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HEAD OF THE CLASS: A COMPARATIVE ECONOMIC ANALYSIS OF GLOBAL HIGHER EDUCATION AND COMPETITIVENESS

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Abstract

Since World War II, the United States has been a shining beacon of leadership in the field of higher education. The innovation and economic growth associated with this leadership has also been globally noticed. Dominance is a part of the American character as the US economy has outperformed those of other nations for many years. Similarly, US institutions of higher education – colleges and universities, both public and private – have, on average, historically outperformed those of other nations. Leadership has become part of United States citizens' national identity. The trend of the United States in terms of progress, innovation, tertiary enrollment rates, and tertiary graduation rates has been reversing and the gap between the United States and other nations has been closing. This paper will highlight the current trends and explain why the United States is losing its dominance in the realm of higher education.

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Chapter 1: Introduction

In today's globalized knowledge economy, a college degree is crucially important to individual growth and success. At the micro level, a college degree may be imagined as "an indispensable passport" (Brody, 2007, p. 122) that allows individuals to move seamlessly beyond the borders of income class structure. At the macro level, higher education is an imperative tool for promoting and sustaining the economic growth of nations. Since World War II, the United States has been traditionally recognized as the global leader in higher education for a number of reasons. In early 2007, William Brody wrote, "[The United States] has more colleges and universities, enrolls and graduates more students, and spends more on advanced education and research than any other nation" (Brody, 2007, p. 122). In the same breath, he acknowledges the recent trend that resounds throughout this thesis – the historically dominant position of the United States is being challenged.

Educational policy worldwide has been shifting to focus on improving aggregate student achievement, often measured by graduation rates and contribution to human capital, as a means to increase overall economic growth (Ramirez et al., 2006). Historically, higher education policy and reform was based on political, religious, or military force rather than economic goals and interests, but in today's global economy the winds have changed.

There is also a considerable push to focus tertiary education investment in the subject areas of science, engineering, and mathematics, given their link to innovation (Ramirez et al., 2006). In addition to a focus on quality instruction of math and science, since World War II economic success "has increasingly been viewed as produced by

mass, and later even higher, educational expansion" (Ramirez et al., 2006, p. 20). Education is "no longer mostly a local matter shaped by societally endogenous factors but instead a world institution influenced by universalistic ideas about education as a means to development, which itself is now a standardized world goal" (Ramirez et al., 2006, p. 21). This standardization has led in part to the convergence of nations with respect to higher education that is the crux of this thesis. Globalization is also partially responsible, along with differences in political climate and values across nations. The United States, once a shining example of how universities could ultimately benefit society, is starting to sink into the shadows of other nations.

Recent studies have revealed that in the past ten years, the United States has done the least of all comparable rich nations (and even some developing ones) to better itself in terms of innovation and competitiveness. United States universities are also starting to share top global rankings with more and more colleges from all over the world. Part of this problem lies in misguided public and private investment in higher education. Part lies in a financial aid system that is outdated and difficult to access. What is clear is that the United States cannot let its current higher education remain stagnant if it hopes to compete with and contribute like the education systems of foreign countries. Our innovativeness and competitiveness does not rely completely on higher education, but a significant portion of it does, and other nations are taking great strides while the United States stands still.

This thesis is essentially a tale of two gaps. The first gap describes the distance between other countries and the United States as they vie for the lead position as the best provider of higher education. This gap is closing as the rest of the world is catching

up to or surpassing the United States in terms of higher education enrollment, tertiary graduation rates, and preparedness for future years of sustained innovation and competitiveness. The second gap describes the widening distance between socioeconomic classes seeking higher education. Due to limited knowledge of and access to federal funding, the United States system of higher education is excluding potential students, mostly from the lower socioeconomic classes. As generations of poor miss out on precious schooling and generations of rich continually benefit from misguided investment and archaic aid policy, a paralyzing divide is formed, defeating the "indispensable passport" purpose of higher education altogether. To fight this progression, the United States must provide fair access to all students, not just upper-class students, or else it will miss out on potential innovators and contributors to economic growth.

Before delving into the tale of the two gaps, this thesis will set the scene by discussing fundamental links between higher education and economic growth in Chapter 2. In reference to the global gap, Chapter 3 will then focus on a study conducted by the Information Technology and Innovation Foundation that reveals just how little the United States is doing to prepare itself for the future in terms of competitiveness. Part of this discussion will focus on the progressiveness of Europe and to a larger extent, Southeast Asia. There is less global emphasis now on low cost production and more emphasis on better human capital – a product of strong tertiary education. In Chapter 4, Recent empirical data from OECD and UNESCO will be interpreted to discover exactly how the United States is doing in terms of growth in tertiary enrollment and tertiary graduation rates. Chapter 5 will shift to focus on the

domestic gap and begins with a discussion of investment patterns in higher education, specifically in the United States. By highlighting the findings of two public policy think tank projects, the thesis will address the domestic gap and how it affects the global gap, and will then suggest frameworks for future investment schemes. It is certainly not too late for higher education in the United States to change. With recognition of crucial issues and carefully crafted reform, the United States can take its place as a leader in higher education once again.

Chapter 2: Economic Linkages to Higher Education

Human Capital and Higher Education

It is intuitive that greater levels of innovation and competitiveness can be achieved through a skilled, educated workforce. Higher education[1] plays a role in determining economic growth by providing a nation's labor force with necessary training and knowledge. "Since the 1960s, the role of human capital in economic growth has enjoyed popularity among economists as it is believed to give better insights into differences in economic growth" (Permani, 2009, p. 2). Furthermore, accumulation of tertiary-educated human capital can create economies of scale, accelerate technological progress, and increase the effectiveness and productivity of inputs (Permani, 2009). Risti Permani (2009) summarizes a number of studies conducted on East Asian countries and concludes that higher education does positively impact economic growth directly, indirectly, and complimentarily through other factors such as openness, physical capital and exports. Economic growth may also lead to demand for skilled labor, which in turn creates demand for more higher education, suggesting a symbiotic relationship between higher education and economic growth (Permani, 2009). There also exists a natural flow of information from universities to industries that will be discussed later in this thesis. The idea behind this flow is that research and development carried out at the university level can ultimately lead to higher levels of

[1] For the purposes of this thesis, the terms "higher education" and "tertiary education" are interchangeable. A tertiary degree is defined as a degree resulting from a theoretically-based, research oriented program which takes at least three years to finish and is intended to provide base knowledge and preparation for an advanced research degree. In the United States, this corresponds to a traditional four-year undergraduate degree.

innovation and better standards of living. F. M. Scherer has written extensively on the subject and notes that in addition to himself, “[e]conomists of as diverse persuasion as Adam Smith, Karl Marx, and Joseph Schumpeter have argued that material standards of living depend critically on the level of technology” (Scherer, 1984, p. 32).

Much of this thesis discusses tertiary enrollments and graduation rates of various nations to find and determine current trends in higher education. Atkinson and Andes (2009) examine higher education attainment as a percentage of adults aged 25–34 who have graduated with a tertiary degree. As earlier defined, such a degree is a result of a theoretically-based, research oriented program which takes at least three years to finish and is intended to provide base knowledge and preparation for an advanced research degree. This statistic is important in understanding economic development because, as the authors of the study put it, “innovation and productivity are supported by a highly educated workforce, [and] higher education attainment has become an important component of economic success” (Atkinson and Andes, 2009, p. 10). This is especially true in more industrialized, high-skill nations since they cannot compete as effectively in low-skill work. While the United States currently leads Europe in terms of higher education attainment, some EU nations individually exceed the US tertiary graduation rate of 39%, as calculated by Atkinson and Andes. The researchers mention Ireland at 41%, which includes higher education as a priority in its development strategy, but other nations like Spain, Denmark, and Belgium also surpass the United States in this statistic (Atkinson and Andes, 2009). Elsewhere in Europe, graduation rates are lower, but this may be due to different styles of higher education. For example, only 22% of 25–34 year-olds in Germany hold a tertiary degree, but program lengths are significantly longer

and many students choose to pursue technical education rather than a traditional four-year curriculum[2] (Atkinson and Andes, 2009). It follows that countries with shorter program lengths like Australia, Denmark, Finland, Iceland, Italy, the Netherlands, New Zealand, Norway and Poland have higher graduation rates, while countries like Austria and Germany that have longer program lengths have lower tertiary graduation rates (Atkinson and Andes, 2009). Trends paint a different picture, however; the United States has seen only a 3% increase over the last decade in tertiary graduation rates, which is well below the average (22%) for the nations involved in the study. On the other hand, this figure increased by 25% in the EU-15 thanks to high growth nations like the UK and Ireland. In the EU-10, Poland alone boasts a 117% change score for the advancements it has made in higher education over the past decade (Atkinson and Andes, 2009).

When the United States is compared to nations outside of Europe in this statistic, it becomes evident that while the United States may have previously led the world in higher education attainment, they do not at present. Russia is the current global leader with a tertiary graduation rate of 56% and Canada, with a rate of 54%, is the runner up (Atkinson and Andes, 2009). The other six nations that surpass the United States include two more countries outside of Europe and are Japan (53%), South Korea (51%), Belgium (41%), Ireland (41%), Denmark (40%), and Spain (40%) (Atkinson and Andes, 2009). In terms of change scores and for all countries examined where data was available, the United States scored lowest once again in terms of the growth in the tertiary graduation rate over the past decade (Atkinson and Andes, 2009).

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[2] The ITIF study employs a weighting system for each of the 16 factors considered in determining a country's overall innovativeness rank. These will be discussed later in the thesis and can also be found in the Appendix. Due to dissimilarities in tertiary degree programs across countries, the higher education statistic is given a lower weight, according to its relative importance.

University-Industry Knowledge Transfer

Graduation and enrollment rates would mean nothing if not for the contributions to human capital made by students of higher education systems. One of the key concepts behind what makes one country more innovative than the next is the idea of a transfer that takes place between a university and industry. The skills to create and innovate obviously would not be useful if students never took them to work after graduation. Historically, universities taught hard science, but educational incentives are now more in line with the true aims of scientific research than ever – that is, universities are becoming increasingly important in the processes of invention, innovation, and commercialization (Litan et al., 2007). It follows that universities and those who invest in universities should support this transfer every step of the way.

According to Robert E. Litan in a Brookings publication, more than half of basic research today is conducted in universities (Litan et al., 2007). And while the research output of U.S. universities appears to be in good shape at present, there are some unsettling indicators that suggest otherwise for the future. Litan lists three trends; “stagnant to declining levels of industrial research and development investments, decreasing industry-university co-authorships, and decreasing citations of U.S. science and engineering articles by industry” (Litan et al., 2007, p. 3). He also mentions that the research being done in foreign universities is becoming increasingly innovative in nature, and that industry investments in university-based research and development have stagnated (Litan et al., 2007). This stagnation is very much unlike a previously decades-long increase in funding from both government and industry. Given the other information presented in this thesis, this short-term trend should be regarded as serious.

Litan also notes that United States universities are becoming “less friendly” to commercialization and collaboration between schools and businesses. Furthermore, research and development capital from foreign companies to U.S. universities may decrease significantly if U.S. universities place more of an emphasis on intellectual property rights for inventions produced by their faculty (Litan et al., 2007). In other words, if universities in the United States want to benefit more from economic development and innovation, they should refrain from creating too many barriers to collaboration with industry, not just within the country.

U.S. universities and industries are very much exposed to a global economy and should do everything in their power to remain competitive and highly collaborative. The ideal system proposed by Litan is based on competitive advantage – a knowledge transfer system should exist that encourages universities to discover and private industry (i.e., entrepreneurs) to commercialize (Litan et al., 2007). This way, universities will not need to take on the financial burden of investing in projects with uncertain commercial returns and will be able to use more of their funding on research and education, which ultimately leads to innovation and increased competitiveness. Incentives need to be aligned so that the commercialization of technological breakthroughs is encouraged. Litan suggests the use of “volume models,” which, unlike preexisting models that focus primarily on efficient licensing, provide incentives for moving innovations into the market, focus on faculty as the key innovators and commercializers, and emphasize standardization of interactions between faculty and industry (Litan et al., 2007). The term “volume model” refers to a shift in emphasis in the commercialization process from maximizing licensing income toward maximizing the

volume of university innovations and the speed with which they are pushed to market. These volume models would include mechanisms such as “open source collaborations, copyright, non-exclusive licensing, and a focus on developing the social networks for graduate students and faculty to commercialize all types of innovations” (Litan et al., 2007, p. 18). Due to the positive relationship between innovation and economic growth, the government would also be encouraged to participate in educating universities on the benefits of a more seamless environment that allows for smoother knowledge transfer between universities and industries. Litan also suggests that the government provide research grants and the encouragement of experimentation with volume model arrangements, keeping in mind that the ultimate goal is to decrease the amount of time it takes for universities to transfer valuable research to industries that can commercialize ideas (Litan et al., 2007).

Globalization and Higher Education

If Thomas Friedman could comment on recent trends, he would say the world of higher education has been flattened. The process of obtaining a college degree is not uniform across nations, but there is one force that affects higher education regardless of where it is taking place. Globalization has introduced new pressures and influences into the realm of higher education, but most of all, it has helped assist the convergence that this thesis is mainly focused on discussing. What once was a system made and used by the elites of society has become and is continually becoming more and more accessible and widespread than ever before. The elite nations and their universities that once produced the greatest number of highly educated individuals are now matched by

universities from the second tier of industrialized nations. Developing nations below them are also catching up. Long-established dominance is crumbling before the richest world's eyes, and as aforementioned studies have examined, the societies that are slipping are often doing the least to stop themselves from backsliding in the near future. Whether or not globalization is going to continue at its quick pace is a whole other argument, but it has not stopped yet, and neither has the convergence of nations with respect to higher education enrollment and graduation rates.

David Ward of the United States American Council on Education notes that "after centuries of largely divergent national traditions in higher education and continuing differences in national educational policies, the processes of globalization have created conditions that are leading to stronger convergent developments in higher education between countries" (Ward, 2007, p. 2). He attributes the convergence to several products of globalization, namely the growth in number of international students with qualifications from more than one country, the internationalization of disciplinary research, and the use of English as the primary language of instruction (Ward, 2007). In addition to the influences of globalization, expansions in public expenditure on higher education have increased pressure for universities to be more accountable for their output, i.e., students. Graduation rates are also a crucial measure of how effective a university is, along with their graduates' ultimate contribution to human capital.

Unfortunately these demands placed on universities often conflict with the core values of higher education institutions. Ward states that more managerial approaches to the administration of universities and increased pressure to seek revenue in addition to public funding are steering higher education institutions off a track of academic freedom,

moral and intellectual integrity, and a commitment to respond to social concerns (Ward, 2007). Universities worldwide are faced with an identity crisis – should they do whatever it takes to churn out highly skilled graduates whose sole, collective purpose is to innovate and grow the economy? Or should they promote the traditional values and ways of thinking that universities have historically promoted? Furthermore, there are fundamental differences between the college education a student receives in the United States and the college education a student receives in Ireland, or India, or Japan. Regardless of these differences and what a university chooses to stand for, it is certain that now and in the future, universities will increasingly be called upon to "educate more students, provide more support for them, address workforce needs, solve social, scientific and technical problems and do all of it better, more efficiently, and in physical facilities and surroundings appropriate to the task" (Ward, 2007, p. 3). He adds, "despite variations in demographic conditions and especially in the patterns of foreign immigration, there is a global setting to the continuing expansion of the demand for higher education" (Ward, 2007, p. 3). Risti Permani also prioritizes sensible action to globalization impacts in his 2009 paper with a particular emphasis on cultural conservation while simultaneously emulating the world's greatest higher education scheme. While innovation and competitiveness are certainly important, "diminishing pride and sense-of-belonging to their own culture is a decline in political support for government policies...which can impede economic expansion" (Permani, 2009, p. 15).

University Identity and Purpose

In some nations, particularly the United States, there is a popular view that an individual's investment in higher education leads to personal, private monetary benefit in the form of higher lifetime earnings. Often overlooked are the societal benefits of highly educated and highly skilled individuals who serve their societies in private capacities. Universities do produce professionals who set the pace of innovation and development for the country to which they belong, but they also produce better citizens which sets the moral tone of the society to which they belong. As Ward discusses, "there is a temptation for publicly funded institutions to argue their case primarily on the basis of the purely instrumental needs they fulfill in producing trained professionals and creating new knowledge that supports economic development and competitiveness" (Ward, 2007, p. 5). The positive externalities produced by tertiary-educated individuals are always present, but these externalities are often not what drives funding and investment in higher education. Ward believes governments are likely to be more responsive to arguments focused on economic development and national competitiveness; at least in the case of the United States, there is now less of an emphasis on "carrying the cultural legacy of a country" (Ward, 2007). In the global race for competitiveness, however, Ward warns against losing the traditional values of education and that economic development should not be the sole reason for monetary support from government and other investors. D. Sunshine Hillygus (2005) also points out that those who earn degrees in social science are more likely to participate politically than those who earn science degrees; therefore, an emphasis on science, engineering, and related fields may lead to "unintended consequences for democratic engagement" (Hillygus, p. 41,

2005). Since higher education institutions rely on public support to some extent, they will always have to keep national and societal needs in mind. Most states operate under a dual system of public and private higher education institutions, all of which rely on public funding but to varying extents. For example, in Pennsylvania, schools given the classification of “state-assisted” are private schools that receive targeted funds, which are primarily for medical-related purposes (Salerno, 2004, p. 120). These societal needs must also consider universities’ ultimate goal of “being objective and sometimes sceptical (sic) critics of society at large and perhaps more directly of some segments of the larger society” (Ward, 2007, p. 5).

Public Interest in Higher Education

Tuition fees are the most widely disputed aspect of higher education and one of the most variable as well – a college education in the United States can cost tens of thousands of dollars whereas a college education in some European countries is virtually free. In the United States, the underrepresentation of college students from low-income families drives most of the public debate and tuition levels are skewed toward the interests of middle-income families (and their children) who make up the largest proportion of college students (Ward, 2007). Ideally, the higher education system works in a pooling equilibrium fashion – higher-income families are charged higher amounts of tuition fees which in turn are supposed to help subsidize education for lower-income students. Unfortunately what we have seen of late is diminished access to higher education for the lowest tier of society. Ward points out that “under conditions of inadequate public funding, higher education cannot be a universal entitlement and

increased tuition fees become one strategy to charge those who can afford to pay and to provide need-based financial assistance for those less able to pay" (Ward, 2007, p. 9). As one can assume, discourse on the necessity and cost of high access to tertiary education and global competitiveness is an ongoing process.

In other nations, free higher education has been made possible in part by historically sustainable costs of research and the expectation that only a quarter of the student-age population would require investment. Public investment was often adequate and universities could still be seen as positively contributing to competitiveness, innovativeness, and society in general. In Europe, "[t]he overwhelming pattern...is to meet the direct costs of higher education...by means of institutional grants from public funds" (Blaug and Woodhall, 1978, p. 333). Each country's funding scheme has its own unique characteristics – France subsidizes meals and housing for its college students and provides tax breaks for families of college students on top of low tuition fees, Germany uses state funding to keep fees either low or non-existent and upholds a strong tradition of student apprenticeships, and the United Kingdom divides expenditure between local and central government and assists students through grants rather than loans – but in general, public funding pays for the majority of each student's costs (Blaug and Woodhall, 1978).

In the United States, pressures of other social priorities and globalization paired with the need for better-allocated investment in higher education has called for what Ward calls "a new social compact," or social agreement (Ward, 2007). His new social compact will likely vary from state to state and country to country, but will rely on tuition fees and other market-related revenues (charitable donations, government assistance,

etc.) to bolster the current, diminished levels of investment in higher education. Additionally, any rise in the cost of higher education will need to be sensitive to student demand and government pressures. If a university charges high fees but does not offer a sufficient return on investment, students will not attend. Government may need to regulate funding as well since student enrollment, and ultimately graduation, is directly related to a nation's competitiveness, level of innovation, and level of economic development. That being said, the social and public priorities of higher education must also be considered. As Ward summarizes, there needs to be enough market and government influence to keep the higher education system well-funded, but there is a fine line between assistance and authoritarianism that should not be crossed (Ward, 2007).

Chapter 3: Dead Last

In a recent *New York Times* column, Thomas Friedman anticipates a grim future for the United States in terms of its ability to innovate and remain competitive in any market by summarizing a speech by Paul Otellini, the chief executive of Intel. While speaking about competitiveness at Brookings and the Aspen Institute, two reputed Washington-based public policy think tanks, Otellini brought attention to the United States government's lack of effort "in developing the next generation of scientific talent and incentives to induce big multinationals to create lots more jobs" (Friedman, 2010). Smart, skilled labor is available everywhere now, and if companies like Intel wanted to, they could staff all of their operations with workers from foreign countries, particularly from Southeast Asia. In China, low labor costs are not the sole reason for offshoring; there are more government incentives for investment, and the labor force is more and more prepared for work in the technology sector every year. As Otellini put it, "I have the luxury of hiring the best engineers anywhere on earth. If I can't get them out of M.I.T., I'll get them out of Tsing Hua (which is Beijing's M.I.T.)" (Friedman, 2010). The most eye-opening part of Otellini's speech came in the form of a study done in 2009 by the Information Technology and Innovation Foundation (ITIF), another Washington-based educational and public policy think tank. According to this study, the United States ranks sixth among the top 40 industrialized nations in innovative competitiveness, which takes into account 16 different indicators including economic performance, investment in information technology, investment in higher education, and infrastructure, among other things (Friedman, 2010). Sixth place is not really anything to be worried about, especially when one considers the other half of the study's findings. Out of those same

40 industrialized nations, the United States ranks 40th – that's right, dead last – in the rate of change of innovation capacity over the last decade[3] (Friedman, 2010). That is, from 1999 to 2009, the United States has done the least to make themselves more innovative for the future. Otellini talks about lowering corporate taxes and increasing research and development funding, but he also notes that he would "like to see competitiveness and education take a higher role than they are today" (Friedman, 2010). One of the main metrics of the competitiveness index in the ITIF study is higher education attainment, which is analyzed in the United States but is compared to nations in Europe and also in the rest of the world. Evidence of a closing global competitiveness gap and an American loss of economic dominance can be found throughout this study.

U.S. Versus the World

ITIF president Robert D. Atkinson and research assistant Scott M. Andes released their study focused on benchmarking U.S. and EU competitiveness and innovation in February 2009, noting that it was "almost a cliche" to point out that increased locational freedom for firms and the widespread accessibility of global markets have increased pressures on nations to be globally competitive (Atkinson and Andes, 2009). More recently however, firms and nations are competing on their level of innovativeness, their knowledge, and their ability to create – it is not just about low cost production anymore. Sixteen indicators organized into six broad categories are taken into consideration in their holistic perspective of how competitive nations truly are and

[3] A complete table of rankings from the ITIF study can be found in the Appendix.

whether or not their competitive advantage will endure, decline or grow in the future. The sixteen indicators and six categories are listed in the table below.

Table 3.1: Indicators of National Innovation and Competitiveness

Category	Factors
Human Capital	Higher Education Attainment, Science and Technology Researchers
Innovation Capacity	Corporate Investment in R&D, Government Investment in R&D, Share and Quality of World's Scientific and Technical Publications
Entrepreneurship	Venture Capital, New Firms
IT Infrastructure	E-Government, Broadband Telecommunications, Corporate Investment in Information Technology
Economic Policy	Effective Corporate Tax Rates, Ease of Doing Business
Economic Performance	Trade Balance, Foreign Direct Investment Inflows, GDP per Working-Age Adult, Productivity

The five nations that rank above the United States in global competitiveness as of 2009 are Singapore, Sweden, Luxembourg, Denmark, and South Korea (Atkinson and Andes, 2009). Of those five nations, Denmark and Luxembourg are the highest ranked (fifth and sixth respectively) in terms of which nations have done the most to foster innovation and competitiveness over the past decade. The other four nations that have excelled most in promoting innovation are China, Singapore, Lithuania, and Estonia (Atkinson and Andes, 2009). As mentioned before, the United States has the lowest change score of all 40 nations included in the study, meaning that over the last decade, they have made the least progress in improving innovation capacity and

international competitiveness. The EU-15 region[4] ranks 29th in terms of their change score over the last decade, but as the study points out, “if [this] region as a whole continues to improve at this faster rate than the United States, it would surpass the United States in innovation-based competitiveness by 2020” (Atkinson and Andes, 2009, p. 1).

Atkinson and Andes discuss some of the implications of this low ranking for the United States, suggesting that it needs to think of itself as a “big state” and put in place national economic development strategies (Atkinson and Andes, 2009). Policymakers cannot rest on their laurels and assume that because the United States has been the front runner for such a long time that they will remain in the lead. The United States needs to have a clear-cut competitiveness strategy that places incentives for firms to innovate within their borders, is open to high-skill immigration, fosters a digital economy, supports institutions that are critical to innovation, and ensures that government policies work in accordance with those who innovate (Atkinson and Andes, 2009). If all nations are to grow and economically develop, then they must all be given the right resources and government backing to excel, create, and innovate into the future. Atkinson and Andes believe that the countries who lead now can be leaders in the future if they follow the outline of the aforementioned economic development strategy.

Compared to Europe alone, the United States is currently more competitive and innovative. In 13 out of the 16 variables considered in the ITIF study, the United States outperforms Europe, and that includes higher education – the United States ranks 9th,

[4] The EU-15 region consists of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the UK.

the EU-15 ranks 20th and the EU-10 region[5] ranks 25th (Atkinson and Andes, 2009). On an individual level, Sweden and Denmark still outperform the United States in innovation and competitiveness, and Denmark is one of the eight nations that currently outperforms the United States in higher education (Atkinson and Andes, 2009). We will return to higher education later in this section, but for now, keep in mind that even though the United States leads Europe in competitiveness, the trend is expected to reverse within a decade. Atkinson and Andes attribute this reversal to efforts made by the European Commission and individual EU-15 and EU-10 nations to become more knowledge based; an example of such efforts is the Lisbon Agenda, which calls for government-backed research and development funding and investment, along with tax incentives. The Baltic States (Lithuania, Latvia, and Estonia) along with Ireland, Sweden, and Denmark have been making the most rapid progress on the continent (Atkinson and Andes, 2009).

Europe is not the United States' most dire concern, however. Singapore ranks first on the current scale of global competitiveness and second in terms of their progress over the last decade. China has done the most to ensure a bright future, and Russia and India are also gaining ground. South Korea and Japan are also above the EU and United States rankings in terms of change score. The ITIF study attributes these high changes scores to a number of reasons: China aggressively promotes modernization and invests in new technology, Singapore is "obsessed" with innovation and has government policies to fuel the fire, and Russia ranks highest in the current number of people aged 25-34 with a tertiary degree (Atkinson and Andes, 2009). While low costs

[5] The EU-10 region consists of Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia.

may currently be a great strength for the BRICs[6] and nations of similar status, they will grow even stronger and more productive if they can eliminate their weaknesses by building infrastructure, improving the business climate, attracting foreign investment, and boosting workforce skills (Atkinson and Andes, 2009). The two authors of the ITIF study make an interesting point about the difference in attitude between nations that may help to explain the variation in statistics. Referring to the up-and-coming BRICs, Baltic States, and Asian nations, they say that "most if not all of these nations don't see themselves as number 1 and therefore they do try harder," but in the United States' case, "many...still persist in believing that the United States is number 1 and that it is its destiny to remain so almost irregardless (sic) of what it does" (Atkinson and Andes, 2009, p. 4). As the global innovation gap closes between the United States and other nations, this attitude entails a risk that the United States likely cannot afford to take.

[6] The BRICs are Brazil, Russia, India, and China.

Chapter 4: Empirical Data

Data from the 2009 UNESCO Institute for Statistics Global Education Digest focuses primarily on global trends in tertiary education. These trends, combined with data on economic variables, may be useful in revealing net effects of higher education on economic growth. Overall, UNESCO data shows that the gap in higher education achievement between the United States and the rest of the world is shrinking. Figures used in their latest publication are from the years 1970 through 2007 and are roughly organized into five sections: the evolution of tertiary students in absolute number, the relationship between secondary education enrollment/graduation rates and tertiary education, the fields in which tertiary students choose to study, mobility of tertiary students, and the role of public and private expenditure on tertiary education. This chapter will focus primarily on the first and third of those sections.

Tertiary enrollments

UNESCO reports that from 1970 to 2007, the number of students pursuing tertiary education has grown from 28.6 million students to 152.5 million – about a five-fold increase (UNESCO, 2009). Expansion has been particularly great since 2000, with 51.7 million of those students freshly enrolled in only seven years. This also means there is an average annual increase in enrollments of 4.6%, with the average number of tertiary students doubling every fifteen years. The highest regional growth rate is in sub-Saharan Africa, but as is explained in the UNESCO findings, what took 37 years to achieve in this region occurred every two years in China or every five years in Latin America (UNESCO, 2009). This of course does not account for extraneous factors such

as political strain and unsustainable education systems, but the important statistic is the growth itself. East Asian and Pacific enrollments have risen twelve-fold from 3.9 million in 1970 to 46.7 million in 2007, with an average annual growth rate of 10% since 2000 (UNESCO, 2009). Due to the influence and intense growth in China, the East Asian and Pacific region surpassed North America and Western Europe as the global leader in tertiary student enrollment in 2000, likely due to an annual increase of 19% in Chinese tertiary student body since 2000. Latin America has seen a similar ten-fold increase in tertiary enrollment with an annual increase of 6.8% since 2000, and South and West Asia has seen a six-fold increase over the entire period of 1970 to 2007, though annual growth has been negative in recent years (UNESCO, 2009).

As one might assume, North America and Western Europe have seen the slowest rate of change in tertiary enrollment, with the number of students in 2007 being 1.6 times the number of students enrolled in 1970. Historically this makes sense since the United States and most Western European countries have been more prominently established in higher education for longer, but the relevant comparison for these statistics lies in data related to the distribution of tertiary students across the globe. According to UNESCO, almost every second tertiary student in the world studied in North America or Western Europe in 1970, but today that statistic is only one in four students, meaning the North American and Western European share of global enrollment in 2007 is approximately one half of what it was in 1970. Global enrollment in the region fell an aggregate 25 percentage points from a 48 to 23 percent share of the world's tertiary students. East Asia and the Pacific has seen the opposite trend, and since 2005 has had the largest share of tertiary students, now exceeding 30% of global

enrollment (UNESCO, 2009). A similar shift in global distribution of tertiary enrollment can be seen if countries are grouped by income levels. In 1970, the majority of tertiary students lived in high-income countries, even though these countries only accounted for one-fifth the global population in the tertiary education age range. In 2007, lower to middle-income countries accounted for 42% of tertiary enrolled students as opposed to 22% in 1970 (UNESCO, 2009). In short, the gap in tertiary enrollments between the United States and other nations is closing. The United States has seen a significant decrease in share of global enrollments since 1970 and has the slowest rate of growth in enrollments.

Tertiary-level graduates

OECD reports that tertiary level dropout and completion rates can be useful indicators of the internal efficiency of tertiary education systems. There may also be a link between the efficiency of such systems and the rate at which human capital is grown. A problem arises when studying dropout and completion rates – students may drop out for a number of reasons, and those reasons do not necessarily mean failure or that the student will not go on to contribute to human capital. For example, a student may find attractive employment before graduation and leave school to work. Still, dropout and completion rates are relevant because they measure how well an education system meets its students' needs. Requirements for graduation and access to tertiary education also vary greatly from nation to nation; for example, undergraduate programs in Ireland take only three years to complete, but German undergraduate

programs take a minimum of five years to finish (OECD, 2009). Graduation rates[7] are around 40% or more in countries such as Australia, Sweden and the United Kingdom where shorter undergraduate programs are the norm, while in Austria and Germany, graduation rates are below 25% where programs last five years (OECD, 2009). As will be explained later, the statistics used in this analysis will be taken from a particular type of tertiary program and will be fair and comparable across all countries studied. Graduates of this type of tertiary program should also be understood as first time graduates for the purposes of this analysis.

A nation's economic growth is only as great as its tertiary graduates' collective output and contribution to human capital, so it is imperative to examine numbers of tertiary graduates, which fields they study in, and which fields contribute most to innovation and output. If tertiary graduates contribute positively to human capital that is essential for well-oiled labor markets and government, then the end impact on society and economic growth should be significant. UNESCO further speculates that an increase in science and engineering graduates will increase the amount of innovation and growth in knowledge-based economics. Output of tertiary graduates is measured by the gross graduation ratio specific to one of three types of tertiary programs.

The first type, ISCED 5A, is identical to the type of degree discussed in this thesis so far and includes largely theoretically-based programs and research oriented programs that take at least three years to complete, but typically take four or more years to finish (UNESCO, 2009). Such programs include training in mathematics, economics, history, philosophy, and architecture. This classification includes the majority of

[7] Graduation rates reflect the percentage of the adult population aged 25 or older that has attained a tertiary degree.

undergraduate programs in the United States, and are intended to be the foundation for future education and research, like that which would be pursued in a PhD program. The second type, ISCED 5B, are shorter, more technical programs that are intended to give tertiary students the skills necessary for success in a particular vocation or trade (UNESCO, 2009). Graduates end up with a specific labor market qualification after at least two, but more typically three, years of study. The final type, ISCED 6, lead to the award of an advanced degree and require more study and unique research. A dissertation or thesis is usually complete at the conclusion of such programs that provides new knowledge and is a product of original research (UNESCO, 2009).

The classification which this thesis primarily focuses on is ISCED 5A, since it is the most common type of program in the United States and most other comparable countries. OECD reports that on average in member countries, the graduation rate has risen 18 percentage points from 18% to 36% from 1995 to 2007 for ISCED 5A graduates. At this level, Iceland and Australia lead the world with the highest tertiary student graduation ratios of 65.6% and 60.7% respectively. According to UNESCO data, the United States only has a graduation ratio of 35% at the tertiary level for ISCED 5A programs, surpassed also by Finland, Denmark, Netherlands, Norway, Ireland, Sweden, United Kingdom, France, and Spain – and that only accounts for North America and Western Europe. The Republic of Korea, Japan, New Zealand, Russia, Poland, and many other countries in various regions of the globe have higher tertiary graduation rates than the United States as of 2007. OECD data also lists the United States as having a similar tertiary graduation rate, but slightly higher at about 37%. OECD also notes that the graduation rate did not increase in Spain, the United Kingdom, and the

United States as much as it did in other member countries from 2000 to 2007. At the ISCED 6 level, UNESCO data also shows the United States lagging in comparison to other nations; it turns out the highest number of graduates, but has a poor ratio of college graduates to the total population at graduation age[8]. Switzerland and Sweden have the highest graduation ratios at 3.7% and 3.6% respectively, followed by Portugal (3.4%), Finland (2.7%), Germany (2.5%) and the United Kingdom (2.2%), while the United States has a ratio of 1.5%.

OECD data from 1995 to 2007 shows a modest increase of 4 percentage points in tertiary ISCED 5A graduation rates for the United States, with similarly modest increases of 2 percentage points in the United Kingdom and 4 percentage points in Canada. All other OECD member countries participating in the study have seen much greater increases over the same twelve-year period, even if their gross tertiary graduation rate is higher or lower than that of the United States. For example, the Czech Republic had a tertiary graduation rate of just 13% in 1995, but it has since grown to 35% in 2007 (OECD, 2009). Similarly large increases have been seen in countries such as Denmark, Finland, Iceland, Ireland, Japan, Netherlands, Norway, Sweden, and Switzerland and are summarized in the following table.

[8] Graduation age in this data set reflects members of the population who are aged 25 or older.

Table 4.1 - Increases in ISCED 5A Graduation Rate from 1995-2007

Country	ISCED 5A Graduation Rate in 1995	ISCED 5A Graduation Rate in 2007	Percentage point increase
Czech Republic	13%	35%	22
Denmark	25%	47%	22
Finland	20%	48%	28
Iceland*	33%	63%	30
Ireland*	30%	45%	15
Japan	25%	39%	14
Netherlands	29%	43%	14
Norway	26%	43%	17
Sweden	24%	40%	16
Switzerland	9%	31%	24
United States	33%	37%	4
OECD Average	18%	36%	18

*Data for Iceland and Ireland is from 2000 since data from 1995 is unavailable.

Source[9]: OECD, “Education at a Glance 2009: OECD Indicators,” September 2009

The United States falls just under the 2007 OECD average for this statistic by 1 percentage point, but the most important aspect of this particular data set shows that countries other than the United States have been making considerable recent progress in increasing tertiary graduation rates, while the U.S. is increasing rates at a slower pace (OECD, 2009).

[9] Located in the Appendix.

The issue of tuition fees has been considered when exploring completion rates of tertiary students. Many OECD countries have increased fees in recent years assuming that this increase will lead to an increase in students' incentives to complete their program and graduate, but upon a broad look at statistics from all OECD member countries, it is difficult to find a pattern between academic fees and completion rates. One notable point in the OECD 2009 data is that among countries that charge average tuition fees in excess of $1,500, the United States has significantly lower tertiary graduation rates than the OECD average (69%) along with New Zealand, while other countries charging fees such as Australia, Canada, Japan, the Netherlands, and the United Kingdom have completion rates over 70%. Even in the case of public subsidized higher education, like in Denmark, completion rates are as high as 81%, but this makes sense when higher educational attainment leads to later employment and earnings benefits.

When comparing the percentage of science and engineering graduates to the percentage of graduates in other fields such as education, social science, business, law, health and welfare, services, and agriculture, the United States shows a similar lagging trend. Science and engineering tertiary graduates make up just 16% of the total tertiary graduate pool, with 9% of those graduates falling under the "science" classification and 7% falling under the "engineering" classification (UNESCO, 2009). The countries that boast a higher percentage of science and engineering graduates in Western Europe are summarized in the following table.

Table 4.2 - Percentages of Science and Engineering Graduates[10] in 2007

Country	Percentage
Austria	32%
Finland	29%
France	27%
Spain	26%
Germany	25%
Ireland	24%
Switzerland	22%
United Kingdom	22%
Italy	21%
Denmark	20%
Belgium	17%
United States	16%

In other regions of the world, countries such as Japan, Iran, Czech Republic and the Russian Federation also churn out higher percentages of science and engineering graduates (UNESCO, 2009). If the amount of such graduates shows a strong link to the level of output, innovation, and human capital in a nation's economy, it will be interesting to see the effect on growth levels in years to come, especially when comparing the aforementioned nations to the United States, where less of an emphasis is placed on science and engineering when it comes to tertiary education.

[10] Interpreted as the percentage of science/engineering graduates out of all tertiary graduates.

Chapter 5: Smarter Investment

In a recent *New York Times* column titled "The Uneducated American," Paul Krugman (2009) attributes the alleged decline of American higher education to a lack of public spending and limited federal aid. Citing statistics from the Bureau of Labor Statistics, he also claims quality of tertiary education in the United States is falling due to a lack of government funding and lost jobs in the education realm. At first glance, UNESCO statistics seem to say the opposite of what Krugman believes – the United States spends more of its GDP per capita (3.1%) on tertiary education than any other nation (besides Cuba), but upon a closer look, it can be seen that approximately two-thirds of the investment comes from private sources. Public investment in tertiary education only amounts to around 1% of GDP per capita and is surpassed by other nations such as Denmark, Finland, Switzerland, Sweden, Greece, Norway, Austria, Belgium, France, Netherlands, and Iceland.

UNESCO statistics also show, however, that high levels of public investment are not limited to developed countries, and therefore, high levels of public investment do not necessarily mean quality of education is high or that more students are enrolled in such programs. Seven out of the eleven countries with the highest level of public expenditure relative to GDP are outside the North American and Western European region, including Colombia, Cuba, Ethiopia, Lesotho, Tunisia, and Venezuela. To account for differences in education systems from country to country, UNESCO compares expenditure per student expressed in U.S. dollars converted using purchasing power parities (PPP), which are simply currency exchange rates that equalize the purchasing power of different currencies. The United States spent PPP $10,616 in public expenditure per

tertiary student in 2007 (UNESCO, 2009). This number can be compared to figures for Austria, Denmark, Netherlands, Norway and Switzerland where more than PPP $15,600 is spent per tertiary student and figures for Australia, Portugal, New Zealand, Spain, Greece, and Italy where under PPP $8,000 is spent per tertiary student. The United States falls somewhere in the middle of the distribution for high-income countries, and countries that spend around the same amount of public expenditure per tertiary student are Ireland, United Kingdom, France, Finland, Iceland, and Belgium (UNESCO, 2009). Essentially there is nothing particularly outstanding about the amount of public expenditure per tertiary student in the United States. As will be discussed in the next part of this paper, it is not how much is spent, but rather how the spending is allocated that matters in the grand investment scheme.

Why Invest in Higher Education?

Much debate surrounds the topic of whether or not governments in all countries should increase or decrease funding for higher education. Global economic downturn has recently been causing a few rich nations to cut investment in higher education, according to an article in The Economist. In the United States, California governor Arnold Schwarzenegger took away one-fifth of available funding for the University of California, leading to a possible increase in tuition and a definite loss of jobs. In late December of 2009, the British government announced plans to reduce spending on higher education, science, and research by close to one billion dollars by 2012-2013, which will also inevitably lead to lost jobs and, given the link between science and innovation, decreased levels of economic growth and progress (Economist, 2010). Even

in Japan, university spending is to be reduced, but by a less severe 1 percent over each of the next five years (Economist, 2010).

One study conducted by Norman Baldwin and Stephen A. Borrelli suggests that reducing investment in education may have adverse effects on the United States' economy. According to their data, between 1988 and 2005, increased spending on higher education leads to increased state per capita income[11] (Baldwin and Borrelli, 2008). They also assert that "...by the late 1990s, it may have become clearer to state policymakers that the way to attract businesses in the growing hi-tech sector was to cultivate and retain a skilled workforce through higher education" (Baldwin and Borrelli, 2008, pp. 197-198). The study further suggests that increased investment in higher education could also lead to improved health care or increased social welfare, but does not conclusively test these hypotheses. Still, an important link is formed between investment in higher education and increased economic growth in terms of state per capita income.

If this positive relationship between investment in education and economic performance exists, budget cuts will not enhance the prosperity of these nations. Furthermore, not all Western nations are decreasing funding. In December 2009, Nicolas Sarkozy announced that the French government will be financing a $50 billion spending plan, a majority of which will be pumped into universities (Economist, 2010). While private universities may pick up some of the public universities' slack for the United States, it is likely that broad reform will be necessary if the U.S. higher education system does not wish to fall further behind.

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[11] See Appendix for a table of results.

The Hamilton Project

One investment proposal has been presented by three men of The Hamilton Project, which is focused primarily on advancing the American promise of opportunity, prosperity and growth. Joshua Bendor, Jason Bordoff, and Jason Furman set forth an education strategy that presents evidence that education is essential to broad-based economic growth and, in the realm of higher education, that structural reform and investment reform is necessary if the United States educational system is to reach its full potential. Structural form entails a fundamental change in the relationship between federal aid providing organizations and the families that benefit from their services. Investment reform entails a more efficient allocation of available government money. The study also seeks to prove that investment in education benefits society and individuals alike and that greater access to education is necessary to confront skill bias due to technological change (Bendor et al., 2007). They stress that the United States can expect to prosper economically only if equality of opportunity exists and estimate that if the poorest quarter of Americans is denied access to a college education, the nation could easily miss out on its next set of great innovators.

The Hamilton Project argues for more resources and wiser use of the ones our government already has, and all levels of education are discussed, from primary to tertiary. With respect to tertiary education, it is noted that while the cost of college education has risen over time, the quality of that education has also risen over time along with the returns to college. Bendor, Bordoff and Furman recommend that “society should not use its limited resources to subsidize those who would attend college without such aid, because those students already recoup more than they invest in college, [b]ut

public investments are needed to help those students who are prevented from attending college because of liquidity constraints or uncertainty about the returns to schooling" (Bendor et al., 2007, p. 5). To rectify this uncertainty problem, the project suggests that the government make better use of the "complex and duplicative resources already dedicated to financial aid," and in turn, helping students better understand how to use these resources (Bendor et al., 2007). Information not only needs to be available, but it also needs to be accessible. Additionally, the Untied States Department of Education spends less than 1% of its budget on research according to OECD statistics cited in the study. A lack of funding could be limiting the amount of knowledge available to a market of college students (Bendor et al., 2007).

According to the Hamilton Project, "evidence suggests that [the United States is] treading water while the rest of the world is pushing forward" with respect to general preparedness for higher education (Bendor et al., 2007, p. 9). They also cite reports from the National Center on Education and the US Secretary of Education that say "our education and training systems were built for another era" and "too many Americans just aren't getting the education that they need – and that they deserve," respectively (Bendor et al., 2007, p. 8). The issue is not so much lack of funding as it is inefficiencies in the way funding is spent, according to the project. Current expenditures must be more effective if the United States education system hopes to become a pacesetter once more.

While the Hamilton Project is not attempting to paint the United States higher education system as one that is ailing and in need of complete overhaul, it is quick to point out that there is room for improvement. Among young adults, the United States

ranks 12th on a list of industrialized nations in overall higher education attainment, due to the highlighted lack of “clear, accessible information about the cost and value added of American institutions of higher education” (Bendor et al., 2007, p. 15). This lack of information leaves policy makers in the dark as well as prospective college students who are trying to make decisions about which schools to attend. Although college costs are rising, the authors of this study feel the benefits of having a college education are greater than such costs and are also rising. They stress that “[t]he focus of college policies should not be redistributing resources to more affluent students who are getting a degree that will increase their earnings by hundreds of thousands of dollars. Instead, it should be about assisting more students to go to college and enjoy these gains, as well” (Bendor at al, 2007, p. 15). If more information is available at an earlier point, barriers are removed, and more is understood about the cost of a college education from the start, more young adults will be able to attend universities, graduate, and ultimately contribute to human capital at a greater rate.

The project first recommends that the United States switch to a “higher tuition, higher aid” model which allocates tax dollars to state schools and implicitly subsidizes education at said universities. However, such a system would likely fail without a more transparent government-run financial aid program due to potential students being discouraged by the increased price tag on a college education (Bendor et al., 2007). In other words, if tuition is to be raised, higher aid must be simultaneously or previously presented in a clear manner, as discussed earlier in the study. A second approach discussed by the project involves increasing the amount of federal funding available for higher education grants and loans, but this may lead universities to raise tuition to take

advantage of public subsidies, which would leave none of the benefit for prospective college students (Bendor et al., 2007). This strategy would require better risk management, and as the Hamilton Project notes frequently and previously, more investment is not necessarily better investment.

An ideal approach "would focus on improving the effectiveness of the current federal aid program" (Bendor et al., 2007, p. 16). Other studies conducted by the Hamilton Project argue that low and middle income students have a difficult time accessing financial aid under the current system and that there is little evidence that the current federal program of grants and tax credits has a net positive effect on enrollment. This approach calls for a simplification of the process of distributing financial aid to those about to enroll, for example, sending a postcard of tabled aid information in the mail to students, and then allowing parents to check a box corresponding to the aid package of their choice on their tax returns (Bendor et al., 2007). This would potentially raise enrollment rates by an estimated 5.6 to 7.4 percentage points according to other members of the Hamilton Project and, with an increase in federal aid of 2 to 3 billion dollars, would ensure that all income groups would receive no less than they would have under the old system (Bendor et al., 2007). A list of other important steps for improving higher education is included in the study, including "increasing the high school completion rate, increasing accountability, improving the quality of instruction, and focusing resources on subjects related to economic productivity such as science and engineering..." along with a few other critical measures (Bendor et al., 2007, p. 17). The ultimate mission here is to build a strong higher education system that ensures future sustained periods of economic prosperity.

The Economic Mobility Project

A more recent May 2009 study conducted by the Economic Mobility Project (EMP) is similarly focused on improving equality of opportunity for American college students as a means ultimately increasing human capital and economic success. Using statistics and other data on income levels, enrollment rates and economic mobility measures, the study seeks to demonstrate that college educated adults make more money and contribute more to society, so there should be improved federal support and subsidies for higher education. Like the Hamilton Project, EMP agrees that current federal investment in higher education is inefficient and not targeted at those who need it most. They also point out the unrealized potential of young adults from the United States and call for clarity throughout the process of obtaining financial aid (Haskins et al., 2009).

Higher education does play a role in earnings differences, which is not too widely disputed, but it is important to understand this when making decisions of whether or not to invest. EMP notes that the income difference between those with a four-year college degree and those who failed to graduate from high school was $50,000 in 2006 (Haskins et al., 2009). Trends in family income also show that those with at least a four-year college degree have benefited from more than four decades of income growth by 46 percent or greater, while those without any college experience have only seen 7 percent growth, and high school dropouts have seen a 6 percent decline in income (Haskins et al., 2009). These figures suggest that “unless something is done to boost the number of young people earning postsecondary credentials, millions of Americans will continue to be limited in their economic mobility” (Haskins et al., 2009).

Controlling for bias due to different intellectual skills, different high schools, and other different environments, the study estimates the private rate of return on investment in a college education to be between 6 and 9 percent, which shows that education generates significant economic advantages. Another study cited by EMP explored rate of return based on fifteen outcomes other than economic returns that are important to individuals. They found that more education leads to more productive children, healthier children, healthier adults, less divorce, more charitable giving, more savings, and lower rates of crime (Haskins et al., 2009, p. 8). Taking these factors into account means that the rate of return on investment in a college education then doubles to approximately 15 percent, according to EMP. Given this combination of significant economic and social returns, investing in higher education is one of the best decisions individuals could make, and it directly follows that government should invest as well.

One widely cited positive externality of higher education that is of government interest is increased political engagement. The aforementioned paper by Hillygus (2005) explores the link between higher education and political engagement and finds that the content of higher education is influential in shaping participation in an American democracy. Higher education “imparts knowledge, skills, and political familiarity that help in navigating the political world” and helps citizens understand “the relationship between political action and the preservation of a democratic system” (Hillygus, 2005, p. 27). Empirically speaking, Hillygus estimates that on the whole, college graduates are 56% more likely to be politically interested than those who do not obtain a tertiary degree, and within that large set of college graduates, those who graduate with a

degree in social science are more likely to be politically engaged than those who graduate with a degree in science or business (Hillygus, 2005).

The Economic Mobility Project further finds that college-educated adults move up the income distribution higher and more quickly than their peers. For example, adults with parents in the bottom income quintile nearly quadrupled their chances of moving to the top quintile after obtaining a college degree while nearly half of adult children with parents in the bottom quintile stay in the bottom quintile unless they get a college degree (Haskins et al., 2009). Enrollment rates have grown six times as fast as the US population has grown over the past fifty years, but completion rates are not following a similar trend (Haskins et al., 2009). Students are not gaining the full economic benefit of getting an education and universities' resources are not being used efficiently. With respect to enrollment rates, "children from families in the bottom income quintile have only a 34 percent chance of enrolling in college as compared with an enrollment rate of nearly 80 percent among children in the top quintile," and with respect to graduation rates, "children from the bottom quintile are only 20 percent as likely to earn a college degree as children from the top quintile" (Haskins et al., 2009, p. 12). In fact, across all income quintiles, completion rates are at least 23 percent less than enrollment rates, according to data compiled by the Economic Mobility Project (Haskins et al., 2009). Perhaps this statistic would increase if smarter investment in higher education were to occur, along with more transparent federal aid packages as suggested by Hamilton and EMP.

Reliance on the private market for higher education funding is difficult for a number of reasons. Private grants and loans are complex and expensive to administer,

and creditors who issue loans might be reluctant to lend due to imperfect information on repayment risks (Haskins et al., 2009). The Economic Mobility Project presents two main arguments for federal support of higher education. The first is that "the American economy needs educated workers to provide leadership, innovation, research, and competent and reliable labor at all levels," and the second is "the federal government's long-standing commitment to promoting equality of educational opportunity and its close cousin economic mobility" (Haskins et al., 2009). With respect to the first argument, EMP also notes that technological innovation and globalization have placed a premium on educated workers. Additionally, "other nations are surpassing the United States in the share of their population obtaining postsecondary education," which could mean a loss of economic dominance unless the United States increases its share of college-educated individuals (Haskins et al., 2009, p. 15). With respect to the second argument, EMP points out that "[i]f postsecondary education constituted an efficient and equitable market, huge numbers of young people, including those from poor families, would flock to postsecondary institutions," but this is not true in reality. As earlier discussed, financial aid, grants and loans are hardly efficient or simple, and, as EMP asserts, colleges and universities have a tendency and an incentive to admit students who can not only afford to pay their tuition bills, but will also contribute to the university after they have left (Haskins et al., 2009, p. 15). There are numerous other personal barriers that might keep a student from completing his or her degree, but EMP is mainly arguing that the government has a direct interest and clear incentive to fund higher education, and should do what it can to lower barriers.

The Economic Mobility Project has proposed a plan to increase attendance and completion rates in higher education particularly but not exclusively for poor and low-income students. In order to improve academic pre-college preparation and increase success while in college, the quality and coverage of preparatory programs should start at an early age and continue through secondary education. A “college-going” culture is desired and academic preparation for college coursework should be improved as well. To help students select and pay for a college education, EMP suggests improving college and financial aid counseling at the high school level, along with simplifying the application process for federal aid, reforming the Pell Grant, providing stipends for mature students, and even introducing a voucher program for low-income students (Haskins et al., 2009). To prevent students from dropping out and to help them along the route to graduation, the government should sponsor incentive grants encouraging colleges and universities to offer innovative programs that help keep students in school. Finally, to clarify the goals of federal policy and research, EMP recommends that college enrollment and completion rates be made a top priority (Haskins et al., 2009). Even if only some of such guidelines are followed, the end result will be a more educated, economically mobile workforce that can positively contribute to economic growth and prosperity.

Chapter 6: Conclusion

The tale of two gaps mentioned at the beginning of this thesis is unquestionably a reality. The data shows that the global innovation gap is closing between the United States and other nations due to lack of government action in preparing the United States to be competitive in a modern knowledge economy. Stagnation in the previous decade will lead to stagnation and decline in the coming decade if reform does not occur. With respect to higher education, the United States' enrollments and graduation rates are slowing while the academic institutions of other nations rise to the challenge of strengthening the next generation of capable human capital.

The domestic gap between socioeconomic classes seeking higher education is widening in the United States. Students from lower classes are ill-informed about federal aid options, and government investment in US universities is misallocated, neglecting students from lower-income families. As the Hamilton Project and the Economic Mobility Project report, the federal aid application process must be simplified, and the allocation of funds in higher education must be made more efficient so that all students – not just rich ones – can reap the benefits of a college education.

There is not much quantitative research on the effects of higher education on economic growth, but what does exist demonstrates a clear link between the two agents. Sound investment in higher education will eventually lead to increased levels of innovation and better technology, which will further lead to elevated quality of life, a prosperous economy, and a number of other positive externalities. Recognition of the trends discussed in this thesis is crucial if the future of US higher education and economic growth is to be as bright as its past.

Appendix

Figure 1

Chapter 2 - ITIF Higher Education Rankings (Atkinson and Andes, 2009)

Rank	Country	Percent of adults aged 25-34 with tertiary degree 2005	Rank	Country	Percent Change 1999-2005
1	Russia	56%	1	Poland	117%
2	Canada	54%	2	S. Korea	46%
3	Japan	53%	3	Ireland	41%
4	S. Korea	51%	4	Australia	31%
5	Ireland	41%	5	UK	30%
6	Spain	40%	6	EU-25	27%
7	France	39%	7	France	26%
8	**U.S.**	**39%**	**8**	**EU-15**	**25%**
9	Australia	38%	9	Spain	21%
10	Singapore	38%	10	Japan	18%
11	Sweden	37%	11	Sweden	16%
12	UK	35%	12	Canada	15%
13	NAFTA	35%	13	Mexico	13%
14	**EU-15**	**30%**	14	NAFTA	6%
15	EU-25	29%	**15**	**U.S.**	**3%**
16	Poland	26%	**16**	**EU-10**	**N/A**
17	**EU-10**	**22%**	17	Singapore	N/A
18	Germany	22%	18	Germany	N/A
19	Mexico	18%	19	China	N/A
20	China	9%	20	Russia	N/A
21	India	9%	21	India	N/A
22	Brazil	8%	22	Brazil	N/A
	Average	**23%**		**Average**	**22%**

Figure 2

Chapter 3 - ITIF Overall Rankings (Atkinson and Andes, 2009)

Overall Score

Rank	Country	Overall Score 2009
1	Singapore	73.4
2	Sweden	71.0
3	Luxembourg	66.2
4	Denmark	64.5
5	S. Korea	64.2
6	**U.S.**	**63.9**
7	Finland	59.6
8	UK	59.2
9	Japan	59.0
10	NAFTA*	58.6
11	Netherlands	58.4
12	France	57.3
13	Ireland	56.4
14	Belgium	56.3
15	Germany	55.0
16	Canada	54.4
17	Austria	52.6
18	**EU-15****	**52.5**
19	Australia	51.5
20	EU-25**	50.6
21	Czech Republic	47.9
22	Estonia	46.1
23	Spain	43.7
24	Hungary	42.5
25	Lithuania	40.8
26	Italy	40.2
27	Portugal	38.7
28	Slovenia	37.6
29	Slovakia	37.0
30	**EU-10****	**36.9**
31	Latvia	36.5
32	Malta	36.2
33	China	36.0
34	Poland	35.4
35	Russia	35.1
36	Cyprus	33.2
37	Greece	31.5
38	Brazil	30.1
39	Mexico	26.0
40	India	21.6
	Average	**36.5**

Change Score 1999-2009

Rank	Country	Change Score (1999-2009)
1	China	19.5
2	Singapore	19.0
3	Lithuania	14.8
4	Estonia	18.1
5	Denmark	17.4
6	Luxembourg	16.9
7	Slovenia	`16.7
8	Russia	15.2
9	Cyprus	14.7
10	Japan	14.4
11	Hungary	14.3
12	Slovakia	14.1
13	Czech Republic	13.8
14	India	13.6
15	Latvia	13.4
16	Austria	13.2
17	S. Korea	13.2
18	Ireland	12.9
19	**EU-10****	**12.8**
20	Spain	10.8
21	Sweden	10.7
22	France	10.6
23	Portugal	10.1
24	Malta	9.9
25	Belgium	9.5
26	EU-25**	9.4
27	Poland	9.4
28	UK	9.0
29	**EU-15**	**8.5**
30	Mexico	8.0
31	Netherlands	7.9
32	Australia	7.4
33	Finland	7.3
34	Canada	6.3
35	Germany	6.3
36	Italy	5.2
37	NAFTA*	5.1
38	Greece	5.1
39	Brazil	3.7
40	**U.S.**	**2.7**
	Average	**11.2**

Figure 3

Table 3.1 - ITIF Indicators of National Innovation and Competitiveness (Atkinson and Andes, 2009)

Category	Factors
Human Capital	Higher Education Attainment, Science and Technology Researchers
Innovation Capacity	Corporate Investment in R&D, Government Investment in R&D, Share and Quality of World's Scientific and Technical Publications
Entrepreneurship	Venture Capital, New Firms
IT Infrastructure	E-Government, Broadband Telecommunications, Corporate Investment in Information Technology
Economic Policy	Effective Corporate Tax Rates, Ease of Doing Business
Economic Performance	Trade Balance, Foreign Direct Investment Inflows, GDP per Working-Age Adult, Productivity

Figure 4

Table 4.1 - Increases in ISCED 5A Graduation Rate from 1995-2007 (OECD, 2009)

Country	ISCED 5A Graduation Rate in 1995	ISCED 5A Graduation Rate in 2007	Percentage point increase
Czech Republic	13%	35%	22
Denmark	25%	47%	22
Finland	20%	48%	28
Iceland*	33%	63%	30
Ireland*	30%	45%	15
Japan	25%	39%	14
Netherlands	29%	43%	14
Norway	26%	43%	17
Sweden	24%	40%	16
Switzerland	9%	31%	24
United States	33%	37%	4
OECD Average	18%	36%	18

Figure 5

Source data for Table 4.1 (OECD, 2009)

OECD countries	Tertiary-type A								
	1995	2000	2001	2002	2003	2004	2005	2006	2007
Australia	m	36	44	49	50	51	50	50	m
Austria	10	15	17	18	19	20	20	21	22
Belgium	m	m	m	m	m	m	m	m	m
Canada	27	27	27	27	28	29	35	31	m
Czech Republic	13	14	14	15	17	20	25	29	35
Denmark	25	37	39	41	43	44	46	45	47
Finland	20	41	45	49	48	47	48	48	48
France	m	m	m	m	m	m	m	m	m
Germany	14	18	18	18	18	19	20	21	23
Greece	14	15	16	18	20	24	25	20	18
Hungary	m	m	m	m	m	29	36	30	29
Iceland	m	33	38	41	45	51	56	63	63
Ireland	m	30	29	32	37	39	38	39	45
Italy	m	19	21	25	m	36	41	39	35
Japan	25	29	32	33	34	35	36	39	39
Korea	m	m	m	m	m	m	m	m	m
Luxembourg	m	m	m	m	m	m	m	m	m
Mexico	m	m	m	m	m	m	m	m	m
Netherlands	29	35	35	37	38	40	42	43	43
New Zealand	33	50	51	46	49	50	51	52	48
Norway	26	37	40	38	39	45	41	43	43
Poland	m	34	40	43	44	45	45	47	49
Portugal	15	23	28	30	33	32	32	33	43
Slovak Republic	15	m	m	23	25	28	30	35	39
Spain	24	30	31	32	32	33	33	33	32
Sweden	24	28	29	32	35	37	38	41	40
Switzerland	9	12	19	21	22	26	27	30	31
Turkey	6	9	9	10	11	11	11	15	m
United Kingdom[1]	m	37	37	37	38	39	39	39	39
United States	33	34	33	32	32	33	34	36	37
OECD average	*20*	*28*	*30*	*31*	*33*	*35*	*36*	*37*	*39*
OECD average for countries with 1995 and 2007 data	*18*								*36*
EU19 average	*18*	*27*	*29*	*30*	*32*	*33*	*35*	*35*	*37*

Figure 6

Table 4.2 - Percentages of Science and Engineering Graduates in 2007 (UNESCO, 2009)

Country	Percentage
Austria	32%
Finland	29%
France	27%
Spain	26%
Germany	25%
Ireland	24%
Switzerland	22%
United Kingdom	22%
Italy	21%
Denmark	20%
Belgium	17%
United States	16%

Figure 7

Chapter 5 - Effects of higher education expenditure on state per capita income (Baldwin and Borrelli, 2008).

Table 2 Multiple regressions predicting per capita income growth over three periods

Predictors	Income 1988–2005		Income 1988–1996		Income 1997–2005	
	Beta	SE	Beta	SE	Beta	SE
K12 expends	−.363*	.000	−.207	.000	−.192	.000
HEd expends	.466***	.000	.199	.000	.350**	.000
Hway expends	.309*	.000	−.020	.000	.445**	.000
Savings	−.106	.000	−.084	.000	−.069	.000
Popn growth	−.156	.065	−.133	.117	−.050	.111
Pupil–teacher ratio	−.272*	.001	−.096	.001	−.343*	.001
% HS graduates	.224	.000	.341*	.000	−.001	.000
% College graduates	−.077	.000	−.549***	.000	.312*	.001
R^2	.436		.296		.444	

* $p < .10$; ** $p < .05$; *** $p < .01$

$n = 48$

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  - Worked concurrently as an economic researcher with Bates White, LLC
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ACTIVITIES:

IFC/Panhellenic Penn State Dance Marathon (THON) - Morale Committee member and dancer
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Relay For Life - Team Captain
- Lead a team of approximately 15 members through all the stages of a 24-hour charity walk raising funds for the American Cancer Society
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