a newspaper article touting the importance of the donation and the positive impact it will have on the university and the state.

In many ways, developing and implementing a program like the Research Trust Fund is an exercise in negotiating expectations so that all involved parties feel that they are getting what they want out of it. Elected officials can count the program as a political victory. The governor can point to a legacy program which is free from the need for legislative reappropriations. Individuals in the Legislature can say that they brought money into their districts (if they represent WVU or Marshall) or helped build a brighter future for the state. Institutions are supportive of the program because they receive millions of state dollars that they can use to leverage private donations and fund research positions and scholarships on their campus, things they want to do anyhow. The key policy entrepreneurs advocated for the program because it fit within both their professional and personal motivations for improving the state's research universities and diversifying the state's economy. Even though elected officials would like to

see more jobs and more start-ups and universities would like to have more flexibility to spend the money, both groups can see this as a victory. How campuses use the endowments, so long as they are funded, then becomes a secondary issue for the Legislature and the state's coordinating board.

There are a number of practical and theoretical implications for this research. One is that using state policy to steer universities towards research commercialization is not as simple as providing state funds and encouraging long-term goals of economic development and diversification through technology transfer. Economic diversification and successful promotion of commercialization requires the commitment and engagement of several levels of university leadership, researchers, the individuals in the technology transfer office and a network of industry leaders and angel funders. State funding can serve a signaling function that commercialization is of interest to the state, which can in turn attract individuals to the universities who wish to pursue those activities. That signal alone, however, is not sufficient to change an institutional culture. As Johnson's (2012) research has shown, the difference in orientation between commercialists and traditionalists is profound and linked to professional identity and career choices. It is unlikely that a program like the Research Trust Fund will change the mindset of many individuals, but it may lead to a cultural shift which will attract commercially-oriented faculty over time.

What the Research Trust Fund has done, though, is encourage institutional fundraising. Fundraising is an activity that research universities already pursue, and the $50 million in state funding gave them a powerful tool to expand that activity. The differences between Marshall and WVU provide some lessons about the importance of aligning norms and expectations between donors, university leaders and academic faculty and highlight the negative consequences of not

doing so. WVU's pursuit of external funding to support the university's research core through student scholarships as well as endowed chairs was more popular with donors than Marshall's attempt to acquire funds to endow a commercialization focused institute under control of the Marshall University Research Corporation. The successes of these two strategies points to the pervasiveness of academic capitalism in West Virginia's two research universities. It appears from this case study that a modest academic capitalism that provides high salaries to researchers in STEM fields is fine, but a more radical form of academic capitalism that attempts to use state funds to finance an interstitial organization that eliminates tenure and explicitly places faculty careers into the marketplace is not. What this suggests is that while universities may be viewed as organizations oriented towards the acquisition of funds by all of the stakeholders involved, there are limitations to how those funds should be acquired and spent.

Although the question of whether investing $50 million of state funds into the West Virginia Research Trust Fund has been a wise investment is perhaps more a matter of opinion than fact at this stage, a few lessons are clear. First, a five year time horizon is too short to properly evaluate the economic impact of the program. The timeline is too short because it took three to four years for the endowments to generate spendable revenue, but also because of the time it takes to move a research idea from the bench, through the patenting and licensing process, into commercial production. Second, if states are intent on promoting commercialization, they should write policy that focuses more explicitly on commercialization and technology transfer. Focusing on fundraising as the primary benchmark of success has meant that Marshall and WVU have focused on fundraising, not on research commercialization. The investment may lead to research commercialization, or it may not, but there are no explicit mechanisms for tracking commercialization that results from the RTF program. Third, even if states drafted more

explicitly commercialist policy, it is not clear it would work. Commercialization activity is contested area of professional identity for scientists, with many traditionalist faculty members vehemently opposed to commercially-oriented research. The mechanisms by which state policy has the ability to change those views are not well understood, although as reward structures shift to favor commercialization activities it seems that some researchers do change their views. Finally, states need to consider what goals they expect to reach with such policies. Institutional rankings and reputations change slowly and there is stiff competition between peers to maintain their positions relative to one another. Expecting an institution like WVU or Marshall to make a tremendous leap forward because of $50 million in state investment is probably unrealistic. If that money was used to build meaningful regional partnerships rather than fuel competition with out-of-state peers, it might have a better chance of impacting the state and helping the universities to carve out valuable resource niches.

Areas for Future Research

This research opens up several lines of inquiry for future research. In terms of better understanding the impact of policies and programs like the Research Trust Fund, one possibility would be to use this study as a basis for comparative research. Looking at the development and impact of Kentucky's Bucks for Brains program would be particularly interesting because of the similarity between the two programs. Another fruitful area of research about the impact of such programs would be to look more closely at the campus cultures around technology transfer and commercialization. Conducting campus interviews with faculty members, upper-level administrators, technology transfer officers and those in the development office would provide a more nuanced understanding of the different institutional reactions to this program. Additionally,

reexamining the Research Trust Fund program in several years to better evaluate the economic impact and the external factors that influenced it would prove valuable. A longer timeline would allow more activities to develop and provide better information about the program's long-term impacts. Better understanding the impact of such programs through comparative or more in-depth study could also lead to a better understanding of institutional capacity to attract eminent scholars or build research capacity in areas identified through state policy. Looking closely at the institutions that have been impacted by policies like the Research Trust Fund and looking at what they have done with those funds could help identify a set of factors that institutions need to have in order to be successful in achieving state policy objectives such as commercialization of university research, technology transfer or job creation. It can also help identify a capacity threshold below which these investments do not make sense for states. Although allocating funding for programs like the RTF is a political process and subject to dynamics of state legislatures as illustrated in this study, understanding which institutions can benefit the most from RTF-like programs, or how to maximize state investments once they are made, could be very valuable for policymakers and institutional leaders.

This study also opens up areas for potential research in the study of policy adoption. The Research Trust Fund was examined within the context of policy adoption and diffusion, framing it as a new addition to the eminent scholars programs that had been adopted by over twenty states. One of the primary research questions was about the factors and actors at play in a state when such a policy is adopted. The other side of that question, and an area that is under researched, is what socio-economic and political factors lead to *decreased* funding and support for eminent scholars programs specifically, or university research-based economic development programs more broadly? Which actors become less supportive, and why, and which actors

discourage funding or adoption of such programs? The State Science and Technology Institute (SSTI, 2013) finds that decreases in tax revenue can lead states to either invest in technology and research-based economic development initiatives, or to cut them. They also observe that a, "pattern of heightened activity in the first year of a new gubernatorial administration with fewer proposals in the second year is typical, particularly in the 20 states with biennial budgets" (2013, p. 1). This suggests that there are state-level factors (having a new governor, having a biennial budget) that may influence funding levels for university research-based programs. At the same time, the diversity of state reactions to similar economic conditions suggests that there are likely factors that exist which contribute to the disinvestment of state funds in programs like the RTF, just as there are with investment. The findings of this study suggest that there are likely policy entrepreneurs that work to defund state investments in university research in favor of other areas, just as there are those that work to provide funding. Using a case study approach like the one utilized here could provide valuable information about disinvestment as well and could be a useful tool for state policymakers, university leaders or researchers.

An additional line of policy adoption research that this study opens up is why quantitative and qualitative studies differ in their assessment of the impact neighboring states have on policy adoption. Hearn et al.'s (2009) research on the spread of eminent scholars (ES) programs found that when other states in the region have an ES program it does not increase the likelihood of a state adopting an ES policy. They tested specifically for diffusion within a census-region and across contiguous states and found that neither indicator was significant. Yet in this study, every interviewee mentions Kentucky's Bucks for Brains programs as the model for the West Virginia Research Trust Fund. Several also mention socio-economic and cultural elements that Kentucky and West Virginia share as part of what helped policymakers in West Virginia "see themselves

in the problem" as discussed in Chapter 3. This suggests that the deployment of the Kentucky example in West Virginia may have been a post-hoc justification for the adoption of a policy that important in-state policy entrepreneurs wanted to see adopted. Other qualitative studies of higher education policy diffusion have also found that the policies of neighboring states influence one another. While focused on merit-aid scholarship adoption in southeastern states rather than eminent scholars (Cohen-Vogel, Ingle, Levine, & Spence, 2008) find that what neighboring states do is a definite factor in policy adoption. Specifically, they find that competition with other states, the convenience of adopting policy ideas from neighbors and the existence of inter-state policy communities all factor into policy diffusion across state borders. Mintrom & Vergari's (1998) study of the diffusion of state education reforms also finds that policy networks that crossed state lines are a factor in diffusion. While the fact that the Research Trust Fund is both a higher education program and an economic development program may make comparisons with the two studies above more difficult, interviewees consistently mentioned the importance of key actors in Kentucky, such as the University of Kentucky's President Lee Todd, in helping to convince policymakers in West Virginia to adopt a Bucks for Brains program like Kentucky's. What this suggests is that further qualitative research not only on the ways that policy ideas migrate, but on how arguments about what neighboring states are doing are deployed as a tool for promoting policy adoption could help inform future quantitative studies. Specifically, identifying policy entrepreneurs from each state and asking them how, why and to whom they discussed policies in other states could provide critical insights into the mechanics of policy diffusion.

Finally, this study raises questions about the role that donors play in university research-based economic development programs. The structure of the Research Trust Fund, requiring

universities to acquire private donations before they can access state funds, gives the donors de facto control over both their own funds and those that the state has provided. While this policy structure can be seen as a clear example of academic capitalism, questions remain about the consequences of such a policy for faculty and students. Interviews with faculty in both STEM and non-STEM disciplines could help answer questions about how impacts vary across departments. What are also poorly understood at this point are the personal, professional and economic reasons that donors are giving to programs like the Research Trust Fund. This study finds that many of the biggest donors are wealthy alumni or foundations with a history of regional or institutional donations. Interviews with donors or development officers might reveal more about the motivations of donors and the power dynamics between donors and institutions. Those interviews would also help illuminate how the norms and values of donors, university leaders, legislators and research faculty intersect and conflict and what the consequences of those conflicts are on university research agendas, institutional funding and regional economies. This would be particularly interesting in cases where donors, institutions or state legislatures are at odds and would help illuminate the power and influence that donors actually wield in state-funded research programs that require private match.

Research that answers the questions described above on the development and decline of policies that promote the commercialization of university research, and their efficacy, will be increasingly valuable as more states and regions attempt to use universities as engines of economic development. In addition, further qualitative or mixed-methods studies can also help researchers better understand how policy ideas move across state lines and what the consequences are for that movement. Examining the dynamics at play in the organizational field around such a policy can also help elected officials, state agency representatives, university

leaders and research faculty develop and implement such policies in a way that makes good use of state resources while protecting the integrity of researchers and the public service mission of state research universities. Finally, the power dynamics at work in the development and implementation of policies promoting the commercialization of university research and research-based economic development bear further scrutiny. As we have seen here, reframing universities as economic development engines is not without it complications and has real consequences for students, faculty members and citizens. In particular, a closer examination of both donors and faculty members would help clarify what dynamics are at play and how students, faculty and universities may be impacted by transferring authority over public funds to the private sector.

REFERENCES

American Community Survey. (2008). *American Community Survey Public Use Microdata Sample*. Washington, D.C.: U.S. Census Bureau.

Associated Press. (2012, August 22). WVU closes book on Bresch degree scandal. *The Charleston Gazette*. Charleston, WV. Retrieved from http://wvgazette.com/News/201208220090

AUTM. (2010). Bayh-Dole Act. *Association of University Technology Managers*. Retrieved November 5, 2012, from http://www.autm.net/Bayh_Dole_Act/7698.htm

Bastedo, M. N., & Gumport, P. J. (2003). Access to what? Mission differentiation and academic stratification in US public higher education. *Higher Education*, *46*(3), 341–359.

Becher, T. (1989). *Academic tribes and territories*. Philadelphia, PA: Open University Press.

Berglund, D., & Coburn, C. (1995). *Partnerships: A compendium of state and federal cooperative technology programs*. (C. Coburn, Ed.). Columbus, OH: Battelle Press.

Berry, F. S., & Berry, W. D. (1990). State lottery adoptions as policy innovations: An event history analysis. *The American Political Science Review*, *84*(2), 395–415.

BLS. (2011). May 2011 National Occupational Employment and Wage Estimates - United States. Bureau of Labor Statistcs. Retrieved from http://www.bls.gov/oes/current/oes_nat.htm#19-0000

Bozeman, B. (2000). Technology and Economic Development for Whom?: The Prospects for "Dual Agenda" State Programs. In A. Teich, S. D. Nelson, C. McEnaney, & S. Lita

(Eds.), *AAAS Science and Technology Policy Yearbook 2000* (pp. 175–189). Washington, D.C.: American Association for the Advancement of Science.

Bumgardner, B. (2012, May 22). President Clements salry increase approved. *The Daily Athenaeum*. Morgantown, WV. Retrieved from http://www.thedaonline.com/news/president-clements-salary-increase-approved-1.2873914#.UKE5zWfisn4

Bureau of Economic Analysis. (2011). Gross Domestic Product by State. U.S. Department of Commerce. Retrieved from http://www.bea.gov/iTable/iTable.cfm?ReqID=70&step=1&isuri=1&acrdn=1

Business Roundtable. (2011, March 9). Tapping America's Potential. Retrieved from http://businessroundtable.org/uploads/hearings-letters/downloads/20110309_TAPReid_and_McConnellAmerica_COMPETES_complete_1.pdf

Carnegie Foundation for the Advancement of Teaching. (2011, January 18). Basic Classification: Analysis of Research Activity. Retrieved from classifications.carnegiefoundation.org/downloads/Research_Activity_Index_2011CC.xls

Carnevale, A. P., Smith, N., & Strohl, J. (2010). *Help Wanted: Projections of Jobs and Education Requirements Through 2018*. Washington, DC: Georgetown Center on Education and the Workforce.

Clark, B. R. (1983). *The Higher Education System: Academic Organization in Cross-National Perspective*. Berkeley, CA: University of California Press.

Cohen, M. D., March, J. G., & Olsen, J. P. (1972). A Garbage Can Model of Organizational Choice. *Administrative Science Quarterly*, *17*(1), 1–25.

Cohen-Vogel, L., Ingle, W. K., Levine, A. A., & Spence, M. (2008). The "spread" of merit-based college aid. *Educational Policy, 22*(3), 339–362.

Committee to Assess Research-Doctorate Programs. (2011). *A Data-Based Assessment of Research-Doctorate Programs in the United States: Excel Data Table*. Washington, D.C.: The National Academy of Sciences.

Compact with Higher Education for the Future of West Virginia. , West Virginia Code § 18B-1A-5-C (2004). Retrieved from http://www.legis.state.wv.us/WVCODE/Code.cfm?chap=18b&art=1A#01A

Crum, T. (2011, February 28). University to hire 30 new faculty by semester's end. *The Daily Athenaeum*. Morgantown, WV.

Davis, C. (2013, January 16). Marshall meets $15 million "Bucks for Brains" goal. West Virginia Public Broadcasting. Retrieved from http://www.wvpubcast.org/newsarticle.aspx?id=28231

DiMaggio, P., & Powell, W. W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review, 48*(2), 147–160.

Etzkowitz, H. (2008). *The Triple Helix: University-Industry-Government Innovation in Action*. New York: Routledge.

Etzkowitz, H., & Leydesdorff, L. A. (Eds.). (1997). *Universities and the Global Knowledge Economy: A Triple Helix of University-Industry-Government Relations*. London: Pinter.

Feiock, R. C. (1991). The effects of economic development policy on local economic growth. *American Journal of Political Science*, 643–655.

Feldman, M. P., & Francis, J. L. (2004). Homegrown solutions: fostering cluster formation. *Economic Development Quarterly*, *18*(2), 127–137.

Feller, I. (1992). American state governments as models for national science policy. *Journal of Policy Analysis and Management*, *11*(2), 288–309.

Feller, I. (1997). Federal and state government roles in science and technology. *Economic Development Quarterly*, *11*(4), 283–295.

Feller, I. (2004). Virtuous and vicious cycles in the contributions of public research universities to state economic development objectives. *Economic Development Quarterly*, *18*(2), 138–150.

Feller, I. (2009). Performance Measurement and the Governance of American Academic Science. *Minerva*, *47*(3), 323–344.

Georgia Research Alliance. (2011). Georgia Research Alliance - Origins. Retrieved from http://www.gra.org/AboutGRA/Origins.aspx

Gibbs, L. (Trans.). (2002). *Aesop's Fables* (Oxford World's Classics.). New York: Oxford University Press.

Giltner, T. (2001, December 3). Governor Patton Shares Kentucku's Postsecondary Education Successes with other States. KY Office of the Governor. Retrieved from http://www.e-archives.ky.gov/_govpatton/dec_2003/gov.state.ky.us/ngalab/ngalabrelease.htm

Grant, D. S., & Wallace, M. (1994). The political economy of manufacturing growth and decline across the American States, 1970–1985. *Social Forces*, *73*(1), 33–63.

Greenwood, R., & Hinings, C. R. (1996). Understanding Radical Organizational Change: Bringing together the Old and the New Institutionalism. *The Academy of Management Review*, *21*(4), 1022–1054.

Gumport, P. J. (2000). Academic restructuring: Organizational change and institutional imperatives. *Higher Education*, *39*(1), 67–91.

Hart, D. M. (2008). The Politics of "Entrepreneurial" Economic Development Policy of States in the U.S. *Review of Policy Research*, *25*(2), 149–168.

Harvey, D. (2005). *A Brief History of Neoliberalism*. Oxford: Oxford University Press.

Hearn, J., C., McLendon, M., K., & Lacy, T. A. (2009). The Emergence of State-funded "Eminent Scholars" Programs: University Faculty Recruitment as a Policy Instrument. Manuscript submitted for publicatoin.

Higginbotham, A., Pennington, E., Christiadi, & Witt, T. (2010). *Economic Impact of West Virginia Higher Education Institutions FY 2008*. Morgantown, WV: Bureau of Business and Economic Research, West Virginia University.

Hodel, R., Laffey, M., & Lingenfelter, P. (2006). *Recession, Retrenchment, and Recovery: State Higher Education Funding & Student Financial Aid*. Boulder, CO: State Higher Education Executive Officers. Retrieved from http://www.eric.ed.gov/ERICWebPortal/search/detailmini.jsp?_nfpb=true&_&ERICExtSearch_SearchValue_0=ED502180&ERICExtSearch_SearchType_0=no&accno=ED502180

Hohmann, G. (2011, August 22). Marshall University's head research scientist leaving post. *Charleston Daily Mail*. Retrieved from http://www.dailymail.com/News/statenews/201108211545

Huisman, J., Norgaard, J. D., Rasmussen, J., & Stensaker, B. (2002). Alternative universities revisited: A study of the distinctiveness of universities established in the spirit of 1968. *Tertiary Education and Management*, *8*(4), 316–332.

Jenkins, J. C., Leicht, K. T., & Jaynes, A. (2006). Do High Technology Policies Work? High Technology Industry Employment Growth in US Metropolitan Areas, 1988–1998. *Social forces*, *85*(1), 267–296.

Johnson, D. (2012). *A New Reward System in Academic Science*. University of Georgia, Athens, GA.

Kentucky Council on Postsecondary Education. (2007). Kentucky's Bucks for Brains Initiaitve 1997-2007. Kentucky Council on Postsecondary Education. Retrieved from http://cpe.ky.gov/NR/rdonlyres/CA48D119-0E78-41BB-9D05-1FFBBA0CF7C5/0/BucksForBrains10YearReport.pdf

Kingdon, J. W. (2003). *Agendas, Alternatives, and Public Policies* (2nd ed.). New York: Longman.

Kraatz, M. S, & Zajac, E. J. (1996). Exploring the limits of the new institutionalism: The causes and consequences of illegitimate organizational change. *American Sociological Review*, *61*(5), 812–836.

Kraatz, Matthew S., & Zajac, E. J. (1996). Exploring the limits of the new institutionalism: The causes and consequences of illegitimate organizational change. *American sociological review*, *61*(5), 812–836.

Kvale, S. (1996). *Interviews: An Introduction to Qualitative Research Interviewing*. Thousand Oaks, CA: Sage.

Larsen, I. M. (2000). Research Policy at Universities-Walking the Tightrope Between Internal and External Interests. *European Journal of Education*, *35*, 385–402.

Link, A., & Scott, J. (2003). The Growth of the Research Triangle Park. *Small Business Economics*, *20*, 167–175.

Lumina Foundation for Education. (2010). Navigating the "New Normal." Lumina Foundation for Education, Inc. Retrieved from http://www.luminafoundation.org/publications/Navigating_the_new_normal.pdf

Manchin, J. (2008, January 9). West Virginia State of the State Address 2008. Retrieved from http://stateline.org/live/details/speech?contentId=271437

Marginson, S. (2000). *The Enterprise University: Power, Governance and Reinvention in Australia*. Cambridge, U.K: Cambridge University Press.

Marginson, S., & Rhoades, G. (2002). Beyond national states, markets, and systems of higher education: A glonacal agency heuristic. *Higher Education, 43*(3), 281–309.

Marks, J. (2011). *SREB Fact Book on Higher Education*. Atlanta, GA: Southern Regional Education Board.

Marshall University. (2006). *Marshall's Strategic Vision: Our Bold Constellation for the Future*. Huntington, WV. Retrieved from http://www.marshall.edu/president/strategic/economic.asp

Marshall University. (2011). *Marshall University Research Endowment Plan Annual Report 2010-2011*. Huntington, WV.

Marshall University Board of Governors. (2004a, March 10). Intellectual Policy Property. Marshall University. Retrieved from http://muwww-new.marshall.edu/tto/files/2010/06/MUBOG-GA-4-Intellectual-Property.pdf

Marshall University Board of Governors. (2004b, May 12). Mission of the University. Retrieved from http://www.marshall.edu/www/mission.asp

McLendon, M. K., Deaton, R., & Hearn, J. C. (2007). The enactment of reforms in state governance of higher education: Testing the political instability hypothesis. *Journal of Higher Education*, 645–675.

McLendon, M. K., Hearn, J. C., & Deaton, R. (2006). Called to account: Analyzing the origins and spread of state performance-accountability policies for higher education. *Educational Evaluation and Policy Analysis, 28*(1), 1–24.

McLendon, M. K., Heller, D. E., & Young, S. P. (2005). State postsecondary policy innovation: Politics, competition, and the interstate migration of policy ideas. *Journal of Higher Education*, 363–400.

Merton, R. K. (1973). The normative structure of science (1942). *The Sociology of Science. Theoretical and Empirical Investigations*, 267–78.

Mintrom, M. (1997). Policy entrepreneurs and the diffusion of innovation. *American Journal of Political Science, 41*(3), 738–770.

Mintrom, M., & Vergari, S. (1998). Policy networks and innovation diffusion: The case of state education reforms. *Journal of Politics, 60*, 126–148.

Missouri Technology Corporation. (2007). *Missouri Life Sciences Research Board Spending Plan*. Report to the Chair of the Senate Appropriatns Committee and Chair of the House Budget Committee. Retrieved from http://www.missouritechnology.com/docs/lsrb-/lsrb-december-2007-report-final-doc.pdf?sfvrsn=2

MURC. (2011, July 20). Cline Family Foundation makes $5 mllion gift to Marshall University for sports medicine research. *Marshall University Research Corporation*. Huntington, WV. Retrieved from http://www.marshall.edu/wpmu/murc/cline-family-foundation/

National Economic Council, Council of Economic Advisors, & Office of Science and Technology Policy. (2011, February). A Strategy for American Innovation: Securing Our Economic Growth and Prosperity. The White House. Retrieved from http://www.whitehouse.gov/administration/eop/nec/StrategyforAmericanInnovation

National Science Board. (2004). *Science and Engineering Indicators 2004* (Vols. 1-2). Arlington, VA: National Science Foundation.

National Science Foundation. (2010a). *Survey of Research and Development Expenditures at Universities and Colleges*. Washington, DC: National Science Foundation. Retrieved from http://www.nsf.gov/statistics/rdexpenditures/

National Science Foundation. (2010b). *National Science Foundation/Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges, FY 2008.* Washington, D.C.: National Science Foundation.

NGA. (2002). *A Governor's Guide to Buliding State Science and Technology Capacity*. Washington, D.C.: National Governors Association.

Niemi, R. G., Bremer, J., & Heel, M. (1999). Determinants of state economic perceptions. *Political Behavior*, *21*(2), 175–193.

NSF. (2012). *Higher Education Research and Development: Fiscal Year 2010* (No. NSF 12-330). National Science Foundation: National Center for Science and Engineering Statistics. Retrieved from http://www.nsf.gov/statistics/nsf12330/

Odom, J. (2006). *EPSCoR 2020: Expanding State Participation in Research in the 21st Century - A New Vision for the Experimental Program to Stimulate Competitive Research (EPSCoR)*. Washington, D.C.: National Science Foundation.

OECD. (2004). *Internationalisation and trade in higher education: Opportunities and challenges*. Paris: OECD Publications.

Ohio Board of Regents. (2007, February 20). The Ohio Board of Regents Eminent Scholars Program: FY 2007 Request for Proposals. Retrieved from http://regents.ohio.gov/organization/contracts_proposals/rfps/Eminent_Scholars_RFP_2007.pdf

Olsen, J. P. (2005). The institutional dynamics of the (European) University. *ARENA Working Paper No. 15*.

Palmintera, D. (2005). *Accelerating Economic Development Through University Technology Transfer: Based on Report to the Connecticut Technology Transfer and Commercialization Advisory Board of the Governor's Competitiveness Council*. Reston, VA: Innovation Associates Incorporated.

Palmintera, D., Joy, J., & Lin, E. X. X. (2007). *Technology transfer and commercialization partnerships*. Reston, VA: Innovation Associates. Retrieved from https://cfi-institute.org/Bookstore/TT_and_Comm_Partnerships_Palmintera.pdf

Peters, A., & Fisher, P. (2004). The failures of economic development incentives. *Journal of the American Planning Association*, *70*(1), 27–37.

Pfeffer, J., & Salancik, G. R. (1978). *The External Control of Organizations: A Resource Dependence Approach*. New York: Harper & Row.

Plosila, W. H. (2004). State science-and technology-based economic development policy: History, trends and developments, and future directions. *Economic Development Quarterly*, *18*(2), 113.

Reagan, R. (1987, April 10). Executive Order 12591--Facilitating access to science and technology. Retrieved from http://www.archives.gov/federal-register/codification/executive-order/12591.html

Redman, E. (1973). *The dance of legislation.* New York, NY: Simon and Schuster.

Rudder, T. (2008, March 1). Quad/Graphics' donation to aid WVU medical school. *Hearlad Mail*. Martinsburg, WV. Retrieved from http://articles.herald-mail.com/2008-03-01/news/25085186_1_internal-medicine-health-care-graphics-president

Sá, C. M., Geiger, R. L., & Hallacher, P. M. (2008). Universities and State Policy Formation: Rationalizing a Nanotechnology Strategy in Pennsylvania. *Review of Policy Research*, *25*(1), 3–19.

Saiz, M. (2001). Politics and economic development: Why governments adopt different strategies to induce economic growth. *Policy Studies Journal*, *29*(2), 203–214.

Scott, W. R. (1991). Unpacking institutional arguments. In W. W. Powell & P. J. DiMaggio (Eds.), *The new institutionalism in organizational analysis* (pp. 164–182). Chicago: The University of Chicago Press.

Slaughter, S. (2010). Research Commercialization. In (P. Peterson, E. Baker, & B. McGaw, Eds.)*International Encyclopedia of Education*. Oxford: Elsevier.

Slaughter, S., & Rhoades, G. (1996). The emergence of a competitiveness research and development policy coalition and the commercialization of academic science and technology. *Science, Technology, & Human Values*, *21*(3), 303–39.

Slaughter, S., & Rhoades, G. (2004). *Academic Capitalism and the New Economy: Markets, State, and Higher Education*. Johns Hopkins University Press.

Slaughter, S., & Rhoades, G. (2005). From "Endless Frontier" to "Basic Science for Use": Social Contracts between Science and Society. *Science, Technology, & Human Values*, *30*(4), 536–572.

SSTI. (2013). Trends in Technology-Based Economic Development: Local, State and Federal Action in 2012. State Science and Technology Institute. Retrieved from http://www.ssti.org/

Stephen, P. E., Shiferaw, G., Sumelland, A. J., & Black, G. (2007). Who's Patenting in the University? *Economics of Innovation and New Technology*, (61), 71–99.

TechConnect WV. (2013). TechConnect West Virginia: Mission. Retrieved from http://techconnectwv.org/organization/

TechConnectWV. (2009, March). West Virginia Blueprint for Technology-Based Economic Development. Retrieved from http://techconnectwv.org/Downloads/Executive%20Summary%20-%20WV%20TBED%20Blueprint.pdf

The Associated Press. (2012, April 3). Protea: New device may help reverse $37M losses. *The Charleston Daily Mail*. Charleston, WV. Retrieved from http://dailymail.com/Business/201204230062

Tornatzky, L. (2000). *Building State Economies by Promoting University-Industry Technology Transfer* (p. 34). Washington, D.C.: National Governors' Association.

Tornatzky, L. G., Waugaman, P. G., & Gray, D. O. (2002). *Innovation U.: New university roles in a knowledge economy*. Research Triangle Park, NC: Southern Growth Policies Board.

Travis, S. (2011, January 16). Eminent scholars create controversy at FAU. *Sun Sentinel*. Ft. Lauderdale, FL. Retrieved from http://articles.sun-sentinel.com/2011-01-16/travel/fl-professor-eminent-scholar-20110116_1_scholars-tim-lenz-average-teaching-load/2

U.S. Census Bureau. (2009). 2005-2009 American Community Survey. U.S. Census Bureau. Retrieved from http://www.factfinder.census.gov/servlet/ACSSAFFFacts?_event=Search&_name=&_state=04000US54&_county=&_cityTown=&_zip=&_sse=on&_lang=en&pctxt=fph&_submenuId=factsheet_1

United States Congress. Morrill Act. , Public Law (1862). Retrieved from http://www.ourdocuments.gov/doc.php?flash=true&doc=33&page=transcript

Unruh, R. (2011). *Driving Innovation from the Middle*. Washington, DC: National Skills Coalition. Retrieved from http://www.nationalskillscoalition.org/assets/reports-/nsc_sga_middleskillsbrief_2011-08.pdf

Van Vught, F. (1996). Isomorphism in higher education? Towards a theory of differentiation and diversity in higher education systems. In *The Mockers and Mocked: Comparative Perspectives on Differentiation Convergence and Diversity in Higher Education.* Oxford: Pergamon.

Walker, J. L. (1969). The diffusion of innovations among the American states. *The American Political Science Review*, *63*(3), 880–899.

Ward, K., Jr. (2012, March 15). Shell to build ethane cracker plant in Pa., not W.Va. *Charleston Gazette*. Charleston, WV. Retrieved from http://wvgazette.com/News/201203150088

Weick, K. E. (1976). Educational organizations as loosely coupled systems. *Administrative Science Quarterly*, *21*(1), 1–19.

West Virginia College Completion Task Force. (2012, May). Educating West Virignia is Everyone's Business. West Virginia Higher Education Policy Commission. Retrieved from https://www.wvhepc.org/resources/West_Virginia_College_Completion_Task_Force_releases_findings_and_recommendations.pdf

West Virginia EPSCoR Advisory Council. (2005, December). Vision 2015: West Virginia Science and Technology Strategic Plan. WVEPSCoR. Retrieved from http://www.wvresearch.org/wp-content/uploads/2011/11/vision2015.pdf

West Virginia Higher Education Policy Commission. (2008). *2007-2008 Fiscal Years in Review*. Charleston, WV: WVHEPC Division of Science and Research.

West Virginia Higher Education Policy Commission. (2011). *Report to the Legislative Oversight Commission on Education Accountability: West Virginia Research Trust Fund*. Charleston, WV: West Virginia Higher Education Policy Commission.

West Virginia Legislature. Directed Research Endowments. , West Virginia Code § 18B-18A-1 (2008). Retrieved from http://www.legis.state.wv.us/Bill_Status/bills_history.cfm?year=2008&sessiontype=RS

West Virginia University. (2005). *West Virginia University's 2010 Plan: Building the Foundation for Academic Excellence*. Morgantown, WV. Retrieved from http://www.wvu.edu/~2010plan/documents/2010plan.pdf

West Virginia University. (2011a). WVU2020: Strategic Plan for the Future. West Virginia University. Retrieved from http://strategicplan.wvu.edu/the_destination/aspirations

West Virginia University. (2011b). *WVU 2020: Strategic Plan for the Future*. Morgantown, WV. Retrieved from http://strategicplan.wvu.edu/

WVHEPC. (2008). *Report of Five-Year Outcomes from the First Round of Research Challenge Grants*. Charleston, WV: West Virginia Higher Education Policy Commission Division of Science and Research.

WVHEPC. Research Trust Fund Program. , Legislative Rule § §133-48-14.3 (2009). Retrieved from https://www.wvhepc.org/resources/rulesandpolicies_files/Series%2048%20%284-16-09%29.pdf

WVHEPC. (2012a). HEPC Yearly Personnel. West Virginia Higher Education Policy Commission. Retrieved from https://www.wvhepc.org/resources/Dashboard/YearlyPERS/hepc_no_race/allHepcTotTop.html

WVHEPC. (2012b). Master Planning Indicators.

WVHEPC. (2012c, December 7). Meeting of the West Virginia Higher Education Policy Commission Amended Agenda.

WVU. (2011). *WV Research Trust Fund Annual Report from West Virginia University*.

WVU Today. (2011, March 14). WVU receives gift enabling nearly $10 million investment in graduate education. *University Relations/News*. Morgantown, WV. Retrieved from http://wvutoday.wvu.edu/n/2011/03/14/wvu-receives-gift-enabling-nearly-10-million-investment-in-graduate-education

WVU Today. (2012, January 12). WVU College of Engineering and Mineral Resources dedicated in name of benefactor Benjamin M. Statler. *University Relations/News*. Morgantown, WV. Retrieved from http://wvutoday.wvu.edu/n/2012/01/12/wvu-names-engineering-and-mineral-resources-college-for-alumnus-ben-statler

WVURC. (2006, December 5). WVU's Intellectual Property Policy. West Virginia University Research Corporation. Retrieved from http://techtransfer.research.wvu.edu/ip_policy

Yin, R. K. (1994). *Case Study Research: Design and Methods* (2nd ed., Vol. 5). Thousand Oaks, CA: SAGE Publications.

Youtie, J., & Shapira, P. (2008). Building an innovation hub: A case study of the transformation of university roles in regional technological and economic development. *Research Policy*, (37), 1188–1204.

APPENDIX A

West Virginia Senate Bill No. 287

ENROLLED

COMMITTEE SUBSTITUTE

FOR

COMMITTEE SUBSTITUTE

FOR

Senate Bill No. 287

(BY SENATORS TOMBLIN, MR. PRESIDENT, AND CARUTH,

BY REQUEST OF THE EXECUTIVE)

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[Originating in the Committee on Finance;

reported February 21, 2008.]

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AN ACT to amend the Code of West Virginia, 1931, as amended, by adding thereto a new article, designated §18B-18A-1, §18B-18A-2, §18B-18A-3, §18B-18A-4, §18B-18A-5, §18B-18A-6, §18B-18A-7, §18B-18A-8, §18B-18A-9, §18B-18A-10, §18B-18A-11 and §18B-18A-12, all relating to public higher education; research; establishing the West Virginia Research Trust Fund; legislative findings; defining terms;

creating special account in the State Treasury; providing for allocation of moneys; authorizing Marshall University and West Virginia University to establish directed research endowments; providing requirements for and administration of directed research endowments; authorizing use of investment earnings; prohibiting expenditure of principal in directed research endowments; providing criteria and restrictions for qualified private donations and qualified private donation pledges; establishing eligible uses of directed research endowment proceeds; requiring directed research endowment plans; establishing criteria and procedures for distribution of matching moneys from the West Virginia Research Trust Fund and providing for reallocation of moneys under certain conditions; requiring participating institutions to return unmatched moneys to the trust fund under certain circumstances; authorizing distribution of certain moneys to state colleges; directing and authorizing Higher Education Policy Commission to promulgate rules; and requiring annual reports.

Be it enacted by the Legislature of West Virginia:

That the Code of West Virginia, 1931, as amended, be amended by adding thereto a new article, designated §18B-18A-1, §18B-18A-2, §18B-18A-3, §18B-18A-4, §18B-18A-5, §18B-18A-6,

§18B-18A-7, §18B-18A-8, §18B-18A-9, §18B-18A-10, §18B-18A-11 and §18B-18A-12, all to read as follows:

ARTICLE 18A. DIRECTED RESEARCH ENDOWMENTS.

§18B-18A-1. Legislative findings; purpose; and intent.

(a) The Legislature finds that the continued expansion of the nation's economy is dependent upon the ability of its institutions of higher education to increase the quality, quantity and productivity of its citizens who are engaged in scientific and technical fields of study. Failure of the United States to compete in these areas may lead to lower standards of living, dependence upon foreign intellectual capital and international insecurity. The economic future of West Virginia is equally dependent upon the ability of Marshall University and West Virginia University, the state's two doctoral-granting, public research universities, to promote, educate and train researchers and research support staff in these diverse fields of study.

The Legislature further finds that a recent emphasis on the creation of innovative curricula and the receipt of significant private donations by Marshall University and West Virginia University has led to major expansions in certain areas of study, including energy, national security technology, environmental sciences, health and biomedical sciences, biometrics, biotechnology and nanotechnology. Despite these

expansions, the additional investment of both private donations and state moneys is critical to recruiting world-class scientists, researchers, research staff, technicians and professional degree graduates, as well as providing funding for laboratories and scientific equipment.

(b) The purpose of the Legislature in enacting this article is to establish a state fund to be administered by the Higher Education Policy Commission to address the findings outlined in subsection (a) of this section. The fund will make public moneys available to the state's two doctoral-granting public research universities to match qualified private donations and qualified private donation pledges; thereby creating an incentive for donors to support certain priority areas of study consistent with each participating institution's long-range strategic plan for research. Creation of this fund promotes strategic private donations targeted to specific areas of research and creates a sustainable source of funding for research initiatives that are critical to achieving long-term goals including, but not limited to, the following:

(1) Research-based economic development and economic diversification; and

(2) Increased potential for patenting, licensing and related technology transfer and commercialization of scientific and technological research in the state.

§18B-18A-2. Definitions.

(a) *General* -- For the purposes of this article, terms have the meaning ascribed to them in section two, article one of this chapter, unless the context in which the term is used clearly requires a different meaning or a specific definition is provided in this section.

(b) *Definitions* --

(1) "Directed research endowment" or "research endowment" means an account established at or administered by a participating institution or its affiliated research corporation or foundation in accordance with the provisions of section four of this article;

(2) "Directed research endowment plan" or "research plan" means the strategies and procedures formally approved and adopted by a governing board of a participating institution pursuant to section seven of this article outlining how a participating institution proposes to use directed research endowment proceeds to meet established goals and objectives;

(3) "Directed research endowment proceeds" or "endowment proceeds" means those investment earnings accruing to a participating institution's directed research endowment and available for expenditure by a participating institution or its affiliated research corporation in accordance with the provisions of section four of this article;

(4) “Trust fund” means the special account designated as the West Virginia Research Trust Fund established in section three of this article;

(5) "Participating institution” means Marshall University or West Virginia University;

(6) “Qualified private donation” or “qualified donation” means any private donation, gift or bequest to a directed research endowment that meets the criteria set forth in section five of this article;

(7) "Qualified private donation pledge" or “qualified pledge” means any pledge, commitment or other agreement to give a private donation to a directed research endowment that is made pursuant to a written agreement between the donor and the institution or its affiliated research corporation or foundation and that meets the criteria set forth in section five of this article;

(8) “Foundation” means a corporation created, organized and located in West Virginia that meets the following conditions:

(A) Is organized and operated for educational purposes in support of one or more state institutions of higher education;

(B) Is designated by the board of governors of one or more state institutions of higher education to receive charitable

contributions for educational purposes on behalf of the institution or institutions;

(C) Does not have any part of its earnings inuring to the benefit of any private shareholder or individual;

(D) Is not disqualified from tax exemption under 26 U. S. C. §501(c)(3) for any reason; and

(E) Does not participate or intervene in, on behalf of or in opposition to any political campaigns for public office;

(9) "Research corporation" means an organization created pursuant to the provisions of article twelve of this chapter; and

(10) "State college" means the West Virginia School of Osteopathic Medicine, Bluefield State College, Concord University, Fairmont State University, Glenville State College, Shepherd University, West Liberty State College or West Virginia State University.

§18B-18A-3. West Virginia Research Trust Fund.

(a) There is created in the State Treasury a special fund to be known as the West Virginia Research Trust Fund which shall consist of any appropriations of moneys to the fund made by the Legislature, all earnings from investment of the fund and any unmatched portion of state moneys returned by a state institution of higher education.

(b) Expenditures from the trust fund shall be made for the purposes set forth in this article and are not subject to separate appropriation by the Legislature. Any balance, including accrued investment earnings on any unmatched portion of state moneys returned by a state institution of higher education in the trust fund at the end of each fiscal year shall not expire to the General Revenue Fund, but shall remain in the trust fund and be expended as provided by this article.

(c) In accordance with the provisions of section eight of this article, the commission shall make available seventy percent of moneys in this account to match qualified donations and qualified pledges to West Virginia University and thirty percent of the moneys to match qualified donations and qualified pledges to Marshall University.

(d) Investment earnings accruing in the account may be expended by the commission to provide matching research funds to state colleges in accordance with the provisions of section ten of this article.

§18B-18A-4. Directed research endowments.

(a) The governing board of each participating institution may create and administer or enter into an agreement with its research corporation and/or foundation to administer one or more directed research endowments to receive qualified donations and

matching state moneys allocated for distribution to that institution.

(b) A research endowment consists of qualified donations and
matching moneys distributed by the commission from the trust fund in accordance with the provisions of section eight of this article.

(c) Subject to the following conditions, the governing board of a participating institution or its research corporation may invest moneys deposited into the research endowment either directly or through a foundation subject to the following conditions:

(1) Any interest or other investment earnings on the moneys invested are retained by the participating institution to be used for the purposes set forth in this article;

(2) Any investments authorized by this subsection are made in accordance with and subject to the provisions of the Uniform Prudent Investor Act codified as article six-c, chapter forty-four of this code; and

(3) Any investments authorized by this subsection are not subject to the provisions of section twelve-d, article one, chapter twelve of this code.

(d) Investment earnings accruing to a participating institution’s research endowment, hereinafter referred to as

endowment proceeds, may be expended by the governing board of the participating institution or its research corporation, subject to the provisions of section six of this article and the following conditions:

(1) Endowment proceeds may be expended only for the eligible uses designated; and

(2) The principal of a research endowment may not be expended for any purpose.

(e) The governing board of a participating institution is exempt from liability for any loss or decrease in value of the assets or income of a directed research endowment, except as losses or decreases in value are shown to be the result of bad faith, gross negligence or intentional misconduct.

(f) The governing board of each participating institution shall promulgate a rule or rules for the administration of research endowments that fulfills the purposes and requirements of this article and section six, article one of this chapter.

§18B-18A-5. Qualified private donations.

(a) Private donations and pledges to a research endowment meet the criteria for designation as a qualified donation or qualified pledge under the following conditions:

(1) The donation or pledge is expressly and specifically restricted by the donor for one or more of the eligible uses designated in section six of this article; however, nothing in

this subdivision prohibits a participating institution from designating unrestricted gifts or bequests, or any portion thereof, for use as a qualified donation;

(2) The individual donation or pledge is a minimum of fifty thousand dollars or is bundled with other qualified donations or qualified pledges to meet the fifty thousand-dollar threshold; and

(3) Donations or pledges may be accepted from individuals, partnerships, associations, public and private for-profit and nonprofit corporations and nongovernmental foundations.

(b) The following may not be included as a qualified donation or a qualified pledge:

(1) Any donation or pledge received by a participating institution or its affiliated research corporation or foundation prior to the effective date of this article;

(2) Educational and general fees, auxiliary fees or other student fees generated by the participating institution;

(3) Proceeds from promissory notes, bonds, loans or other instruments evidencing an indebtedness or any other obligation of repayment by the governing board to the maker of the instrument;

(4) Any moneys or assets, other than qualified donations or qualified pledges, received from the participating institution's affiliated research corporation or foundation; or

(5) Any other moneys received from the state or federal government.

(c) The president of each participating institution or his or her designee shall make the initial determination of whether a donation or pledge meets the criteria for qualified donations or qualified pledges as set forth in this section. The president shall also provide a report to the governing board at least once each fiscal year regarding the amount of qualified donations and qualified pledges the participating institution has received.

§18B-18A-6. Eligible uses of directed research endowment proceeds.

(a) Endowment proceeds may be expended by a participating institution or its affiliated research corporation for any of the following designated uses:

(1) To pay the base salaries of newly endowed department chairs, new professorship positions, new research scientists and new research staff positions, including, but not limited to, research technicians and support personnel, and to fund affiliated graduate or undergraduate student research fellowships.

All positions or fellowships shall be engaged primarily in one of the following areas of research:

(A) Energy and environmental sciences;

(B) Nanotechnology and materials science;

(C) Biological, biotechnological and biomedical sciences;

(D) Transportation technology and logistics;

(E) Biometrics, security, sensing and related identification technologies; or

(F) Gerontology; or

(2) To purchase basic infrastructure directly related to an area of research identified in subdivision (1) of this subsection, including, but not limited to, laboratory and scientific equipment, and other essential equipment and materials.

(b) Eligibility criteria regarding the expenditure of directed endowment proceeds to pay the base salaries of personnel, to fund student fellowships and to purchase basic infrastructure shall be established by rules of the commission promulgated pursuant to section eleven of this article.

§18B-18A-7. Directed research endowment plans.

(a) To facilitate the goals of this article and to ensure the prudent expenditure of state moneys, the governing board of each participating institution shall submit to the commission a directed research endowment plan.

(b) The research plan shall include, but is not limited to, the following:

(1) An assessment of the participating institution's current research initiatives, including any initiatives falling within an area of research identified in section six of this article;

(2) An analysis of possible strategies to enhance current research initiatives;

(3) An outline of the participating institution's proposed uses of endowment proceeds, including identification of any specific disciplinary hires, collaborations or acquisitions currently under consideration;

(4) A list of proposed uses contained in the research plan including the anticipated costs associated with each proposed use;

(5) An analysis of the anticipated costs compared to the expected endowment proceeds available to the institution;

(6) An evaluation of how the research plan furthers the purposes of this article and addresses the research needs of the institution;

(7) Identification of the proposed uses for which alternative funding sources may be sought to enhance the comprehensive research initiatives contemplated by the participating institution. Alternative funding sources exclude qualified donations, matching moneys from the trust fund and the endowment proceeds generated from the trust fund; and

(8) Notation of the amount allocated for distribution to the participating institution pursuant to section three of this article.

(c) The governing board of each participating institution shall submit its research plan to the commission prior to submitting its first request for a distribution of matching moneys from the trust fund.

§18B-18A-8. Distributions from West Virginia Research Trust Fund.

(a) A participating institution seeking a distribution of matching moneys from the trust fund first shall obtain qualified donations and/or qualified pledges in an amount equal to the amount of matching moneys requested for distribution and shall submit a request to the commission setting forth the following:

(1) The amount of qualified donations and/or qualified pledges designated for use in requesting the distribution of matching moneys from the trust fund and the amount of any previous distributions of matching moneys from the trust fund;

(2) The amount requested for distribution to the participating institution pursuant to section three of this article;

(3) An explanation of how the proposed use satisfies the criteria for the eligible uses of endowment proceeds set forth in section six of this article;

(4) An explanation of how the proposed use of the endowment proceeds furthers the purposes of this article and addresses the research needs of the institution as identified in the research plan; and

(5) A designation of the applicable research endowment into which the requested matching moneys are to be deposited.

(b) The commission shall review each request for distribution of matching money from the trust fund for compliance with the provisions of this article and the rule promulgated pursuant to section eleven of this article.

(c) Once the commission approves the request of a participating institution, it shall distribute matching moneys from those allocated to the institution in the trust fund to the applicable research endowment in an amount equal to the amount of qualified donations and/or qualified pledges.

§18B-18A-9. Reallocation of matching moneys.

(a) No later than five years from the effective date of this article, each participating institution shall have deposited into its research endowments an amount of qualified donations equal to or greater than the total amount of moneys allocated for distribution to the institution pursuant to the provisions of subsection (c), section three of this article.

(1) If one of the participating institutions fails to have deposited into its research endowments the requisite amount of

qualified donations by the end of this five-year period, then any portion of the moneys allocated to the institution that has not been distributed shall be reallocated for distribution to the other participating institution pursuant to the terms of this article.

(2) To be eligible to receive a distribution of reallocated moneys pursuant to this subsection, the other participating institution shall have qualified donations in excess of the amount required by subsection (a) of this section deposited into its research endowment(s) in an amount equal to or greater than the amount of reallocated moneys.

(3) If the other participating institution does not have excess qualified donations on deposit, the reallocated moneys shall be made available for distribution by the commission to state colleges in accordance with the provisions of section ten of this article.

(b) If any pledge previously used by a participating institution to obtain a distribution of matching moneys from the trust fund has not been paid in full within five years from the effective date of this article, then the institution shall return the unmatched portion of state moneys to the trust fund. These moneys shall be reallocated for distribution to the other participating institution or to the state colleges pursuant to

the terms of this section and section ten of this article as applicable.

(c) If both participating institutions fail to have deposited into their respective research endowments the requisite amount of qualified donations within five years from the effective date of this article, then any moneys remaining in the trust fund that have not been distributed shall be made available for distribution by the commission to state colleges in accordance with the provisions of this article.

§18B-18A-10. Distributions to state colleges.

(a) The commission may use a portion of those moneys derived from investment earnings accruing to the trust fund in accordance with the provisions of section three of this article, as well as moneys that are not distributed to participating institutions in accordance with the provisions of section nine of this article, to distribute state matching moneys to state colleges, as that term is defined in section two of this article.

(b) In the rules required by section eleven of this article, the commission shall establish procedures for the competitive application and review of requests from state colleges and criteria for the eligible use of moneys distributed pursuant to this section.

(c) To qualify for a distribution of state matching moneys pursuant to this section, a state college shall meet the following conditions:

(1) Obtain qualified donations in an amount equal to or greater than the amount of matching moneys requested for distribution from the trust fund; and

(2) Deposit the qualified donations and any matching moneys distributed from the trust fund into the accounts of the institution or its affiliated research corporation or foundation.

(d) State matching moneys may be expended only for a research-oriented initiative approved by the commission.

§18B-18A-11. Higher Education Policy Commission rule required; emergency rule authorized.

(a) By the first day of October, two thousand eight, the commission shall propose a rule for legislative approval in accordance with the provisions of section six, article one of this chapter and article three-a, chapter twenty-nine-a of this code to implement the provisions and purposes of this article. The rule shall include the following:

(1) Documentation standards and review procedures to determine whether a donation or pledge meets the criteria of a qualified donation or qualified pledge when initially received

or when the terms of a qualified donation or a qualified pledge are materially altered;

(2) Eligibility criteria in accordance with the provisions of section six of this article for the expenditure of endowment proceeds to pay the base salaries of personnel, to fund research fellowships and to purchase basic infrastructure;

(3) Procedures to ensure that endowment proceeds are expended in compliance with the provisions of this article;

(4) A requirement for each participating institution to report on the total amount of qualified donations received, the investment earnings realized and any anticipated expenditures of the research endowment proceeds in its annual operating budget; and

(5) Procedures for the competitive application and review of requests from state colleges and criteria for the eligible use of moneys distributed pursuant to section ten of this article.

(b) The Legislature finds that an emergency exists and, therefore, the commission shall file a rule to implement the provisions of this article as an emergency rule pursuant to the provisions of article three-a, chapter twenty-nine-a of this code. The rule is subject to the prior approval of the Legislative Oversight Commission on Education Accountability.

§18B-18A-12. Annual report.

By the first day of January, two thousand ten, and annually thereafter, the commission shall submit a report to the Governor, the President of the Senate, the Speaker of the House of Delegates and the Legislative Oversight Commission on Education Accountability detailing implementation of the research endowments at each participating institution, the amount of qualified donations received by each participating institution in the preceding fiscal year, the amount of any distributions made from the trust fund and a description of the research and outcomes supported by those moneys.

APPENDIX B

Interview Protocol

Title: Using State Policy to Promote the Commercialization of University Research: An Analysis of the West Virginia Research Trust Fund

PI: Sheila Slaughter

Interview Questions

1. Where did the idea for SB287 come?
    a. Why matching fund? Other examples?
    b. How were the areas of expenditure determined?
2. From your recollection, what were some of the key events that led to the introduction of SB287 during the 2008 regular session of the WV legislature?
3. How would you describe your involvement in the development and passage of the "Bucks for Brains" legislation?
4. Who were the leading proponents of the bill? Why did they support it?
5. Who were the major opponents of the bill? Why did they oppose it?
6. Were there any significant challenges you can recall in passing the bill?
7. How did you expect this legislation to lead to economic development?
    a. What were the specific expectations for WVU and Marshall?
8. How has WVU met these expectations/the expectations of the legislature? How has Marshall?
9. What impact do you think this bill has had on WVU and Marshall?
    a. Do you think it has improved the way people view the universities?
    b. Have there been any negative consequences that you are aware of?
10. What impact do you think this bill has had on the state's economy so far? What impact do you think it will have in the next 10 years?