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## Title Page

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# THE PARK PLACE ECONOMIST

A Student Publication of the Illinois Wesleyan University  
Economics Department

Volume XX  
2012



Bloomington, Illinois  
IWU Printing Services

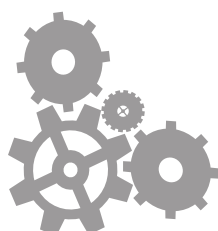


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# 2011-2012 EDITORIAL BOARD

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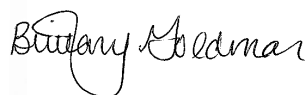
# LETTER FROM THE EDITOR

Welcome to the 2012 edition of *The Park Place Economist*. This volume is the twentieth publication of one of the nation's few undergraduate economic journals. While *The Park Place Economist* has certainly changed over the last twenty years, it stays true to its purpose of recognizing the best economics research conducted by students at Illinois Wesleyan University.

This year we received research papers from Senior Seminar as well as from other economics electives, providing a great variety of research done by economics students in the past year. Graham Boden, Manh Dao, Cathy Geehan, and Joshua Pandian researched and discussed both sides of the debate over China's accession to the World Trade Organization. Tung Hoang, an international student from Vietnam, was intrigued by the impact China's trading has had on U.S. manufacturing unemployment. Nicholas Kenaga explores the U.S. Housing Crisis so commonly discussed since the housing bubble burst. Devin Long takes an interesting approach looking at the effects of electricity exports on the quality of life in Africa. Jake Mann takes a local approach and establishes financial and labor market determinants of mortgage delinquency rates in McLean County, IL from the past twenty-six years. Nikola Poplovic studies the returns from self-employment using Human Capital Theory to compare U.S. natives and immigrants. Former Illinois Wesleyan basketball player, Dan Schouten, furthers his passion for basketball and researches the economics of salary dispersion in the National Basketball Association. Finance and Economics double major Cory Sloan explores the determinants of American stock prices at a firm-specific level. Dave Warren's study provides an in-depth analysis of ideology's effect on bilateral aid allocation in the top four aid-giving countries: the United States, the United Kingdom, France and Japan. Chinese native Eunis Wu looks at the economic assimilation of Chinese immigrants in the United States to see if there is a wage convergence with natives. Finally, I took the challenge of being the first Illinois Wesleyan student to conduct a meta-analysis, focused upon Environmental Kuznets Curve studies, for my research.

This edition of *The Park Place Economist* represents a collaboration of the hard work and dedication of many individuals, and I would like to take this opportunity to thank the staff. Mark, Assistant Editor-in-Chief, deserves praise for all of his help. Tung and Tara's technical expertise and assistance were of great help to the journal's production. I would like to thank all of the editors and reviewers for their help in selecting and refining each article published in this edition of *The Park Place Economist*. I am also thankful for Dr. Robert Leekley's excellent guidance, advice, and support over the course of the year. Finally, I would like to express my gratitude to Gary Schwartz and Illinois Wesleyan's Printing Services for handling the production of the journal.

I hope you enjoy this special edition of *The Park Place Economist*!

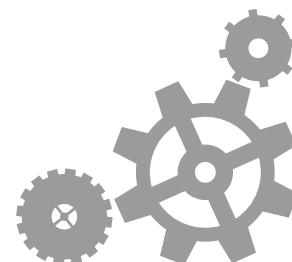


Brittany Goldman  
Editor-in-Chief

## GENERAL INFORMATION

Submissions to *The Park Place Economist* are always welcome, and we strongly encourage students to participate in the creation of this journal. If you are interested in submitting an article or becoming a member of the staff, please contact Dr. Robert Leekley, the faculty advisor, at (309) 556-3178 or at [bleekley@iwu.edu](mailto:bleekley@iwu.edu). Written queries can be addressed to:

*The Park Place Economist*  
Attention: Dr. Robert M. Leekley  
Illinois Wesleyan University  
P.O. Box 2900  
Bloomington, IL 61701



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# WHERE IT ALL BEGAN

AMY CHANG, MICHAEL MAYBERGER & JAKE MANN

*In celebration of the 20th issue of The Park Place Economist, this year's Alumni Editors are thrilled to feature three outstanding alumni who made significant contributions to the successful publication of the very first issue.*

**Bruce T. Bennett**, former Editor-in-Chief of *The Park Place Economist*, proudly shares his thoughts on the origin of the publication, and memories of the first editorial staff.

In the first issue of *The Park Place Economist*, Lisa Kumazawa (former Alumni Editor) said, "The idea of developing this journal took shape in the weekly Society meetings." Later on, while developing the tenth edition of the publication, George Coontz ('04) and Alexis Manning ('04) describe it as beginning over a cup of coffee shared amongst faculty in the Dugout. When asked what he personally recalls about the journal's inception and the challenges it faced along the way, Bennett said, "For me, it started after a conversation with Dr. Michael Seeborg at [what used to be] the Economics Department, located across from Shaw Hall on Park Street." While it has been twenty years since that initial discussion, he remembers that, during the span of their 45-minute conversation, the concept of the inaugural edition of *The Park Place Economist* was enthusiastically developed into a concrete reality. "Wasn't that always the case when Dr. Seeborg approached you with an idea?" he added playfully, and "Needless to say, it was a brilliant idea, as evidenced by its longevity and academic vitality".

Bennett continues by explaining that the time was right for the publication to be launched in 1993, due to several factors. First of all, the amount of academic research was growing as a result of the Senior economics projects and Research Honors programs. Second, the number of students pursuing an economics degree at IWU was also increasing. Initiation into the department's academic honor society, Omicron Delta Epsilon, grew from seven to eighteen initiates from 1990 to 1993. Finally, the quality of the academic work was improving because the university was attracting a higher caliber of students. Also, competition within the student body was increasing, as more of them decided to study economics at IWU. All of these factors contributed to an environment that facilitated and supported the launch of an undergraduate journal.

"As with any blank canvas, the first step was to put a team into place. Dr. Seeborg and I felt that, before we set any tone or policy of the journal, it was important that we design the team to help set the tone and direction of the journal and, at the same time, promote involvement," Bennett said. They systematically examined each function of an editorial board and formed a team based on individuals' skill-sets and their ability to work cohesively, all while also identifying a succession plan for the second edition of *The Park Place Economist*.

While *The Park Place Economist* has evolved and improved over subsequent editions, Bennett is most proud that the main focus of today's journal still represents the original intent: "to provide a medium for students and alumni alike to publish comprehensive and stimulating articles or commentaries pertaining to the field of economics." To this day, Bennett believes that his editorial team laid a solid foundation from which future editorial boards could customize the journal to fit the times. "In hindsight, we had a great team on the inaugural editorial board—and along with some hard work—we had a good time together. Speaking for myself and the original editorial board of *The Park Place Economist*, we are pleased to see the continuation of this successful publication, and look forward to the next twenty years of successful publications".



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Bennett graduated in 1993 with a double major in Economics and English. He continues to work at Archer Daniels Midland (ADM) in Decatur, Illinois, where he started his career as a grain merchandiser. He later joined the Lecithin Division, where he gained sales experience both domestically and internationally. In 2002, he moved into asset management. Today, he is the General Manager of the Protein Specialties Division with global responsibilities for assets, sales, and strategic planning.

**Paul S. Davies** reminisces twenty years after attending IWU on his experience with *The Park Place Economist* (PPE) and its lasting benefits.

Upon being asked about his Economics degree at Illinois Wesleyan, Davies said, "The economics training I received at IWU gave me the foundation I needed to succeed in graduate school and to have a productive and very rewarding career in public service." After graduating from IWU in 1992, Davies attended the University of Colorado at Boulder and earned his PhD in Economics in December 1996. Following graduation, he began working as an economist at the Social Security Administration in Washington, DC. His research focuses on the Supplemental Security Income (SSI) and Disability Insurance (DI) programs. Davies specifically examines SSI eligibility and participations, the effects of SSI policy options on poverty, the provision of SSI benefits to children with disabilities, and interrelationships between SSI and DI. Davies has published papers in *Research in Labor Economics*, the *Journal of Gerontology: Social Sciences*, the *Journal of Aging and Social Policy*, and the *Social Security Bulletin*. In 2006, he was nominated to become a member of the National Academy of Social Insurance.

Davies commented that he is "fortunate to have had an opportunity to move into the management ranks at Social Security." He is currently the Director of the Division of Policy Evaluation in the Office of Research, Evaluation, and Statistics. His division consists of fifteen professional and technical staff, who conduct research and policy evaluations, regarding Social Security beneficiaries, SSI recipients, and the working-age, disabled, and elderly populations, more generally. Davies manages a multi-million dollar program of extramural research, including the Retirement Research Consortium (RRC). The RRC is a grant-based research enterprise that conducts a broad research program on Social Security, retirement, and disability issues. The goal of the RRC is to bring together the academic and policy communities to increase objective, policy-relevant research, and to inform the public and policymakers about alternative policies and their consequences. His division is also responsible for producing a popular data book, *Income of the Population 55 or Older*.

He has two favorite memories from the first publication of the PPE. First, Davies remembers "I was honored to have my senior research honors project published in the PPE in 1993, the year after I graduated from IWU. It was a thrill for me to see that the first editorial board chose to include my paper." Davies also remembers Dr. Seeborg using his senior research paper for several years as an example of how to produce a successful research paper, even when the results he found were not what he expected. He recalls, "[having] an upward sloping demand curve in that paper, but [I] managed to salvage the paper with some creative arguments about why the results turned out as they did."

Davies still keeps in close contact with Dr. Leekley and Dr. Seeborg. Davies was invited back to IWU in March 2009 to give the Guest Lecture for the ODE New Member Initiation Ceremony. He spoke about one of his papers to Dr. Leekley's econometrics course, and also gave a presentation to the ODE group on topics that spanned over several of his research papers. President Wilson attended his presentation and Davies remembers that he "sent me a 'thank you' email the next day—how cool is that?!"

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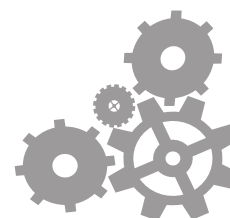
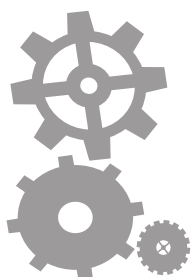
**James Joslin**, a graduate in Economics and a contributor to *The Park Place Economist*, reflects his thoughts on the economics program at Illinois Wesleyan and *The Park Place Economist*.

Since its inception in 1993, *The Park Place Economist* has been a symbol of superlative scholastic achievement, for both the Economics department and for Illinois Wesleyan University. The journal, which features original undergraduate research from Illinois Wesleyan's most dedicated Economics majors, is truly special, not only for this reason, but because it fosters an environment of both creativity and curiosity. Both of these terms are synonymous with a liberal arts education, and are essential in all areas of academia.

To James Joslin ('93), these attributes have been paramount in his life, ever since the first pages of the journal's first edition were off of the press. Specifically, he advocates that his "economic training at IWU helped [him] to develop [his] analytical reasoning skills," in addition to teaching him the benefits of being a "concise writer."

His piece, entitled "Bill Knows Politics – Not Economics," is a witty take on the unfortunate tradeoff that exists in our society between good politics and good economics. In less than a thousand words, Joslin cleverly enlightens readers on then-President Clinton's economic agenda. Between the lines, the article exudes wisdom so strongly that it seems to drip off of the page. It seems as though the author is sharing a lifetime of experiences with the reader, even though we know he was only twenty-two years old at the time. This is precise evidence of how original research publications, like *The Park Place Economist*, give students the ability to critically think about the world around them.

Twenty years later, Mr. Joslin is using his perceptiveness in the courtroom, as a Chief Litigation Counsel for Honeywell International's largest business group – Automation and Control Systems. Mr. Joslin explains that the practice "is a \$15 billion business with more than 75,000 employees worldwide," in which he "manages Honeywell's litigation on all corners of the globe." It is partly the combination of analytical rationale and concise communication skills that help Mr. Joslin in his everyday job; skills that are crucial in the lives of most economics majors at Illinois Wesleyan University. As you read through the pages of the twentieth edition of *The Park Place Economist*, keep these two points in mind, as they are fostered in an atmosphere of creativity and curiosity.



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# THE CLASS OF 2012

**Meara Dibadj** is an Economics and Political Science double major from Belleville, IL. Along with studying abroad in Botswana, Meara was a part of College Democrats and *The Park Place Economist* editorial staff. Her future plans are to attend law school.

**Brittany Goldman** is a double major in Business Administration and Economics from Darien, IL. During her time at Illinois Wesleyan, she was President of Sigma Kappa Sorority, Treasurer for Order of Omega, reviewer of the *Undergraduate Economic Review*, and Editor-in-Chief of *The Park Place Economist*. She was also a member of Gamma Sigma Alpha (National Academic Greek Honor Society), Alpha Lambda Delta (National Honors Society), Omicron Delta Epsilon, and the National Society for Leadership and Success. After graduation, Brittany will be training with AT&T in the Business Sales Leadership Development Program in Atlanta, GA. After completing the program, she will then be relocating into a permanent position within the company.

**Tung Hoang** is an Economics and Business Administration double major and Math minor from Ha noi, Vietnam. During his time at Illinois Wesleyan, he has enjoyed being a part of Economics Society, Acacia Fraternity and *The Park Place Economist* editorial staff. He also participated in the R.I.S.E and KeyBank business conferences.

**Lesley Hunter** is an Economics major from St. Louis, MO. While at Illinois Wesleyan she was involved in Economics Society, *The Park Place Economist*, French Club, and Piano and Choir Ensemble. She was also Vice President of Law Society. After graduation, she plans to continue work as an entertainment show host of "Lesley on the Town." She is also a talent and model agent in the New Faces Division of Centro Models of Talent-Plus.

**Eugene Kuzmin** is an Economics and Theatre Arts double major from Vernon Hills, IL. He has been involved in the *Undergraduate Economic Review*, *The Park Place Economist*, and many theatre productions. Eugene plans on entering the workforce after graduation.

**Devin Long** is double major in Economics and French from South Beloit, IL. She was a reviewer for *The Park Place Economist* and the *Undergraduate Economic Review*. After graduation, she plans to work in banking and eventually earn a Masters Degree in Economics.

**Jake Mann** is a double major in Economics and Business Administration from Jacksonville, IL. He was Treasurer and Vice President of Tau Kappa Epsilon Fraternity and was the Editor-in-Chief of the *Undergraduate Economic Review*. After graduation, he plans to continue to work with WealthLift Inc., a newly formed investment education company.

**Brandon Oliver** is a double major in Economics and Accounting from LeRoy, IL. He has been an active part of Alpha Kappa Psi Business Fraternity, Accounting Society, Economics Society, the *Undergraduate Economic Review*, Residence Hall Association, and the Office of Residential Life. After graduation, he plans on entering the workforce.

**Nikola Poplovic** is an Economics major from Deerfield, IL. At Illinois Wesleyan he was an editor for the *Undergraduate Economic Review*, volunteered at the Illinois Sustainable Living & Wellness Expo, and played in the Bloomington soccer league. After graduation he plans to find work in Finance or Information Technology.

**Dan Schouten** is an Economics and Business Administration double major from Downers Grove, IL. While at Illinois Wesleyan, he played varsity basketball and was an active member of the Economics Society. He has also volunteered with the Big Brothers Big Sisters organization. After graduation, he will be working for Stratford Advisory Group as an Investment Analyst.

**Usman Siddiqui** is an Economics major from Karachi, Pakistan. During his time at Illinois Wesleyan, he was the Student Senate Awareness Events Commissioner, Vice President of Risk Management Society, Vice President of Economics Society, and Vice President of Muslim Students Association. He was involved in the Community

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# TWO DECADES OF EXCELLENCE

ANDREA KERWIN & ELIZABETH LUIBICICH

The inaugural issue of *The Park Place Economist* was published in 1993, making this volume the 20th edition. Over the last twenty years, the journal has remained true to its goals of developing critical thinking skills, encouraging academic research, promoting leadership abilities, and establishing alumni connections. However, *The Park Place Economist* has evolved with each new volume, benefiting from the advances in technology that have been realized during its lifetime as well as featuring topics that reflect the economic conditions of the time.

At its inception, *The Park Place Economist* staff had to make do with limited resources. Students did not have the same technological capabilities that they are privy to today. The first few journals were written in a time before Microsoft Word and the internet were common. The formatting of the journal improved as the students of the university had better access to technology. The front covers of the first few journals were simple, yet effective; by 1998, the covers had become works of art. Although, the cover and formatting of the journal may not be as important as the content, it still reflects the hard work of the journal's staff. As technology has improved, peoples' expectations of the journal layout have changed as well. *The Park Place Economist* has moved parallel with the times, thus improving it each year. The look of the journal has become an expression of student creativity, just as the content of the journal is an expression of student interest and imagination.

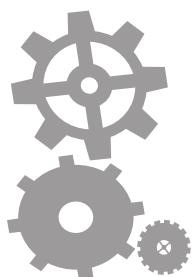
The research within the journal has varied over the past twenty years, reflecting the changing economic state of the country as well as the different opinions and interests of students. For example, in 2011, a year after the gulf coast oil spill, a research paper was written about oil spills and the future prices of crude oil. Such an article was fitting to be published that year as the spill commanded constant media attention and concern from politicians, environmentalists, and economists. In 2009, a student wrote about the impact of the September 11th tragedy on Middle Eastern immigrants. Every student at the university remembers the day the Twin Towers fell, and benefited from the relevance of the article. *The Park Place Economist* does not only address pertinent national events. In 2003, an article was written about horse race betting and the stock market. This provided an interesting perspective to readers considering most people can identify with the temptation to gamble, and possibly, win big. *The Park Place Economist* has always been a journal for the entire Illinois Wesleyan University community as it explores a broad spectrum of issues. Each edition of *The Park Place Economist* brings information about what Wesleyan students think of a particular issue at a particular time.

While many aspects of *The Park Place Economist* have evolved over time, the breadth of topics included has remained steady. The articles included in the 20th issue of *The Park Place Economist* address concerns relating to the housing market crisis, car manufacturing, immigration, and environmental concerns. Since the publication of the very first issue, both international and local issues have been analyzed and explained. Others have researched the economic aspect of a specific field seemingly unaffected by economic concepts and demonstrated a clear connections between the two, most of which were written about professional sports.

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The future of *The Park Place Economist* is limitless. As evidenced by the scope of topics included in the past twenty publications, the economic conditions of the world are constantly changing. Economic crises plague many parts of the world today, and the environment is of increasing importance in political and economic discourse. Readers will undoubtedly see further environmental research and discussions of the current global financial crisis included in the journal in the near future. Students have already begun applying economic concepts to their work in other fields, making *The Park Place Economist* more relevant to other academic departments at Illinois Wesleyan. While the publication remains focused on economic topics, submissions are received from students in other departments as well, such as Political Science. The number of submissions for publication also continues to grow, making the selection of articles more competitive and thus ensuring the quality of research and work included in the final publication.

The size of the economics department at Illinois Wesleyan grows with each passing year. Illinois Wesleyan students have an increased interest in today's economy as a result of the recent recession and current recovery efforts. As the size of the department grows, so does the commitment and quality of this journal. *The Park Place Economist* can only continue to improve and develop in the future. With each new volume it develops into a more valuable resource for both Illinois Wesleyan students and the economics community as a whole.



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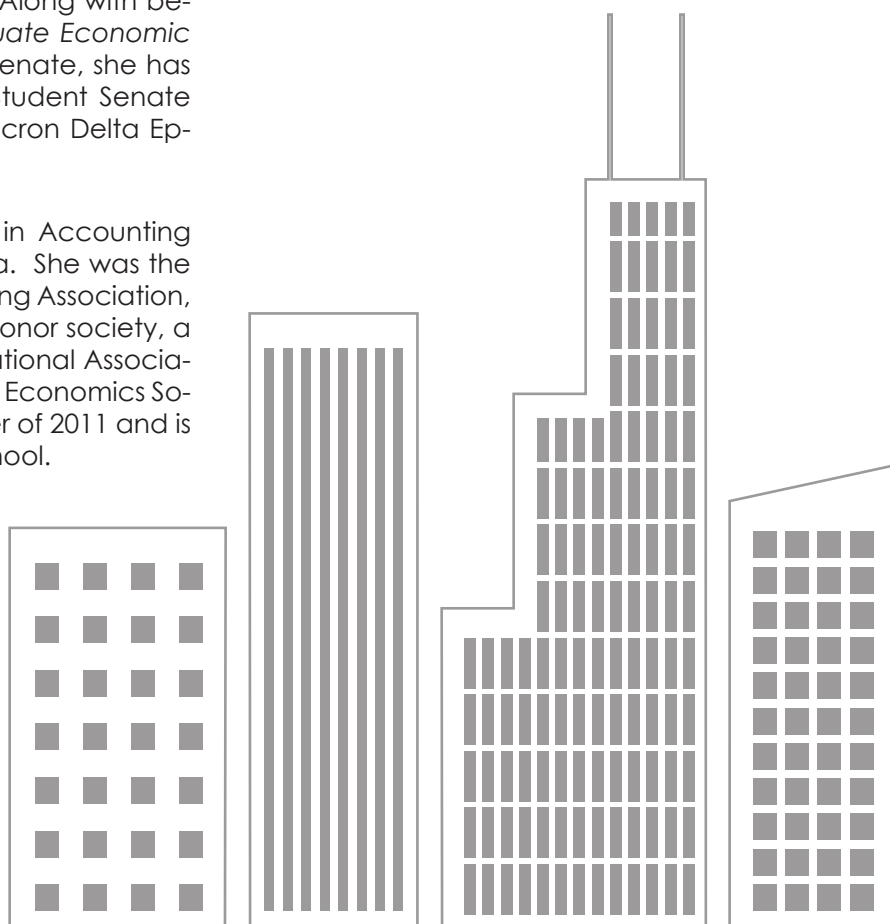
Cancer Center as a Business Development Intern and Mavidea Technology Solutions as a Business Analyst. After graduating, he will be searching for a job.

**Cory Sloan** is an Economics and Finance double major from Hoffman Estates, IL. Along with serving as the Treasurer and Pledge Educator of Phi Gamma Delta Fraternity, he has been a member of a student run investment group, Order of Omega, and the National Society of Leadership and Success. After graduation, he will be working with the Federal Deposit Insurance Corporation.

**David Warren** is a Political Science major and Economics minor from Peoria, IL. He has been involved in habitat for humanity, Risk Finance Club and interned with the City of Bloomington researching vacant house ordinances and calculating the demand for the Pepsi Ice Center's ice rink time. He plans to attend graduate school for public administration after graduation.

**Eunis Wu** is an Economics and Accounting double major from Shanghai, China. Along with being a reviewer for the *Undergraduate Economic Review* and Treasurer of Student Senate, she has been an active member of the Student Senate Financial Advisory Board and Omicron Delta Epsilon.

**Abigail Zou** is a double major in Accounting and Economics from Beijing, China. She was the secretary for the American Marketing Association, treasurer for Alpha Lambda Delta Honor society, a junior advisor, a member of the National Association of Black Accountants, and the Economics Society. She graduated in December of 2011 and is currently applying to graduate school.





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# CHINA'S ACCESSION TO THE WTO: ECONOMIC BENEFITS

*Graham Boden*

2001 was a landmark year for China, who finally gained accession to the World Trade Organization (WTO, 2011) after 15 years of negotiations. The WTO is a multilateral trade organization whose purpose is to help trade flow freely while preventing negative side effects, as well as to serve as a place for settling international trade disputes and negotiations through unbiased legal procedures. The WTO was formed from the General Agreement on Tariffs and Trade (GATT), which was signed by 23 nations in 1947 (Fung, 2006). One of the original contracting nations was China. One of the GATT's main topics was the most-favored-nation (MFN) clause, which gave fellow contracting nations the exact same treatment as other contracting nations, meaning no single country could gain an advantage through lighter customs rates or lower tariffs. One fault of the GATT, however, was that it lacked any mechanism for enforcing cooperation or negotiation. In 1949, only 2 years after signing the GATT, the Chinese nationalist government located in Taiwan withdrew China's membership from the GATT (Fung, 2006). 30 years later in 1979, however, China entered a period of trade liberalization, though the Open Door Policy (Bhatt, 2004). In 1986, China submitted an application to the GATT to resume their status as a contracting party, and negotiations started (Fung, 2006). In 1995, the GATT changed its policies and renamed itself the WTO (Bhatt, 2004). Upon formation of the WTO, China requested the conversion of its status as Working Party to Full Membership. In 2001, after 15 years in total of ongoing negotiations, China was unanimously voted into the WTO (Fung, 2006). Today the WTO consists of 153 member nations and is one of the largest trade organizations in the world.

China's accession to the WTO has helped both the Chinese and the world economy. China's accession resulted in astounding growth of exports, and a reduction in tariffs both on imports into China and tariffs placed on Chinese products. A burgeoning export market and looser investment restrictions led to growth in Chinese

capital. The accession requirements placed upon China brought the nation into a period of greater trade liberalization, weakened state-run enterprises, and giving more power to private interests. The WTO accession agreements also caused China to make international trade law more transparent and even. Other nations have benefited from more access to Chinese markets and vice versa.

WTO accession has led to an increase in Chinese exports, resulting in greater economic growth. Accession to the WTO gave China better market access to its 152 WTO trade partners (Bhatt, 2004). The MFN clause of the WTO agreements helps prevent discrimination against Chinese exports in other WTO nations (WTO, 2011). Greater foreign market access created a surge in the export of Chinese products. From 2002 to 2007, net exports as a share of GDP in China increased from 2.6% to 7.7% (Chen, 2009). By 2010, China's current account balance was \$305 billion (Google public data, IMF). China's exports have primarily been labor-intensive manufactured goods due to China's abundance of inexpensive labor (Chen, 2009). This focus on labor-intensive manufacturing shifted workers away from the primary sector towards the secondary sector (Marti, 2011). The percentage of workers employed in agriculture decreased from 50% in 2001 to 11.2% in 2010 (World Bank, 2011). Furthermore, the percent of GDP that is attributed to the primary sector decreased from 23.5% in 1994 to 11.7% in 2006 (Marti, 2011). As more labor-intensive products are manufactured, there is a greater demand for labor to continue production. This higher demand resulted in rising real wages in China across industries. From 2001 to 2006 real annual wages across industries doubled from 12,000 yuan on average to 24,000 yuan, in terms of 2007 yuan (Yang, 2010). This increase in real wages was not limited to the Chinese upper class. It included typically low-wage industries such as manufacturing and retail. China's export market also greatly benefited from increased foreign direct investment (FDI) inflows due to accession. In the early 1990s, FDI inflows

into China were large, but stagnated by the end of the decade. This stagnation was attributed to restrictions on FDI, government corruption, and inefficient state-owned enterprises (Chen, 2009). Accession to the WTO, however, reduced restrictions on FDI in China, resulting in a new surge in FDI inflows to China. From 2001 to 2002 alone FDI inflows increase 30% (Fung, 2006). The growth of FDI has been shown to help accelerate export growth (Chen, 2009 Zeng, 2010). Foreign-invested firms (FIFs) are some of the largest exporters in China, with their processed exports totaling 45% of Chinese exports. FDI also helps stimulate employment. Between 2001 and 2006 FIFs provided an additional 11 million jobs in China (Chen, 2009). The greater access of foreign markets for Chinese exports as well as the increased FDI inflows brought by WTO accession has greatly benefited the Chinese economy.

Tariff reduction policies required for WTO accession were introduced to China to benefit both foreign and domestic enterprises. As stated above, the MFN status of the WTO helps China's export industries (Bhatt, 2004). MFN status allows China to face the same trade barriers as competitors, allowing China to compete with other nations fairly. These measures are not entirely sudden. Discriminatory measures taken by other nations against China were phased out as specified in Annex 7 of the Protocol (roughly five years since accession for most measures) (Cheong, 2003). These phasing-out periods allowed time for foreign markets to adjust to trade without a sudden flood of cheap Chinese exports. Furthermore, reduction of China's domestic tariffs reduced efficiency loss brought about by the misallocation of resources. Reductions in tariffs also lowered prices for consumers while helping foreign producers by reducing costs and providing greater market access. In addition to removing tariffs, China agreed to limit the non-tariff measures they utilize only to those listed in Annex 3 of the Protocol, many of which have a scheduled date to end (Cheong, 2003). China also agreed to remove performance, trade balancing, foreign exchange balancing, and prior experience requirements, in order to grant permissions to invest, import licenses, quotas and tariff rates regardless of existing domestic demand (Cheong, 2003). China's accession agreements allowed for the continued use of some forms of trade barriers, but these barriers were temporary measures to slowly introduce Chinese trade to

the world economy. China has agreed not only to remove tariffs, but is also now responsible for preventing the formation of non-tariff barriers to trade regardless of foreign competition.

The growth of the Chinese export economy and FDI inflows resulted in the growth of domestic Chinese capital. Since accession to the WTO, average capital stock growth rates have risen, a change from the decreasing growth rates of 1998-2001 (Chen, 2009). The increase in FDI since accession also helped the development of capital by acting as a vehicle for technology transfer. Regions that receive FDI benefited from the advanced foreign technology which is brought in from investing firms. Some of the largest attractors of FDI are capital-intensive projects (Fung, 2006). Thus, the investment brought into China is used for the development of capital. Furthermore, FIFs shifted China toward the production of high-tech goods (Chen, 2009). Since accession China has gained productive capability in IT products (Fung, 2006). China's export of high-tech products rose greatly, with 80% of FIF exports in 2004 consisting of high-tech goods (Chen, 2009). Between 2000 and 2005 China's total exports of high-tech products increased from 17% to 32% (Chen, 2009). While it might seem to be contradictory that China exports capital-intensive goods considering that it was established above that China is labor-abundant, in this case China is exporting both labor-intensive manufactured goods as well as high-tech products. The FDI investments are therefore causing technology transfer and capital growth. It might seem worrisome that if FDI inflows are so large that China would encounter the same problems as found in maquiladoras in Mexico. Maquiladoras are factories in Mexico wholly owned by foreign corporations who utilize the cheap local labor to produce items to be imported back to the firm's home country. Maquiladoras are well-known for their underpaid, overworked employees. China avoids this problem due to the gradual decrease in FDI limitations. Initially after accession, foreign investors could not control more than 49% of a firm, but restrictions on foreign ownership were reduced years after accession (Bhatt, 2004). By slowly allowing more foreign investment over time, control of fixed capital is predominantly Chinese, with 95% of fixed capital in China owned by domestic sources (Chen, 2009). China's accession into the WTO helped the development of capital within China through the flow of technology and



the development of production methods.

The WTO accession requirements provided an impetus for the Chinese economy to enter a period of liberalization. In order to qualify for WTO accession, China has been forced to greatly weaken its state-run enterprises (SOEs) and allow for greater private competition (Cheong, 2003). State-run enterprises are now required to make business decisions based solely on commercial considerations (Cheong, 2003). SOEs must act as any business would because decision-making cannot be changed by the political leanings of the Chinese government. The WTO accession allowed for non-state enterprises to own a portion of trading rights in agriculture (Fung, 2006). This weakened the grip that SOEs have over Chinese agriculture, and brought more power to private agricultural trade. Loosening of government control of the economy promoted greater efficiency and quality due to increased competition. For example, a liberalized logistics sector (transport, warehousing, material handling, packaging) led to better infrastructure and lower transportation costs (Bhatt, 2004). Lastly, the push for liberalization resulted in the 2001 Trade Union Law, which allowed for collective negotiation (Fung, 2006). This law has helped Chinese workers by allowing for the formation of labor unions, granting employees more power to negotiate wages and working conditions. The push for liberalization brought on by China's accession to the WTO has resulted in a shift of economic power away from SOEs and toward private interests.

As a part of the reform required by WTO accession, China is responsible for increasing transparency of trade information and law. Increasing transparency requires not only more effective promulgation of existing trade law, but also making the inner workings of legislative processes more apparent to firms. Transparency is useful for both foreign and domestic firms as it allows them to make more informed decisions based on government trade law. China succeeded in increasing the publicity of existing trade laws. The WTO TBT-SPS website has been set up and contains information concerning China's technical barriers to trade (Chen, 2009). Furthermore, the Chinese government regularly publishes manuals on Chinese foreign trade, which include the printing of laws which may be of interest to both domestic and foreign firms (Cheong, 2003). On the legal side, the Chinese

government has been moving toward reform aimed at increasing the balance of Chinese law. For example, the 2004 Administrative Licensing Law established the publicity of all administrative licenses. In addition, the 2008 Opinions Concerning Deepening Reform of Administrative Management Mechanisms called for administration modes to be transparent and standardized (Chen, 2009). Through the Chinese accession, the Chinese government has been on the path toward greater transparency and balance.

China was not the only nation to benefit from WTO accession. As stated above, the MFN status granted to WTO members allows all countries to trade on an even playing field. This status had beneficial effects not only on China's exports abroad, but also on other WTO members' exports to China. China's imports now all face the same tariffs and barriers to trade, thus making each country's trade with China representative of its comparative advantages, not its political power. Increased trade with China also benefited its fellow developing Asian economies. Since China focuses on labor-intensive manufacturing, it is a large market for raw materials that come from the other developing Asian economies (Chen, 2009). Asia's newly industrialized economies account for 24.59% of all of China's imports in 2007 (Chen, 2009). In 2003 18% of South Korean Exports and 12% of Japanese exports were sold in China (Fung, 2006). China even has a rising trade deficit with other Asian economies (Chen, 2009). China's role as a market for exports contributed to the growth of its developing neighbors, just as the US and EU's role as markets for exports contributed to the growth of the Chinese economy (Chen, 2009). Furthermore, the reduction in barriers to Chinese imports resulted in lower prices, which benefited the US consumers who purchase the lower-priced imports (Fung, 2006). China's accession to the WTO has brought benefits to both developing neighbors as well as its more developed trade partners.

Despite the benefits of China's accession to the WTO, there have been concerns regarding possible negative side effects of its accession. As the influx of FDI has increased the growth of capital and exports, there has been concern that the firms that received FDI have an advantage over domestic firms. Although firms which received large amounts of FDI had a productive advantage

shortly after the accession, the difference in the labor productivity of domestic and FIFs has decreased. In 2001 the labor productivity of FIFs across industries was 1.6 times that of domestically invested firms. However, by 2006 FIFs were only 1.02 times more productive (Chen, 2009). The decrease in labor productivity shows that although FIFs once had an advantage, FIFs are no longer more productive than domestically invested firms.

As the Chinese economy booms, foreign governments have been worried about the undervaluation of the yuan. While the yuan is currently undervalued, sudden revaluation may harm China's growth. Sudden revaluation is expected to greatly reduce the number of China's exports, resulting in massive unemployment, specifically in the textiles, clothing, shoemaking, toys, motorcycles, and agricultural sectors. A sudden appreciation of 5-10% is estimated to cause a loss of 3.5 million non-agricultural jobs in China (Chen, 2009). However, if revaluation occurs slowly then there should be less intense negative repercussions. In fact, the yuan appreciated 18% from January 2006 to June 2008 (Chen, 2009). Immediate revaluation is dangerous to the Chinese economy, so China is cautiously appreciating the yuan to meet international concerns while still avoiding the possible dangers to its export markets.

Although the Chinese economy has seen growth in industrial exports, Chinese farmers face considerable competition with agricultural imports from the US. Chinese farmers face competition with agricultural imports from the US, but this competition is only in grains and oilseed-based products (Fung, 2006). China actually has a comparative advantage in rice, meats and horticulture (Bhatt, 2004). The damage to China's agriculture was further limited by the trade-rate-quotas (TRQs) that have been temporarily allowed to be maintained after accession. China was allowed trade-rate quotas on wheat, rice, corn, cotton, soybean products, palm oil and rapeseed oil. Since 2001, these quota levels decreased as China's economy slowly reacted to agricultural competition (Fung, 2006). The approved TRQs that China maintained allowed Chinese agriculture to slowly adjust to increased foreign competition. TRQs restricted structural unemployment in the agricultural sector and the limited protection allowed Chinese grain producers to maintain some measure of competitiveness in the face of

overwhelming foreign competition (Chen, 2009).

The growth of cheap Chinese exports has undercut the domestic industries of its trading partners. Although increased trade competition with China would negatively impact the domestic businesses of its trade partners, a number of the trade complaints against China come from nations who lack comparative advantages in manufactured goods. For example, when US antidumping action was taken against Chinese furniture imports in 2003, imports of furniture to the US from Indonesia, Brazil, Thailand, and Malaysia increased dramatically. The reason for the surge in antidumping action taken against China, as well as the concern for China's trade partners, is not entirely due to foreign competition issues, but from domestic competition issues. Firms that invest and build business connections in China gain a supply advantage over the firms that choose to pursue imports from other sources. The domestic firms who do not import from China are ultimately negatively impacted as they cannot compete with their fellow importers' cheaper goods. The firms that do invest in China, however, benefit as these firms gain income from their investments into China as the Chinese export market grows, and the business connections built by investing firms can help create an advantage for investing firms (Zeng, 2010).

Although China's accession has caused some negative side effects, the consequences are limited. The difference between FIFs and domestic firms has decreased, and although the yuan is currently undervalued, slow appreciation is preventing damage to Chinese export markets. Although accession has caused some harm to Chinese agriculture, the harm is only limited to grains and oilseeds. Instead, China's use of TRQs allowed a 'soft landing' for Chinese agriculture. The increased disputes with China's trade partners is not necessarily a result of increased competition from China, it also represents changing domestic competition among importers.

China's accession to the WTO in 2001 brought a number of benefits to both China as well as the world. Reduced barriers to trade and larger FDI inflows boosted Chinese export markets. Accession resulted in the reduction of tariffs and barriers to free trade. The booming export economy and FDI inflows improved the growth of capital in China, resulting in a shift toward higher

technology. The accession requirements lessened the power of Chinese SOEs, and gave more power to private interests within China. The transparency requirements of the WTO accession resulted in greater trade law publication and regulations. China's trade partners also benefited. Other WTO members utilized their MFN status to face equal trade barriers, and neighboring countries gained a large market for raw material exports in China. 2001 was truly a landmark year for China.

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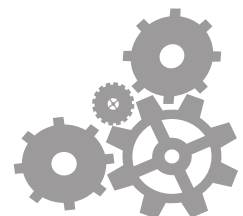
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# CHINA'S ACCESSION TO THE WTO: ECONOMIC COSTS

*Manh Dao, Cathy Geehan & Joshua Pandian*

In 2001, China achieved accession into the World Trade Organization (WTO) after more than ten years of politically charged negotiations. The unusually long negotiation period was an indicator of the controversy surrounding the issue, which remains heated to this day. Since China's accession, economists and politicians around the world have been watching to monitor the outcome after the five year phase-in period. While China's economic gains have been significant, and the increase in exports dramatic, China's accession to the WTO has had numerous negative effects. Some of these negative effects are the adverse impacts on the environment, the disparity in wages between rural and urban citizens, the displacement of neighboring countries' exports, and China's increased skill in utilizing the WTO's loopholes.

To best understand the implications, the WTO's history and Chinese involvement should be reviewed. The WTO came into being as a result of various negotiations. Serving primarily as a mediator for consultations between member nations regarding world trade procedures and disputes, the WTO stems from the Uruguay Round, which spanned from 1986 to 1994. These negotiations were done under the General Agreement on Tariffs and Trade (GATT) and became the successor of the GATT in 1995. The WTO is composed of 153 member states, with 30 serving as observers. The observers typically are states seeking permanent status. A common misconception about the WTO is that it expedites talks between countries and helps lower trade barriers to promote free trade. This is true; however it is not exclusively the work of the WTO. There are situations where certain barriers remain in place to avoid exploitations that could directly affect consumers, such as when some loopholes allow corporations to forgo certain environmental regulations. Essentially, the purpose of the WTO is to allow the free flow of trade internationally, so long as the undesirable effects are minimized. The WTO emphasizes transparency, enforceable agreements, reciprocity, safety valves and non-discrimination. Out of the

five, non-discrimination is arguably the most essential to the WTO. This can be seen in its Most Favored Nation policies, which are designed to ensure that no one nation is favored above another so that free trade can be more easily facilitated. It is what makes WTO such a broad organization.

The most notable thing that comes along with the magnificent increase in trade volume since 2001 is the deteriorating natural conditions for China. The pro-liberalization scholars have long reasoned that trade can be beneficial to the environment. One argument they make is that China could change its producing methods and technology to waste less resources and generate less pollution, and the government could raise the environmental standards. However, it is found that in China's case, the sheer increase in scale far outweighs other effects. In order to produce more and take advantages of the opening markets, production in China has expanded rapidly, which means the amount of resources and the amount of waste have also increased exponentially.

Under the WTO regime, the sectors of China's economy that have grown the most are the agriculture, aquaculture, textile, and industries. China's textile and apparel exports grew by more than 40 percent while its cotton consumption expanded by 34 percent over the first three years of joining the WTO, and is still growing at a significant speed; its growth in 2010 was 10%. This industry has one of the largest ecological footprints: it consumes a lot of water, and releases a lot of harmful chemicals as waste into the rivers and other water sources. In China, the technology, although improved, is still inferior to that of the developed nations: "water consumption per unit of production is about 50 per cent higher than in developed countries ... Dyes made in China usually have lower dye uptake and ... dye residual in wastewater is higher ... The sewer discharge per product is nearly double the amount discharged in developed countries." (Jahiel, 317)

Furthermore, a thorough modernizing program is nearly impossible – as Jahiel states that the small firms are the primary producers of textile, accounting for about 85% of all cotton textile manufacturers, and they have low access to financial sources and cutting-edge technology. The WTO helps worsen the situation in another way; the foreign direct investment (FDI) mostly flows to those small factories, because foreign investors simply want the profits these environment-harming factories can potentially make.

To cope with the fast growth in manufacturing, the raw resource industries are also augmented. China is already the world's largest producer and consumer of coal, the main resources used to produce electricity. And coal mining requires the demolition of mountains and land. "According to the 2005 China Environmental Report, about five billion tons of soil are washed away annually in the region, one third of which comes from Shanxi, Shaanxi and IMAR" (the poor north-western part of China) (Zhu, 14). Not to mention the toxic water discharge and the farmland occupied or destroyed by coal mining.

The rise in volume and variety of trade caused by the WTO creates yet another problem: the introduction of exotic, potentially invasive, species around the world. Ecologists have found many marine creatures in the ballast water of the ships (the water stored in the bottom of a ship to keep it balance) and many insects in the packing crates, accidentally carried from China to the U.S and vice versa. With the similar climates, those species can easily establish and cause ecological disasters. In 2000, it is calculated that it costs the U.S. around \$137 billion per year to deal with the invasive species, and for China, it is \$2.4 billion per year - only eight industries are calculated, which means the actual figure might be greater (Normile).

Statistics show inequality in China also increased at an alarming speed in the 2000s. The year 2009 marks the widest rural-urban income gap in China; the income ratio between the urban and rural population reached 3:33 to 1, and is predicted to keep rising (China Daily). During the high times of FDI inflows since China's WTO's accession, the urban areas and the industrial zones have attracted much attention, leaving the rural areas virtually untouched. While the impoverished people's net income is shown to increase,

it is nowhere near the amount earned by "the managers of State-owned enterprises, real estate developers and some private companies". (China Daily) Additionally, the percentage of rural enrollments in elite universities have shrunk from 50 percent in the 1950s to 17.6 percent in 2000, and it is widely agreed by experts that the figure might be as low as 1 percent in 2010 (Newsweek). These trends actually already happened before the WTO's membership; they are direct consequences of the rapid industrial growth, and especially the increase in FDI, as proved in Wan's article. It is not prudent to say that the WTO is the cause of these problems. However, it helps open up the market and encourages the investors to come to China, so the WTO has its indirect responsibility in worsening the inequality issue in China.

Not directly caused by the WTO's accession, the notoriety of Chinese products originated from a period of rapid export production. The Chinese government chose exports to be the focus of economic development after it joined the WTO. GDP growth was deemed more important than anything, and many quality controls are neglected. In 2008, evidence that melamine, a chemical usually used in making plastics, was found in a Chinese baby formula and shocked the entire world. It was further revealed that virtually all Chinese-produced dairy products, including ordinary milk, ice cream, and yogurt also contained melamine. The structure of the dairy-processing chain is one of the factors that contributed to the poisoning of more than 290,000 people, and 6 deaths. Modern factories, the ones who received the FDI, still get raw materials from small, poor, uneducated families who are desperate to make money. They can easily mix some melamine, which is very accessible and cheap, to increase the nitrogen content – the protein level of the milk. The Chinese government, only focusing on production, neglects its role of inspection and quality controls (Xiu, 467). Also, the news about lead in children's toys imported from China made consumers around the world fear the astonishingly cheap products again, which they bought, due to the help of the WTO. In the long term, China's product quality might be improved because the government wants to keep its reputation in the WTO, yet the problems are very pervasive and have roots in such basic stages that it will be very hard to fix them.



Due to China's geographical size, its abundance of highly elastic, low-cost labor supply, and the overall liberalization of trade due to its accession into the WTO, it is uniquely equipped to attract foreign investment. China's rapid growth has "triggered fears of increased competition for developing countries and hollowing out of manufacturing firms in advanced countries" (Greenaway, 153). First, developing countries that deal in similar exports, such as agricultural goods, textile products, and manufactured commodities, could see their export figures cannibalized by increased production of those goods in China. These countries are, for the most part, countries geographically close to China, such as Thailand and the Philippines. Because they are geographically close, their resources are similar, causing them to compete in similar sectors. Due to China's overwhelming influence in world trade, products from these smaller countries are often neglected for products of similar quality from China. It can be argued that, in the long run, importers would rather import from China because of China's stability and the opportunity for trade from China's other sectors. This would also open the door for future foreign direct investment in China from the importing nations. As a result, smaller neighboring countries can potentially be priced out of the market in the aforementioned sectors.

Similarly, developed countries fear that the shift of Chinese industries from the primary sector to manufacturing will take away from their own exports. More developed nations in the Asian region such as Japan and South Korea have already shifted resources into high tech manufacturing sectors in anticipation of China's growth, but China is starting to encroach on those sectors as well. With China's resources and manpower, this poses a significant threat for the economies of those developed nations (Greenaway, 153). Essentially, developed nations will suffer market share losses while developing nations would find their exponential growth curbed by China's influence. Though it is impossible to say whether or not China will continue to develop at the same rate, the progress it has made since its accession into the WTO and the access to new markets has given them the ability to economically cannibalize its neighbors. China's exports grow at an average of 19.7%, compared to 7.1% for other Asian countries with similar exports and 8.7% for the world's developing economies (Greenaway, 157).

Not only economically, China is taking steps into the legal side of international trade. It has become skilled in exploiting the nature of the WTO legal body, the Dispute Settlement Body (DSB), since its accession in 2001. China has had, to date, 23 cases brought up against it in the WTO, primarily stemming from the United States and the European Union (EU), although usually third parties will join in on the proceedings.

At the beginning, China was very naïve. The first case brought against China was in 2004; it was an accusation by the United States about the Value-Added Tax (VAT) on Integrated Circuits. China was accused of giving a partial refund to Chinese enterprises on integrated circuits, resulting in a lower VAT ("China – Value"). The case was fairly straightforward; China hastily removed the partial refund for enterprises in China. Third parties included the EU, Japan, and Mexico. China and the US reached an agreement without having to request the formation of a panel by the DSB. Yet, after its five-year phase-in period, China began to utilize the knowledge it had gained sitting in as a third party on various negotiations. In 2006 Canada, the US, and the EU brought an accusation against China concerning the imports of automobile parts because China was increasing the tariff on auto parts "from 10% to 25%, the same as the rate charge on imported foreign-made vehicles, if the parts comprise more than 60%" of the automobile (Zhang, 6). Instead of cooperating with the complainants, in this case China allowed proceedings to be carried out to their full term, and due to a lack of retrospective compensation, China did not have to compensate for "any damages made during the litigation process at the WTO, which can easily take two years" (Zhang, 14). Following the panel ruling, China even went so far as to appeal the decision, causing another two months of discussion and prolonging their practices ("China – Measures Affecting Imports"). Similar tactics were taken by China in cases such as the case for intellectual property rights in China and the case regarding procedures that affect trading rights and distribution services for products of an audiovisual nature ("China – Audiovisual Entertainment Products," "China – Intellectual Property Rights").

The most recent case brought up against China involves electronic payment services. Foreign suppliers are forced to go through a Chinese entity for electronic payment services, which

causes those suppliers to use the undervalued Yuan instead of their domestic currency ("China – Certain"). There are also inconsistencies regarding payment methods for other members of the WTO because access is guaranteed to all merchants that use the Chinese entity, while others are forced to negotiate for access. The main complainant is the United States, with third parties including Australia, Ecuador, the EU, Guatemala, Japan, and the Republic of Korea. It is important to note that of the third parties involved, five of them are major players in world trade, indicating that this issue holds serious weight for a large portion of the economic world. This issue has yet to be fully resolved, yet the request for consultations was made on September 15, 2010, with a panel yet to be formed ("China – Certain"). Due to the procedures of the WTO and the complexity of the case, it is doubtful that it will be resolved in the near future. In fact, it is most likely that it will be drawn out like previous cases, which could have a severe impact on the world economy. This is just one example from the recent history of cases brought up against China that have yet to be explored or even discussed. In the meantime, China remains free to continue its practices unregulated. It should be noted that if China had not joined the WTO, other countries would have been able to legitimately punish China with tariffs and other trade barriers, forcing China to follow the general rules of the market. Its WTO membership definitely provides an edge for its legal maneuvering.

Not only has China learned how to use the WTO system to its advantage, there is ample data from the 1990s that shows they have been growing significantly without the WTO, and by joining the WTO China now faces more red tape, as do its trading partners (Greenaway 152). While this is not a point often thought about, it is something worth considering when taking into accounts the risks and benefits of China in the WTO.

It is difficult to discern whether the negative changes brought by and upon China would have still occurred had it not joined the WTO, but certain elements of the WTO have a clear correlation with effects in the world. Due to its accession, China was able to shift towards a more industrial style of economy, which has had a distinct effect on the environment of China, particularly in the water supply. While wage disparity could have occurred regardless of whether or not China joined the WTO, the influx of manufacturing work

surely influenced the widening gap between the urban and rural communities. Other Asian countries have experienced a decrease in exports due to China's rapidly expanding export sector. Before China joined the WTO, the various agreements it had with other nations would be enforced on that nation's terms. Now given that China is a part of the WTO, other nations are forced to work through the laws of the system, a system that China is very adept at manipulating. Overall, while there are numerous positive effects of China's accession, the risks outweigh the benefits in this case.

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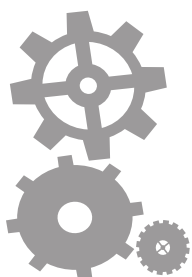
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# META-ANALYSIS OF ENVIRONMENTAL KUZNETS CURVE STUDIES: DETERMINING THE CAUSE OF THE CURVE'S PRESENCE

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## I. INTRODUCTION

Worldwide public concern of the quality of our environment has ignited large efforts toward finding the determinants of environmental degradation. The Environmental Kuznet's Curve (EKC) hypothesis models the relationship between levels of environmental degradation and income in a given economy and has been a topic of high debate in recent years. This concept hypothesizes the relationship between per capita income and the level of environmental degradation in an economy is an inverted U-shape. This focuses upon the idea that economic growth is necessary for environmental quality to be maintained or improved. Following Grossman and Krueger (1992), who first described the EKC, a deeper understanding of the empirical relationship between income and environmental quality has been rapidly evolving through recent studies of the EKC hypothesis.

The EKC is commonly found both present and absent in many different empirical studies, thus spurring controversy of the topic. An abundance of empirical literature exists; however, the level of doubt arises considering the majority of EKC studies rely solely on empirical evidence. EKC literature contains many studies that employ different methods, evaluate different environmental indicators, and use different data, resulting in a broad spectrum of findings which lead to conflicting interpretations. However, there are a limited number of attempts of systematically surveying the EKC literature using meta-analysis to discover what has been learned through past research concerning the existence of the curve.

Since 1991, the EKC has become a standard feature in environmental policy, though its application is highly questioned as an effective tool for policy implementation (Roberts and Thanos, 2003). If there existed evidence of specific factors that lead to a true EKC form in a given

economy, then policy makers could heavily depend upon the EKC as a core policy tool for controlling environmental quality. Uncertainty lies in the question of whether results from previous research are reliable enough to be used for policy formation. Intuitively, if economies with higher income levels naturally pollute the environment less, then policies that stimulate growth should be good for the environment.

Cavlovic et al. (2000) conducted the first meta-analysis of the EKC hypothesis, using a compilation of EKC studies from the early 1990s. She researched 25 studies using 155 observations and considered 11 different environmental degradation measures. Cavlovic's study found that methodological choices can significantly influence results. A second meta-analysis was conducted shortly after by Li et al. (2007). Using the data of the 25 studies from Cavlovic et al. (2000), additional observations were added to update her database to 77 studies which provided 588 observations in total. This study looked at two broad categories of greenhouse gases: anthropogenic activity-related and chemically-active gases. Li et al. (2007) ultimately found no statistically significant evidence that supports the EKC for anthropogenic activity-related gases.

The importance of this topic is derived from the question: what variations and factors of all empirical studies affect the absence or presence of the EKC curve? The objective of this study is to answer this question by further expanding upon past meta-analyses conducted on empirical EKC studies. As many empirical EKC studies continue to be completed, it is important to systematically examine this body of literature so we can come to a better understanding of the key determinants of environmental degradation and its relationship with income supported by the EKC hypothesis.

For this study, I hypothesize that the type of pollution and level of a country's development will be a key determinant of the presence of the EKC in a specific study. All things considered, the type of pollution is commonly the main focus of empirical research of the EKC, thus showing that this factor is likely to be of significance when looking for an EKC relationship. Studies frequently look at a few types of pollution within a given paper and analyze the data for each of the pollutions separately. In addition, since countries show significant differences in political, social, and economic biophysics factors, it can be expected that different countries exhibit different patterns for their relationships between environmental quality and income (Figueroa & Pasten, 2009). Other factors may be significant to the curve, but based on economic theory, I hypothesize that the type of pollution and level of economic development in a country will have the largest effects.

## II. LITERATURE REVIEW

The Environmental Kuznets Curve is a concept that first emerged in the early 1990s hypothesizing the relationship between per capita income and level of environmental degradation has an inverted U-shape. As mentioned earlier, this concept focuses upon the idea that economic growth is necessary in order for environmental quality to be maintained or improved (Stern, 2004).

The EKC hypothesis was made popular by the World Bank's World Development Report 1992, which argued that greater economic activity inevitably hurts the environment based on status assumptions of technology, tastes, and environmental investments (WRI, 1991). As income increases, the demand for improvements in environmental quality increases, as well as resources for available investment to improve the environment. Others have claimed that economic growth leads to environmental degradation in the earlier stages of growth, meaning the only way to attain a healthy environment is to become rich. Researchers believed at higher levels of development, structural change within the economy towards information-intensive industries, services, increased awareness of the environment, enforcement of regulations, and improved technology result in the decline of degradation. Therefore, theory suggests a number of causes of the EKC, including environmentally friendly economies of scale in production,

changes in product mix, changes in technology, changes in input mix, and underlying social considerations such as regulations, awareness, and education.

Scale implies that expanding production increases emissions or given scale economies/diseconomies of pollution, there could be proportional increase in pollution. In earlier phases of development, output mix changes, and there is a shift away from agriculture that moves towards heavy industrial production leading to increased emission. However, in later stages, the economy shifts to less resource intensive work of services and lighter manufacturing, thus decreasing emissions and explaining the fall of environmental degradation. Input mix is the idea that substitution of less environmentally damaging inputs is replaced for more environmentally damaging inputs and vice versa. Changes in technology increase levels of productivity. Being more productive will result in less pollutants being emitted per unit of output. Emissions process changes can result in less pollutants being emitted due to innovations directly related to lowering emissions. Policies developed after pollution becomes an issue can lead to the fall in environmental degradation. Also, educating the population on harming the environment as it becomes a prominent issue, could lead to the eventual decline in pollution. Thus, all of these concepts support the inverse-u shape of the curve as an economy develops.

Many empirical EKC studies are concerned with answering the question: is there an inverted U-shape relationship between environmental degradation and income? (Galeotti et al, 2008). Past literature narrows the focus of EKC studies by looking specifically at different variables. Many empirical studies in recent years have tested the EKC hypothesis through different environmental indicators, countries, regions, and econometric techniques (Ekins, 1997). EKC studies of different focuses have grown to become controversial since the first outbreak of EKC research in the 1990s. Given the broadness and large potential for research of the EKC, many concluding results from numerous EKC studies are very conflicting with one another. Findings from such an abundantly researched topic have developed in recent years to determine if economies actually pollute their way to growth, or, conversely, if economies reduce pollution as they grow. These studies focus on what specific features support

the EKC hypothesis.

Several studies focusing on the same pollution type have revealed contradicting results of the presence of the EKC relationship between pollution and income. For example, Aslandis and Irazzo (2009) studied CO<sub>2</sub> emissions of multiple countries from 1971 to 1997. No evidence was found of an EKC present from CO<sub>2</sub> emissions using econometric techniques for transition regressions with panel data. On the contrary, in a study utilizing a semi-parametric panel model for CO<sub>2</sub> emissions in 15 Latin American countries (Poudel, 2009), results show an N-shaped curve, which is sensitive to the removal of some groups of countries. An N-shaped curve is the same as the standard EKC shape except after environmental degradation falls, pollution begins to increase again and the curve moves back up. An example of the N-shaped curve is shown in Figure 1. Not only

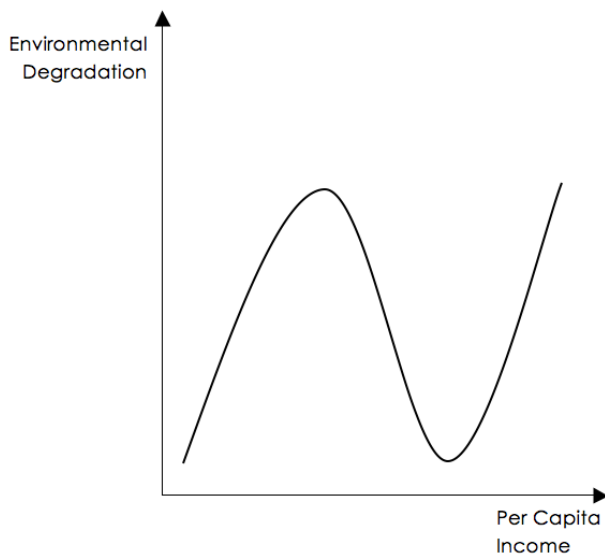


Fig. 1. N-Shaped Environmental Kuznets Curve

are both studies producing contradicting results, but the latter found sensitivity among certain countries included in the study. Considering that the level of development is what usually differentiates these countries from one another, it is evident that the level of development of countries within a study will affect the presence or absence of an EKC in addition to the pollution type.

A largely reoccurring criticism of EKC studies is the omission of relevant explanatory variables (Galeotti et. al, 2009). Many studies are conducted using panel data sets of individual re-

gions and countries throughout the entire world. Some studies group together certain countries while others test each country individually. Different results from these methods plays into the regional effects that have been found among certain results, which bring up the question of whether or not the countries studied ultimately affects the presence of the EKC.

Many studies have shown that the country being studied truly affects the results of the relationship between income and environmental degradation. In Lee et al (2010), water pollution was looked at upon 97 different countries within the years 1980-2001. Empirical results showed evidence of an inverted U-shape relationship in American and Europe countries, but no relationship shown in Asian and Oceania countries, thus strongly supporting the regional effect of EKC studies (Lee et al, 2010). Reasoning for this effect was due to the majority of the Asia Oceania group being low income countries, thus affecting the presence of the EKC hypothesis.

In Fodha and Zaghdoud (2010), both CO<sub>2</sub> and SO<sub>2</sub> were considered for a small and open developing country. Although tests were performed on the same country within the same time frame, results of the two different pollutants were not the same. An inverted U-shape relationship between SO<sub>2</sub> emissions and GDP had been found whereas a monotonically increasing relationship with GDP was found for CO<sub>2</sub> emissions. EKC presence among SO<sub>2</sub> emissions can be explained by the fact that SO<sub>2</sub> mainly affects the regional population as opposed to the global population. Also, in the specific country of this study, there are limited numbers of emission sources and investment can easily reduce emission levels (Fodha and Zaghdoud, 2010). This study provides another example of how country variance can truly affect the presence or absence of an EKC relationship. In addition to Fodha and Zaghdoud, another study of sulfur emissions in different countries found evidence of the EKC hypothesis (Leitão, 2010).

As different econometric techniques have been utilized in past research, a large number of results from specific techniques tend to differ based upon methods used. In a study based on environmental degradation and its relationship to income in China, all three pollutants of waste gas, waste water, and solid wastes have shown

results of an inverse U-shape in support of the EKC hypothesis using a panel cointegration method (Song et. al, 2007). Panel data is very commonly used among most EKC studies. A similar study done using integration and cointegration tests predominantly produced results supporting the EKC hypothesis as well (Galeotti et. al, 2009). Whereas, a different study was performed using smooth transition regressions with panel data and found no evidence of the EKC hypothesis (Aslanidis and Iranzo, 2009). Methodology used within these studies ultimately affects the resulting relationship between income and environmental degradation.

Clearly the focus of the majority of published EKC literature revolves around specific variables chosen for the study. The differences among economies and how to approach looking for the relationship between environmental degradation and income produce diversified results. Despite all of the past EKC literature, there is still much left to be found regarding systemic patterns within a study to determine whether an EKC would be observed or not. In order to look through the large magnitude of EKC studies, Li et al. (2007) used a meta-analysis to investigate empirical EKC studies from 1992 to 2005. Li's meta-analysis, investigating EKC studies from nearly 13 years total, was the first attempt to fill that gap of reasoning behind the presence or absence of an EKC. I will further the exploration of determining the factors influencing the presence and absence of an EKC through my own meta-analysis by investigating EKC studies from the years 2006 through 2011. My study is done with the intent to find significant factors that affect the curve by using more recent findings as opposed to past studies that are already completed and analyzed.

### III. META-REGRESSION ANALYSIS AND DATA

A meta-analysis is a statistical approach used to integrate the findings of a large collection of results among different empirical studies, all with a common factor of a specific topic. The purpose of a meta-analysis is to reach meaningful conclusions relative to past literature on a specific topic and further explain the reasoning for specific results. A meta-analysis is commonly structured in regression form. Observations from every study are individually collected and transcribed based upon the results of the studies. Every explanatory variable is a characteristic of an individual observation (i.e. method type, GDP, developed country, etc.) which is then aggregated into a single database. The process of performing a meta-analysis is both time consuming and complex. The following sections take a deeper look into the process of collecting data for a meta-analysis: determine variables, identify the literature to be analyzed, identify individual observations in each

Table 1: Model Variables

|  | Variable | Descriptions   |
|--|----------|--|
| Dependent Variables                          |          | Indicator variable of the environment-income relationship. If an inverted U-shape or a monotonically declining trend is found then =1; if an insignificant inverted U-shape exists then =2; any other results fall under the category "else" =3. |
| Data-Related                                 | RELATION |  |
|  | LNOBS    | Logarithm of the number of observations.   |
|  | LNTIME   | Logarithm of the data coverage period.   |
|  | PANEL    | Indicator variable of the data in the study; if panel data is used then PANEL=1, else=0.   |
|  | GLOBE    | Indicator variable of using multi-country data; if yes GLOBE=1; else=0.  |
| Variable Controls                            | EMISSION | Indicator variable of using emission as the pollution measurement, true=1, else=0.   |
|  | GDP      | Indicator variable of using GDP as the income measurement in a study, true=1, else=0   |
|  | DEVLPED  | Indicator variable of whether data comes from developed countries or not. If yes, DEVLPED=1; else=0.   |
| Statistical Methods                          | FITNESS  | Fitness of the regression in a study (percentage).   |
|  | TEST     | Indicator variable of applying robustness test for regression results; if applied, TEST=1, else=0.   |
| Environmental Quality Degradation Categories | ANTHPGR  | Indicator variable of anthropogenic activity-related greenhouse gases; if yes, ANTHPGR=1, else=0.  |
|  | CHACTGR  | Indicator variable of chemically-active greenhouse gases; if yes, CHACTGR=1, else=0.   |
|  | BIOREL   | Indicator variable of biologically-related pollutants; if yes BIOREL=1, else=0.  |

Table 2: Sample of Dataset

| AUTHOR    | RELATION | LNOBS | LNTIME | PANEL | GLOBE | EMISSION | GDP | DEVLPED |
|-----------|----------|-------|--------|-------|-------|----------|-----|---------|
| Song      | 1        | 1.099 | 2.996  | 1     | 0     | 1        | 1   | 1       |
| Song      | 1        | 1.099 | 2.996  | 1     | 0     | 0        | 1   | 1       |
| Song      | 1        | 1.099 | 2.996  | 1     | 0     | 0        | 1   | 1       |
| Biagliani | 3        | 1.792 | 0      | 1     | 1     | 1        | 1   | 0       |
| Biagliani | 3        | 1.792 | 0      | 1     | 1     | 1        | 1   | 0       |
| Biagliani | 3        | 1.792 | 0      | 1     | 1     | 1        | 1   | 0       |

study, transcribe the data, and conduct a statistical approach.

#### A. Step 1: Determine Variables

The first step to conducting a meta-analysis is to decide what specific variables will be collected and used from past studies in order to formulate a complete database. The list of variables must be relative to the theory within the meta-analysis and also be present in the studies being analyzed. Because my study furthers the exploration of determining the factors influencing the presence or absence of an EKC, I chose to replicate the variables used in Li et. al, 2007 (see Table 1). My study is completed with the intent to find significant factors that affect the EKC by using more recent findings. To maintain a fair level of comparison from this meta-analysis to Li's, I remain consistent by using the same variables as in Li's meta-analysis.

#### B. Step 2: Identify the Literature to be Analyzed

The next step is to identify what literature will be used in relation to the topic of the meta-analysis. Because I am looking at more recent findings about the EKC, I created a set of criteria to filter through the abundance of literature published on EKC's. I decided to only use peer reviewed empirical studies that were published after the year 2005. Only empirical studies could be used because theoretical studies do not produce the variables needed for my meta-analysis. For example, an obvious variable needed is the resulting shape of the curve found from using an empirical model in a given study. Theoretically supported studies would not provide any empirical evidence or resulting pattern of data that is needed for my analysis. Also studies used must be after the year 2005 in order to prevent overlapping data with Li's past meta-analysis. I am using a total of 20 studies published between the years 2006 and 2011.

#### C. Step 3: Identify Individual Observations in Each Study

Now that the list of variables to look for and the collection of literature is complete, it is time to identify individual observations in each of the studies. The unit of observation is "a study." Each of the studies produces values for the variables defined in step 1. One single study is not limited to any number of observations. That is, one study can easily produce 15 different observations. For an example of what multiple observations look like, refer to Table 2.

Table 2 shows part of the dataset after completion. Notice the author Song fills up three rows of data. The three rows of values corresponding to the author, Song, show three different observations pulled from Song's published study. In Song et. al, 2007, three different types of pollution were tested: waste gas, waste water and solid wastes. These different pollutions qualify for separate observations within one study because they affect the value of the EMISSION variable. Only one pollutant can be considered at a time, so the study must be broken down by pollution types.

#### D. Step 4: Transcribing the Data

After identifying each individual observation, the data collected from every study must be assigned a value and coded into the dataset. As shown in Table 1, most of the variables are dummy variables aside from a few that hold actual values, i.e. LNTIME and LNOBS. The actual values are simply recorded with their corresponding study. Referring back to Song et. al, 2008 from Table 2, the first line shows a "1" under the EMISSION's column. Based off the description of the EMISSION variable in Table 1, a "1" for EMISSION represents a variable in which emissions is the pollutant being observed. This type of transcribing is done for every single variable being considered in the meta-analysis for every study used in the



database. Using a data base of 20 studies from the year 2006 through 2011, 78 observations were collected in total for this study.

### E. Step 5: Taking a Statistical Approach

The last step of the meta-analysis process is taking the formulated dataset and applying a statistical model to it. No meta-analyses are restricted to any one given model just as any other research topic is not limited to taking a specific statistical approach. For this study I will be using the STATA program to run a multinomial logit model as explained in the next section.

Overall, a meta-study allows a much wider and diverse net to be cast than a traditional literature review. Because it uses econometric techniques, meta-analysis is excellent for highlighting correlations and links between studies that may not be readily evident as well as ensuring that the researcher does not subconsciously infer correlations that may not exist. Rather than relying on descriptive literature or individual results of a single study, a meta-analysis has the capability of "analyzing the analysis," thus controlling for a large variety of factors and potentially resulting in an improved statistical interpretation of the results of multiple pieces of literature.

Limitations of meta-analyses arise from potential selection biases, publication biases, and skewed data. Also, certain studies may not have variable results that perfectly fit into all the categories. The researcher compiling the data must make sure that all research is quantitative, rather than qualitative, and that the data can be compared across various researches to allow for a genuine statistical analysis.

The most recent EKC meta-analysis (Li et al., 2007), contained 77 studies and 588 observations. These studies included published papers (83%), book chapters (4%), and working manuscripts (13%) (Li et al, 2007). For the purpose of my study, the data will only consist of peer reviewed papers. My study builds on Li's by including EKC studies that were conducted after the publication of Li's meta analysis.

The dependent variable used for my study is a trichotomous categorical response variable titled *RELATION* as represented in Table 1. First, the types of curves found in all observations can be categorized into seven different variables. These seven types of curves are then grouped into 3

main categories used for the dependent variable. The seven environmental-income relationship variables are: (1) monotonic increasing, (2) monotonic decreasing, (3) inverted U-shape (EKC), (4) U-shape, (5) N-Shaped, (6) insignificance (INSIG), and (7) none. Insignificance means that the estimated coefficients have consistent signs for an EKC relationship to be existent, but the results are not statistically significant in the observation used from empirical results of the individual studies in the database. None refers to when no relationship exists.

The seven types of curves are then categorized into three categories for the purpose of the multinomial analysis. Ultimately, the three categories representing the type of curve are used as the dependent variable. The first category is when environmental quality improves (IMPROVE), the second category is when results show evidence of an EKC curve but are insignificant (INSIG), and the third category (NONE), is every other relationship including no relationship at all. To define each of the three relationships, IMPROVE means that as an economy grows, the level of pollution improves meaning the environmental quality is increasing. Studies resulting in insignificant EKC's are a part of the INSIG category, and observations with no relationship or any other pattern not in the previous two categories fall in the ELSE category. These groups are summarized into the three *RELATION* groups representing the dependent variable in the multinomial logit model.

All of the following explanatory variables are derived from the studies examined and transcribed into the database used for this meta-analysis. The unit of observation is "a study." Each of the studies that have been examined has a value for the variable being defined. The explanatory variables are grouped into four different categories: data-related, variable controls, statistical methods, and pollutant categories. The data-related variables are dataset characteristics of the examined studies. Variable controls are the set of explanatory variables that are used in an EKC study as well as the statistical controls. The statistical method variable represents whether or not a specific econometric test was run.

The four variables in the data-related group are: (1) the time span of the data covered in the study (LNTIME), (2) data size of number of observations in log terms (LNOBS), (3) whether

the study uses panel data or not, (4) the geographic aspect of the study whether or not the information is pulled from one or more countries (GLOBE). The variable controls subgroup includes 3 variables to capture the distinction between different studies: (1) Whether the pollution is measured through emission (EMISSION), (2) whether the study uses GDP as a measurement of income (GDP), (3) whether a study uses data from a developed country or an undeveloped country (DEVLPEd). The statistical subgroup specifies what type of modeling is done in order to clear up any criticisms of model type within a study: (1) goodness-of fit measure as in  $R^2$  or adjusted  $R^2$  (FITNESS) and (2) evidence of robustness test for heteroscedasticity, fixed effects, cointegration, etc. (TEST).

Although there are many other potential categories for the environmental indicator variables, the studies will be isolating the (1) anthropogenic activity-related greenhouse gases (ANTHPOGH), (2) chemically-active greenhouse gases (CHACTGR), and (3) biologically-related indicators (BIOREL). In addition, the same variables used in the meta-analysis by Li et al (2007) will be used in my meta-analysis. However, multiple variables have been omitted due to the smaller size of the database and the incomplete information resulting from specific studies not all producing the same variables.

#### IV. EMPIRICAL MODEL

The response variable (or dependent variable) used is trichotomous, meaning there are three potential categorical responses. Because this model has a qualitative dependent variable, the objective is to find the probability of observing an inverted U-shaped EKC, an insignificant EKC relationship, or no relationship at all. Thus, qualitative response regression models, known as probability models, are employed.

The categorical dependent variable for the environment-income relationships is RELATION. As described before, the RELATION variable is grouped into three categories: category

Table 3: Results

| Variables              | Column 1                  | Column 2              | Marginal Effects |
|------------------------|---------------------------|-----------------------|------------------|
|                        | IMPROVE                   | INSIG                 | IMPROVE          |
| LNOBS                  | -0.073<br>(0.123)         | 0.202<br>(0.241)      | -0.041           |
| LNTIME                 | 0.081*<br>(0.043)         | -0.053<br>(0.056)     | 0.028            |
| PANEL                  | -17.418<br>(2616.829)     | -17.954<br>(2616.831) | -0.341           |
| GLOBE                  | 1.47<br>-1.104<br>(1.526) | 0.425<br>(1.526)      | 0.128            |
| EMISSION               | -20.812<br>(4358.394)     | -20.887<br>(4358.394) | -0.086           |
| GDP                    | -16.626<br>(2519.238)     | -18.841<br>(2519.238) | -0.451           |
| DEVLPEd                | 2.647**<br>(1.259)        | -2.381<br>(3.274)     | 0.290            |
| CONSTANT               | 51.533<br>(5673.619)      | 54.420<br>(5673.619)  |                  |
| Number of Observations | 78                        | 78                    | 78               |

Notes:

1. Standard errors are included in parenthesis
2. \* denotes significance at the .10 level
3. \*\* denotes significance at the .05 level

1 (IMPROVE); category 2 (INSIG); and category 3 (ELSE) as defined in the previous sections. IMPROVE means that there is an EKC present in the study. INSIG means an EKC was recognized, but was also statistically insignificant. ELSE represents the category containing any other shaped patterns (i.e. U-shaped, N-shaped, etc.) and no relationship/EKC found. A weighted multinomial logit model (MNL) of the probability of RELATION is given by:

$$P(Y_i = j | C) = \frac{\exp(\beta_j' x_i)}{\sum_{k \in C} \exp(\beta_k' x_i)}$$

Where as  $P(Y_i = j | C)$  is the probability that the relationship category falls in alternative  $j$  within set  $C$ , and  $C = \{\text{IMPROVE, INSIG, and ELSE}\}$  for study  $i$ .  $\beta_j$  and  $\beta_k$  are vectors of the explanatory variables' coefficients, and  $x$  is a vector of study-specific modeling choices. In order to find the effects of each specific attribute of choice  $k$  on the prob-

ability  $P_j$ , we calculate the elasticities of the probabilities (Greene, 2003). The third category, ELSE, is set as the base category. Thus the explanatory coefficients of one category produced explain the probability of the variables in that category showing an effect against the base RELATION, ELSE. That is, for one given explanatory variable coefficient from IMPROVE, the value of the coefficient explains the probability of that variable producing an IMPROVE relationship over and ELSE relationship.

## V. EMPIRICAL RESULTS

The estimated results of the multinomial logit model (MNL) for investigating different EKC relationships are presented in Table 3. When running the logit model, multicollinearity was the main issue when attempting to incorporate all variables as shown in Table 1. Note that not all variables listed in Table 1 are included in Table 3 due to missing data from specific observations, as well as the main issue of multicollinearity among the data.

Multiple problem variables were removed and the remaining variables, as shown in Table 3, represent the ultimate variables used for the final model. The variables not included in Table 3 are GDP, FITNESS, TEST, ANTHPGR, BIOREL, and CHACTGR. The multinomial logit was originally run with all variables listed in Table 1, but many of the variables were removed. All of the data-related variables produced significant outputs when included in the different combinations of variables tested. Ultimately the remaining variables used within the model were LNOBS, LNTIME, PANEL, GLOBE, EMISSION, GDP, and DEVLPED. Refer to Table 1 for descriptions of the variables.

The coefficients of the MNL are somewhat difficult to directly interpret. Table 3 shows three columns, IMPROVE, INSIG, and marginal effects of IMPROVE only. The three categories of the dependent variable are IMPROVE, INSIG, and ELSE. Within the database, a 1 represents IMPROVE, a 2 represents INSIG, and a 3 represents ELSE. The third category, ELSE, is used as the reference category within the model in order to compare instances when an EKC was present against when there was no EKC pattern present. Since the dependent variable is trichotomous, the effects of the explanatory variables are shown through the

calculations of the elasticities of probability. Elasticities are calculated for continuous variables to represent a small increase in original mean values. The elasticities produced in Table 3 indicate how a one unit change in the independent variable (or equaling one in the case of a dummy variable) affects the probability of the occurrence of the "category." For example, LNTIME is compared to the number of years increased by one. For the dummy variables, elasticities are calculated from 0-1.

Given the limited number of observations used within the database for the purpose of this study, it is not surprising to find only two out of the nine variables included in the final model to be significant among the IMPROVE category and no statistically significant variables in the INSIG category. The only data-related variable found to be significant at the 0.10 level was LNTIME (which is the natural log of the number of years data was collected in a given study). This can be interpreted as meaning when the number of years in a study increases by one, the probability of finding an IMPROVE relationship increases by 0.028, *ceteris paribus*.

DEVLPED is the only variable control that significantly affects the probability of finding an IMPROVE relationship. DEVLPED is a dummy variable that represents if a country is either developed or undeveloped/developing. Relative to the base category (WORSEN), the variable of whether a country is developed affects the probability of finding an EKC. Using a developed over an undeveloped/developing country increases the probability of finding an EKC curve by 0.290. None of the variables had significant probabilities of finding an INSIG relationship over the ELSE relationship.

Both LNTIME and DEVLPED coefficients held positive elasticities values as predicted. Aside from LNOBS, LNTIME, and DEVLPED, all other variables had the same signs and nearly the same coefficients when comparing the IMPROVE coefficients to the INSIG coefficients. The estimation results of the dummy variables for IMPROVE and INSIG are majorly consistent. Not only were the coefficients close in value, but the signs were the same as well. Regardless, all of the remaining variables that were consistent between the two categories were not statistically significant.



## VI. CONCLUSION

Taking a look at the meta-analysis results, it is fair to say that literature results showing inverse-U shape curves statistically insignificant are no different than seeing no significant findings for the categorical relation INSIG. This makes sense logically because when comparing category INSIG to the reference category ELSE, the insignificant coefficients of INSIG's variables explain the probability of a specific explanatory variable leading to an insignificant U-shape curve instead of no relationship. These two things are the same because either way, the resulting relationship is not going to be the EKC, which is the ultimate goal of this project. Intuitively, it makes sense that there would be no significance in any of the explanatory variables when looking among category INSIG, considering that category would explain what determines the output of an insignificant U-shaped curve.

The evidence presented in this paper shows that there are two significant explanatory variables that lead to the presence of the EKC, time and developed countries. These two explanatory variables make sense intuitively to be significant. The time factor holds importance by basically suggesting we need to allow for a passage of time in order to observe a "turning point" of a country's level of pollution. The major idea that can be concluded from these two factors is the concept that countries pollute their way to growth. Considering that there is a positive and significant coefficient for the time and developed variables within category IMPROVE, this shows that there is a significant probability existent showing the odds of a study to result in the EKC curve increases if the country being viewed is developed and looked at over a long period of time. Development that occurs over a period of time eventually causes EKC's to invert. Thus, economies eventually grow themselves toward a cleaner environment. In respect to my hypothesis, predicting the development of a country to significantly reflect the presence of the EKC curve was fairly accurate given that DEVLPED was one out of the two only significant variables resulting in this study.

This idea of developed countries exhibiting this pattern over time is relevant in deciding if people should invest in countries from abroad to stop pollution from occurring. Polluting the way to growth provides negative externalities upon

the increase in pollution levels. Policies should be implemented that provide incentive for countries to become environmentally conscious without majorly polluting their way to a certain point of wealth that make caring for the environment affordable. In addition, policies that stimulate growth are an option to be implemented if ultimately an economy is going to grow enough to sustain a cleaner environment.

In addition to the DEVLPED variable, the idea that length of a study increases the probability of finding an EKC present can lead to the idea that investment and policy should not be spent on economies that are near being completely developed. Also, knowing that it takes time to see the EKC pattern in a given economy, policy makers are going to be able to better predict a time frame to see policies actually take an effect on the environmental quality. Ultimately, findings from this study show that policies to better the environment will take a long period of time and do not provide an instant betterment of an economy's environment.

Given the limited amount of data used within this set of studies from the year 2006 through 2011, further research can expand upon this study by adding both past and even more recent published studies of the EKC. A larger and more variable dataset will provide the variation needed to avoid issues of multicollinearity and also make the results stronger knowing they would incorporate findings from the majority of works published about the EKC and what defines its existence.

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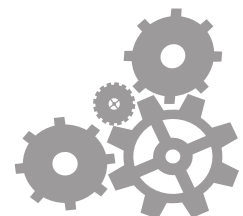
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# THE IMPACTS OF U.S.-CHINA TRADE ON U.S. MANUFACTURING UNEMPLOYMENT

*Tung Hoang*

## I. INTRODUCTION

The U.S.-China economic ties have expanded over the past three decades with a substantial growth in both imports and exports. The total trade amount rose from only 2 billion in 1979 to over 457 billion in 2011. Although total trade increased over time, U.S. imports from China rose at a much higher rate than U.S. exports, and thus have caused a trade deficit since 1974, making China the U.S.'s biggest source of imports and second largest U.S. trading partner.

The impacts of trade on the U.S. economy are yet to be thoroughly examined and many economists have debated the consequences that it has on the employment situation over the years. One thing is certain, the U.S.'s openness with the world in terms of trade will benefit U.S. individuals, corporations, and the U.S. economy as a whole. However, there are many negative aspects of the growing trade deficits; one of those suggested by many leading economists is the rise in unemployment. The U.S. labor market has been up and down many times in the past and these fluctuations can be attributed to many factors. Most of the time, it is thought that the macro-economic situation is the main cause. However, the changes in the labor market can be attributed to a major production shift which can be caused by opening trade with a labor-intensive country, such as China. Understanding the U.S.'s trade situation will yield a greater knowledge of the effect that the trade balance has on the U.S. employment situation, especially in those industries that mainly employ low-skilled workers.

The current unemployment situation in the U.S. has attracted much attention from policy makers and economists as there have not been a clear solution to resolve the problem. The unemployment rate has remained relatively high over the past few years and differed across industries. For the manufacturing sector, the rate has stayed relatively high at about 10% on average (2001 – 2011). Therefore, if the trade imbalance of the U.S. with China contributes to U.S. manufacturing sec-

tor job losses, it would have significant policy implications and help the U.S. government provide necessary protection to its workers. In this paper, I examine the impacts of trade on unemployment while controlling other economic factors such as GDP, U.S. foreign direct investment to China, labor costs and productivity. Upon doing this research, I hope to find what affects unemployment in the U.S. manufacturing sector the most and determine whether trade imbalance is an actual cause of millions of lost jobs in this sector.

The main theoretical framework used in this paper is the classic Heckscher-Ohlin theorem with two goods, two countries and two factors of production. Under this theorem, the U.S. is considered to be the capital abundant country and China the labor abundant country. According to the theory, as the two countries open to trade, each one would specialize in the goods that use intensively its abundant factor of production. Therefore, China, with its advantage in low-wage workers, is expected to utilize its production in industries that are labor intensive. As the U.S. is more focused on producing goods that are capital intensive, there is a production shift from U.S. to China for those goods which primary factor of production is labor. This shift is an indication of job losses in industries that traditionally use workers as its main factor of production.

Despite the logical implication of the Heckscher-Ohlin theorem, the employment situation of the U.S. manufacturing sector may be influenced by factors other than trade. Therefore, I take into account other economic models and theories of leading economists that have different views concerning the impacts of trade on employment. By reviewing different opinions, I look forward to constructing a reliable model that can help answer the question of whether the growing trade with China causes job losses in the U.S. manufacturing sector. My hypothesis, which is based on the Heckscher-Ohlin theorem, is that factors favoring U.S.-China trade (increased imports from China and more U.S. direct investment to main-

land China) contribute significantly to the rise in unemployment of U.S. manufacturing sector.

## II. LITERATURE REVIEW

In reviewing the recent works on the impacts of U.S.-China trade on unemployment, I found a variety of articles and papers that express different viewpoints on the matter. In general, many of them suggest a direct causal relationship between trade deficits and unemployment and provide empirical models using different data sets that span from the 1970s to 2009. There are also several papers that propose the contrary viewpoint that trade impacts have negligible effect on the unemployment situation. The following summary will capture the most notable works done in the field in order to provide a broad picture of the background for this research.

In his research paper, Sucharita Ghosh (2002) investigates the relationship between international trade and employment in the manufacturing sector of the U.S for the period of 1961-1995. The author proposes that changes in trade of manufactured goods affect employment in the manufacturing sector of the U.S. Using the time series analysis method, the author confirms a long-run relationship between net imports and employment. Then, using the test of Granger causality, the author finds that changes in employment do not Granger-cause changes in net imports. In reverse, changes in net imports do cause Granger-cause changes in employment in the two major industries: industrial machinery and chemicals. However, the primary metals industry is an exception to this general finding, and Ghosh (2002) concludes that changes in net import in this industry do not Granger-cause changes in employment. The Ghosh paper (2002) therefore provides insight into the relationship between employment and net imports in a bivariate context over the period 1961-1995 for the United States. The results in this paper set a groundwork to examine further the relationship between trade surplus and unemployment. In addition, it also suggests using time series analysis as an alternative way to test any hypothesis about the causality between variables.

Similarly to the work done by Sucharita Ghosh (2002), Jefferey D. Sachs and Howard J. Shatz's (1994) paper analyzes the impact of trade using theories and simulation models. The paper predicts the trends in the U.S labor market using

a new database that allows the authors to trace the patterns of U.S. foreign trade. The main focus is on the period 1978 – 1990, during which time U.S. trade with developing countries expanded significantly. One of the main conclusions the authors found is that internationalization contributes to the decline of manufacturing employment, particularly of low-skilled workers. Nonetheless, the authors agree that increased internationalization by itself, however, cannot account for most of the observed labor market trends. The end of the paper makes some rough estimates of future trade flows with some of the key low-wage regions that include China, India and Mexico.

The Sacks and Shatz (1994) paper contributes significantly to the arguments and theoretical framework in my research paper with its comprehensive analysis and extensive use of theories. Also, this paper examines a period in the past during which U.S. expanded its trade internationally, which extended the scope of my research topic to a longer timeline. The suggested data sources in this paper are also useful, especially in the case when I want to analyze past patterns of labor markets.

Kate Bronfenbrenner's pilot study (2002) lays the groundwork for more comprehensive research to monitor and analyze the impact of the U.S.– China trade relations on workers, wages and employment in the U.S. Because of the lack of government data, the author first designs a media-tracking system to create a new database on production shifting out of the U.S. Then she analyzes macro data on imports, exports, and foreign investments to draw a conclusion that U.S. – China trade and investment policies have a significant impact on employment and wages for U.S. workers.

Bronfenbrenner's paper (2002) is relevant because it provides an important view on the impact of foreign investment on employment and wages. In addition, the paper provides a rich source of data for employment, wages and many other relevant variables by introducing the use of its media-tracking system. The production shift is also explained very carefully in this paper and is useful in establishing strong arguments.

On the contrary, Krugman's paper on World Trade (1994) provides a different view in the debate of trade impacts on labor markets. The

main focus of the paper is the discussion on the consequences of international trade with a focus on employment and wages. The author introduces a stylized model of global trade, employment and wages to examine the effects of growing trade. Krugman proposes that the rapid growth of 'Newly Industrialized Economies' (NIE) exports has something to do with the trends in OECD labor markets, including the rise in wage inequality and unemployment. However, the author concludes that NIE trade is not the principle cause of these labor market problems.

Krugman's (1994) paper provides a different view on the impact of NIE trade on employment by not suggesting a strong relationship between the two. Therefore, other economic factors besides trends in trade should be taken into account in explaining changes in employment. The articles reviewed in this section focused on the employment situation from 1960s to 1990s. Each paper has a different approach and model to examine the relationship between trade and the labor market, and only a few focused specifically on the manufacturing sector. Both sides of the debate propose very comprehensive models and strong arguments supported by advanced economic theories, yet there are more recent works that support the theory of negative trade impact on employment. However, not many of them are reviewing the period from 2000 – 2010 when U.S. trade with China experienced a substantial growth, mostly due to China joining the WTO in 2001. My research paper will help fill in this gap of literature by examining the most recent 10 years of trade between U.S. and China, specifically focusing on the impacts it has on U.S. manufacturing employment.

### III. DATA

As suggested by the theoretical framework and the list of papers I reviewed, I constructed an empirical model with unemployment in U.S. manufacturing sector as the dependent variable. The independent variables are U.S. imports and exports to China, productivity of U.S. manufacturing labor, the amount of U.S. direct investment to China, and the manufacturing production index. Due to the limit in data available, I am using the 'panel' method to run the regression in order to have a more accurate measurement. I broke down the manufacturing sector into five major industries: Food, Chemicals, Chemical Re-

lated Products, Machinery & Transportation, and Miscellaneous Manufacturing. Data for each of the independent variables will be collected on an annual basis and separately for each industry. Sources of data are U.S. government websites.

I use the U.S. employment index for the manufacturing sector, using 2002 as a base and available from 1930 to 2011. Therefore, value for the employment index in 2002 will be equal to 100 and other years' index will be constructed base on its relative employment value to 2002. For example, employment data in 2002 is 1 million and employment for 2003 is 1.2 million, then the index value of employment in 2003 is 120.

The variables that measure U.S trade with China are U.S. imports and U.S exports, measured by the actual dollar value. Both variables are obtained from the United States International Trade Commission (USITC) website on an annual basis, measured in billions of dollars. The data are available on this website from 1986-2011.

For U.S. manufacturing productivity, I obtained the data from the Bureau of Labor statistics website. Productivity is measured by output per hour and in percentage change from previous year. The data is obtained on an annual basis and are available from 1987-2011.

I acquired the data from the Bureau of Economic Analysis website for the U.S. direct investment in China. The data is available separately for each industry, and has the range of 1989-2009.

The same source is used to obtain Industrial Production Index data. I used Industrial Production Index instead of real GDP because it is a better measurement of the growth of manufacturing industries. GDP covers a broader range of the economy and may not accurately reflect changes in the manufacturing sector. The range for this data is from 1998-2010.

### IV. EMPIRICAL MODEL

In this research, only one OLS regression is used to analyze the effect of trade on employment in the U.S. Manufacturing sector. The dependent variable is the employment data of the U.S. Manufacturing sector, measured in index value with base year of 2002. The independent



variables are Industrial Production Index (INDUS-TRIAL\_PROD), Productivity for Manufacturing Sector (P), U.S. Direct Investment to China (US\_INVEST) and dummy variables for Chemicals, Chemical related products, Machinery and Miscellaneous manufacturing industry.

Regression Model:

$$\text{EMP} = \alpha + \alpha_1 \text{EXPORT} + \alpha_2 \text{IMPORT} + \alpha_3 \text{P} + \alpha_4 \text{US\_INVEST} + \alpha_5 \text{INDUSTRIALPROD} + \alpha_6 \text{CHEMICAL} + \alpha_7 \text{CHEM\_RELATED} + \alpha_8 \text{MACHINERY} + \alpha_9 \text{MISC}$$

All the data are from 1989-2009 and are obtained annually. The empirical model not only controls for trade effects but also economic factors that may have an impact on employment. For the trade variables, I hypothesize that increasing imports from China will result in lower employment levels. Likewise, increasing exports to China will increase the number of jobs in the U.S., which follows directly from the Heckscher-Ohlin theory. The theory states that a capital-abundant country will export the capital-intensive good, while the labor-abundant country will export the labor-intensive good (Salvatore 2009). Under this theory, I consider the United States as the capital abundant country and China as the labor abundant one. Provided that, the United States would be focused on manufacturing the capital-intensive goods and leaves most of its production process of labor-intensive goods to China. Therefore, the manufacturing sector would mostly be affected because it employs labor heavily.

Industrial Production Index (INDUSTRIAL\_PROD) is a measurement for the growth of manufacturing industries and I use the percentage change in value from the previous year. The productivity variable (P) measures output per hour and is hypothesized to have a positive correlation with the employment level. U.S. direct investment to China (US\_INVEST) accounts for the dollar amount that U.S. firms spend each year investing in China. The more U.S. investments made in China, the higher the possibility of production shifts from U.S. to China, thus leading to lower employment in the U.S. manufacturing sector.

A problem when building the empirical model is that the range of data is limited to only 19 observations. As stated previously, in order to increase the reliability of the empirical model, the manufacturing sector is broken down into five smaller industries, each represented by a dummy

variable: Food (FOOD), Chemicals (CHEMICAL), Chemical related products (CHEM\_RELATED), Machinery & Transportation (MACHINERY), and Miscellaneous manufacturing (MISC). The data for each industry is presented using a 'panel' method to increase the number of observation to 99 observations.

The regression model will yield knowledge on which factor has a significant impact on employment and whether changes in employment can be attributed to changes in trade with China (increasing imports to the U.S. and more direct investment to China).

## V. EMPIRICAL RESULTS

### A. Impact of Exports and Imports

The results for the OLS regression are reported in Table 1 along with some descriptive statistics. Table 1 shows the extent to which trading has an impact on manufacturing employment. Because manufacturing employment is measured by an index, change in the value of the coefficient shows how much the employment index will change for a one unit change in the independent variable. In general, all of the independent variables have the predicted sign of coefficients, except for the US\_INVEST variable, and are significant at the 5% level (p-value = 0.000). The regression also has an adjusted R-Square of 0.85. To get started, the results show that a 1% increase in productivity level (P) will decrease the employment level (EMP) by 0.7%, which supports the proposed hypothesis. As U.S. manufacturing workers become more productive, fewer workers are needed for the production process.

US\_INVEST has a positive sign for its estimated regression coefficient, indicating that increasing the amount of investment overseas actually helps boost the domestic employment by a small amount of 0.002% for every million dollars invested. This result contradicts the hypothesis that increasing U.S. investment in China will lead to a production shift in the manufacturing sector, which may decrease the number of manufacturing jobs in the United States. The amount of U.S. investment to China over the past 20 years averages 284 million dollars and surged from a few hundred millions to billions of dollars in recent years.

An important factor that has substantial impact on manufacturing employment is the Industrial Production Index (INDUSTRIAL\_PROD). The index reflects how well the manufacturing industry is doing each year and is a better measurement than GDP. The regression results show that a 1% increase in the industrial production index from the previous year generates a 1.5% increase in manufacturing employment. The relationship between the two variables is positive and is well supported by the fact that the better the manufacturing sector is doing, the lower the rates of unemployment it has.

With regards to exports and imports, the descriptive statistics show that average imports value exceeds the average exports value by an amount of 4.5 billion dollars. Both values of imports and exports have increased significantly over the years. The regression results support the hypothesis that increasing exports creates more domestic jobs while increasing imports reduces the number of jobs in the manufacturing sector. One billion dollars in exports could raise employment by approximately 2.48 percent while the same amount of increase in imports reduces the manufacturing employment by approximately 0.48 percent. This result shows that imports have a lesser impact on employment than exports have.

## **B. Comparing between manufacturing industries**

Using the food industry as a reference, the dummy variable for this industry is omitted in the empirical model. The regression results show that holding other controlled variables equal, the Chemicals and Machinery industry both generate less jobs than the Food industry by approximately 12% compared to food industry employment. In contrast, the Chemical related products industry creates more jobs than the Food industry by 10% , and miscellaneous manufacturing industry increased employment by 29% in reference to the food industry.

## **VI. CONCLUSION**

The topic about the U.S.-China trade impact on unemployment is fiercely debated among intellectuals and policy makers. There has not been a unified view due to the unique characteristics of China and its exponential economic growth over the past years. The findings of this paper support the idea that increasing imports from China will lead to a higher unemployment

situation in the Manufacturing sector, reflected in a negative correlation between employment and imports. It is also interesting to see that exports have a much larger impact on employment than imports. Therefore, the unemployment situation can be improved by increasing the amount of U.S. exports to China. However, given the fact that U.S. is an industrialized country and allocates most of its resources on heavy industries and high-end products where it can utilize its competitive advantage in technology, the trade imbalance in the manufacturing sector is not going to change any time soon. Therefore, the unemployment situation in manufacturing will continue to occur in the near future unless manufacturing workers can improve their skills and move to different sectors that require more advanced expertise.

Surprisingly, as suggested by the results, the employment situation in manufacturing can also be slightly improved by increasing the amount of investment overseas. However, this implication may not hold true in the long term and needs to be tested more in different models. The performance of the manufacturing sector is a good indicator of the employment situation, yet it is highly correlated with the productivity of workers, which has a negative relationship with employment. Therefore, the regression result of this variable does not open much room for suggestion on the employment situation.

In terms of industries within the manufacturing sector, there is a substantial difference in terms of employment and trade amount within each industry. Due to the limitation of data availability, using 'panel' methods in analyzing the empirical model assumes that this difference does not play an important role in yielding the regression results. This assumption may not hold true and further research needs to be conducted to separate the impact of each industry on employment from the manufacturing sector as a whole. One way to do this is to generate a data set that contains more observations for each variable than the one used in this research paper, which mostly depend on the availability of trade data (both exports & imports). Better data will yield a better understanding of trade on manufacturing unemployment.

This study on how trade impacts unemployment can be further expanded by taking into account the possible impact of each industry on

the others within the manufacturing sector. In addition, being able to compare the regression results of the U.S. manufacturing sector with Chinese manufacturing sector using the same model can also yield substantial knowledge on the impact of trade on unemployment. Nevertheless, this seems to be very difficult to implement in the near future because of the data limitation and reliability issue from sources provided by the Chinese government.

The main theoretical framework and many articles and papers in the field of economics have strongly suggested that U.S.-China trade has a great impact on U.S. manufacturing unemployment, which provides good support for my paper. However, there are also strong arguments from the opposite side of the debate made by leading economists that need to be taken into account for any further expansion of this research. More controlling variables such as labor compensation, technology advancement and employment changes in other industry sectors are also very important to analyze in future models. Overall, this is a very controversial topic and through research such as this, the government can have a better approach to reduce the unemployment situation not only in manufacturing sector but for the economy as a whole.

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## APPENDIX

Table 1: Descriptive Statistics

|                       |   | Measurement                          | Mean          | Std. Deviation |
|-----------------------|---|--------------------------------------|---------------|----------------|
| Dependent Variables   | Manufacturing Employment Index          | Index, Base = 2002                   | 102.146       | 16.63090237    |
|                       | Productivity Index                      | Index, Base = 2002                   | 97.7745       | 15.98379504    |
|                       | US Direct Investment to China           | Millions of dollar                   | 284           | 2311.94814     |
|                       | Import                                  | Actual Dollar value                  | 6,256,698,101 | 37,017,026,986 |
|                       | Export                                  | Actual Dollar value                  | 1,756,317,714 | 5,734,269,429  |
| Independent Variables | Manufacturing Industry Production Index | Percentage change from previous year | 2.723591148   | 4.096050092    |
|                       | Chemicals                               | 0 or 1                               | 0             | 0.4            |
|                       | Chemicals related products              | 0 or 1                               | 0             | 0.4            |
|                       | Machinery & Transportation              | 0 or 1                               | 0             | 0.4            |
|                       | Miscellaneous manufacturing             | 0 or 1                               | 0             | 0.4            |

Table 2: Resgression Results

|                       |   | Coefficient | t-Statistic | P-value |
|-----------------------|---|-------------|-------------|---------|
| Dependent Variables   | Manufacturing Employment Index          |             |             |         |
|                       | Productivity Index                      | -0.727      | -8.367      | 0.000   |
|                       | US Direct Investment to China           | 0.002       | 2.708       | 0.006   |
|                       | Import                                  | -4.822E-10  | -10.026     | 0.000   |
|                       | Export                                  | 2.483E-9    | 4.766       | 0.000   |
| Independent Variables | Manufacturing Industry Production Index | 1.519       | 8.156       | 0.000   |
|                       | Chemicals                               | -12.223     | -4.476      | 0.000   |
|                       | Chemicals related products              | 10.182      | 4.399       | 0.000   |
|                       | Machinery & Transportation              | -12.065     | -2.516      | 0.000   |
|                       | Miscellaneous manufacturing             | 29.415      | 8.420       | 0.000   |

Sample Size: 99  
R-Square: 0.850  
Adjusted R-Square: 0.853

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# CAUSES AND IMPLICATIONS OF THE U.S. HOUSING CRISIS

*Nick Kenaga*

## **I. INTRODUCTION**

The British sometimes use the phrase "safe as houses" to describe a sure bet or an investment that carries little to no risk. Until a few years ago, this expression held true in America as well, where housing prices had done nothing but steadily rise since the Great Depression, and the general public considered a home to be one of the best investments possible. As the nation headed into a new Millennium, mortgage loans were easy to come by and housing prices soared while the economy appeared to thrive. The government strongly encouraged Americans to own their own home, and with banks devising creative methods to make money off mortgage loans, everyone appeared to win. However, the seemingly stable economy was belied by the underlying fundamentals, leading to a global financial shakeup that has changed the way we perceive the economy. This paper will trace the housing crisis to its roots and examine how it impacted the broader American economy, bringing us to our current financial situation of a depressed housing market and lingering unemployment.

## **II. BACKGROUND/CAUSES**

The catalyst for the housing bust was the vast increase in subprime mortgage loans, which are loans given to borrowers with less than stellar credit history. Originally considered an anomaly within the real estate market, a multitude of factors caused the market for subprime mortgages to grow rapidly. The first innovation that helped spur the market's development was the vast technological improvement of the 1980s, which changed the mortgage underwriting process. Originally, the home mortgage lending business was the responsibility of community banks. Cut-and-dried formulas involving debt-to-income ratio, amount of savings in the bank, and size of the down payment were used to determine whether a mortgage applicant qualified for a loan. After the computer arrived on the business scene, statisticians could analyze the vast amounts of data on borrowers and lenders to come up with

models for determining default risk for individual buyers, which became known as automated underwriting (AU). Now, rather than waiting a week to get a loan approved, prospective borrowers could find out whether they qualified in a matter of seconds. Furthermore, AU software reduced underwriting costs, on average, by \$916 per loan (Engel, McCoy, 2011). The decrease in costs gave banks incentive to expand lending. It did not yet matter to them that the AU model was only meant to be applied to the prime mortgage market.

In addition to the technology that was revolutionizing the financial world, some developments were happening in the United States to set the stage for the rise and fall of the housing market. After the September 11 attacks and the burst of the dot-com bubble, the U.S. entered a recession. Alan Greenspan, then Chairman of the Federal Reserve Board, brought the target federal funds rate, the rate at which banks lend to each other on the overnight market, down to one percent in June 2003, a record low (New York Fed). Meanwhile, trade surpluses in China and other commodity-producing nations created an excess of dollars in foreign countries. Much of this excess returned to the U.S. as foreign investors bought Treasury bonds, which are considered to be one of the safest investments available (Zandi, 2009). This healthy demand helped to push down yields, delivering a low return on government bonds. Combined with abundance of cheap credit, investors' appetite for risk increased. Seeking to develop new types of marketable securities, financial firms increasingly began securitizing subprime mortgage loans, and the market took off. Sub or near-prime loans swelled from 9 percent of newly originated mortgage-backed securities (MBS) in 2001 to 40 percent in 2006 (DiMartino, Duca, 2007). As housing prices continued to rise while inflation was kept in check, Greenspan was lauded as a genius.

The idea to securitize mortgage loans was hardly new. A lender would bundle their mort-

gage loans, then repackage them as bonds that could be rated by credit rating agencies. Then the lender would sell the bonds—which were backed by the mortgages as collateral—to investors. Borrowers' mortgage payments became the investors' interest payments. This had been done since the 1970s by Fannie Mae and Freddie Mac, government-sponsored entities (GSEs) that later became private corporations. Turning mortgage loans into bonds solved the long-time problem that banks had of “lending long and borrowing short”; in other words, needing to finance long-term mortgage loans with short-term demand deposits. If interest rates rose, banks would need to pay clients a higher rate on deposits than borrowers were paying on their fixed-rate mortgage loans. If interest rates fell, borrowers would simply refinance at a lower rate. With securitization, banks were less subject to interest rate fluctuations because the mortgages were sold and passed off to other parties. Fannie and Freddie were successful in securitizing mortgages that were originated by the lenders, but eventually, investment banks sought to become involved in the underwriting process as well. By then, nearly everyone who qualified for a mortgage already had one, so the banks began securitizing subprime loans, thus linking Wall Street with Main Street. Some of them even began to originate their own loans, and by 2006, up to 80 percent of all subprime loans were being securitized (Engel, McCoy, 2011). The financial intermediaries who securitized the loans often repackaged them into collateralized debt obligations (CDOs), which separated mortgages into separate “tranches” that allowed investors different rates of risk and return, from AAA down to junk status.

At the peak of the housing market in 2006-07, the CDOs were immensely popular, and investment banks issued over \$200 billion of risky MBS and made huge profits. Investors holding the safest tranches of CDOs could have their securities guaranteed by a company like insurance giant AIG, which calculated a 0.15 percent risk of loss and insured massive quantities of CDOs by selling what were known as credit default swaps (CDS) (Engel, McCoy, 2011). Even after paying an insurance fee, CDO investors (mostly banks) still got a return that easily beat that of Treasury bonds on an investment that was thought to be equally safe. Financial institutions that packaged the loans reaped huge service fees that were unrelated to the performance of the loans, so they cared little

about how risky they were. This also illustrates the rise of the “shadow banking” industry, which is the blending of commercial and investment banking (Ghosh, 2011). By allowing commercial banks to participate in underwriting and issuing of securities, they could engage in risky activities with the funds of their depositors because they knew that they would be backed by the FDIC, the government's deposit insurance program. The gross lack of checks and balances in this model began to be exposed in 2007 as housing prices started to go down.

### III. MARKET COLLAPSE

As interest rates began to rise, the housing market finally began to cool off. When home prices declined, many homeowners who had put little to no money down, now had negative equity in their homes (owing more money on their mortgage than what their homes were worth) so they had incentive to walk away from their homes. In addition to this, a growing number of subprime borrowers could no longer afford their mortgage payments, and default rates skyrocketed. The result was for prices to fall even further, along with the value of MBS, which were derived from home values. The new Fed Chairman, Ben Bernanke, seemed unconcerned at first, stating in June 2007 that “the troubles in the subprime section seem unlikely to seriously spill over to the broader economy or the financial sector” (Bernanke, 2007). By March 2008, however, the U.S. was in financial turmoil as Bear Stearns, an investment bank that was heavily invested in the residential mortgage market, was brought to the brink of collapse. Financial institutions that did business with it began withdrawing their funds, and the Federal Reserve had to arrange for J.P. Morgan Chase to acquire Bear Stearns for pennies on the dollar. The balance sheets of financial firms began to deteriorate with the collapse of the housing and mortgage market. Financial firms started deleveraging because they were afraid to lend to each other, households, or businesses and thus economic activity slowed down. By September, the government announced that it was putting Fannie Mae and Freddie Mac into conservatorship, officially taking them over. Fannie and Freddie originally had dealt mostly in prime loans, but during the boom of the subprime market, they lost market share to competitors that were taking on greater risks. Also, they had been pressured by Congress to increase their mortgage purchases

from low-income borrowers as part of the government initiative to boost home ownership (Engel, McCoy, 2011). When outside auditors examined the books, they found the GSEs used accounting tricks to hide the fact they had virtually no capital cushion, and the government was forced to take them over.

As the magnitude of the impending crisis became evident, the rest of the financial institutions began to fall like dominoes. Lehman Brothers, another bank that was loaded with “toxic assets,” securitized loans that went sour, was brought to the brink of failure. When it was clear that Lehman was not getting federal help, Merrill Lynch realized it too would collapse and arranged for Bank of America to take it over. After Lehman filed for bankruptcy on September 15, 2008, markets everywhere crashed and global financial Armageddon seemed likely. Then the Federal Reserve spent \$85 billion on a bailout of AIG, in response to the failure of its recklessly issued credit default swaps. Had AIG gone under, the repercussions would have been many times worse than that of Lehman, due to the countless banks and mutual funds that did business with AIG and would have instantly defaulted. In essence, it helped ameliorate financial “contagion,” in which the failure of an important institution triggers a mass panic. In a chaotic flight to quality, investors snapped up Treasury securities, and the spread between Treasury and BAA-rated corporate bonds spiked. Shown in Figure 1, the higher the spread between their yields, the more risk-averse investors are at a given time. The wide yield spread illustrated the fear that permeated the market at the time. Then came the Congressional legislation: a \$700 billion emergency bank bailout package to stabilize the financial sector. The bailout, known as the Troubled Asset Relief Program (TARP), was the first of many financial reforms that Congress has passed since the crisis. In 2010, for example, the Dodd-Frank Wall Street Reform Act was passed to promote stability and increase oversight in the financial services industry, along with protecting the rights of consumers.

#### IV. AFTERMATH/POLICY MEASURES

The crisis is a reminder of the role that asymmetric information plays in financial markets, and in that regard can be examined for its effect on individuals. For example, the glut of subprime mortgages that originated during the housing

bubble is an example of adverse selection because risks that were not creditworthy were improperly screened. The result of this is that after the financial crisis, banks see too much risk to provide many loans, even to individuals with excellent credit. The lack of funds available to finance economic activity explains the credit freeze, and contributes to the difficult job market.

The behavior of the U.S. consumer also changed greatly; before the crisis, Americans had taken on excessive debt, as the personal savings rate fell to all-time lows (Figure 2). This leveraged consumption helped drive gross domestic product (GDP) when the economy thrived, but when deleveraging finally began, the lack of demand rippled through the economy. Households also saw significant deterioration in their balance sheets as the value of their homes, probably their most valuable asset, plummeted. The evaporation of wealth on the housing side can be seen in Figure 3, which indexes consumer prices (CPI), a measure of inflation, along with housing prices over the past decade. While the spread between the two was significant during the peak of the bubble, after the precipitous decline in home values the two lines converge such that the increase in housing prices over the past decade is merely commensurate with the rate of inflation.

Meanwhile, the Fed is still trying to exercise its monetary policy options to help the economy. The target federal funds rate has essentially been zero since the end of 2008, and the Fed has conducted open market operations of buying short-term U.S. Treasury bills to increase the money supply, both measures intended to spur economic activity. With traditional methods seemingly exhausted, the Fed then turned to buying toxic assets off of banks' balance sheets, hoping to recapitalize them and encourage lending. It also has engaged in a \$600 billion round of “quantitative easing,” a policy where the central bank purchases bonds of longer maturities in order to bring down their yields. More recently, they have announced “Operation Twist,” a plan to sell some of their bonds of short- or medium-term maturities in order to buy bonds of longer maturities. With interest rates on shorter-term bonds near zero, the intuition is for the Fed to try to affect mortgage rates, which are tied to the rates on longer-term bonds, such as the 10-year Treasury. However, the interest rate on a 30-year fixed mortgage dipped below four percent in October 2011, a record low,

so it is unclear if the plan will achieve its intended effect to lower rates further.

## V. CONCLUSION

Unfortunately, signs of a recovery in housing are largely absent in today's market. One of the provisions of the Dodd-Frank bill was to give federal bank regulators the responsibility of defining a "Qualified Residential Mortgage" or QRM. According to the Center for Responsible Lending, the current proposal calls for a down payment of up to 20% on QRM loans, which would become the standard for a "safe" mortgage. An analyst for the Pacific Investment Management Company (PIMCO) mentions this as an obstacle to the housing market's recovery, because fewer people will be able to save up for a mortgage down payment, which has tempered demand. The lack of qualified buyers in the current housing market, along with the excess supply, means that the housing market appears to be depressed for the foreseeable future.

For the broader jobs market, unemployment will be a lingering problem. Despite a corporate rebound since the financial crisis, profit margins have been helped most by streamlining and cost cutting rather than new hiring. Another issue figures to be the labor force participation rate, which is the percent of the adult population that includes itself in the labor force, that has fallen because of discouraged workers leaving the labor force. Figure 4 illustrates the decline of this rate, which is at its lowest level since the early 1980s. As workers eventually reenter the work force when aggregate economic confidence picks up, they will put upward pressure on the unemployment rate (Tasci, Zaman, 2010). Therefore, while the unemployment rate is off its highs from 2009 (Figure 5), it is unlikely to return to pre-crisis levels in the foreseeable future.

Amid all of the financial reform and consumer protection legislation, along with newfound public skepticism toward many financial institutions, the joblessness in our economy is the largest reminder of the crisis. With jobs—and industries—being shipped overseas, it will be difficult to find the capital needed to stimulate housing demand from its current depressed state. And while increasing employment has been the key focus of the policies of the Fed and Congress, prolonged expansionary fiscal and monetary

policy can have worrying implications in the long-term. With all of the liquidity that has been added to the economy, the M1 money stock (currency plus demand deposits) has doubled in the last decade (Figure 6), suggesting that inflation might be a future concern for the economy along with unemployment. These systemic problems in our economy today can largely be traced to the housing crisis and subprime mortgage bust

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## APPENDIX

Fig. 1. Corporate BAA vs. 10-year Treasury Yield Spread

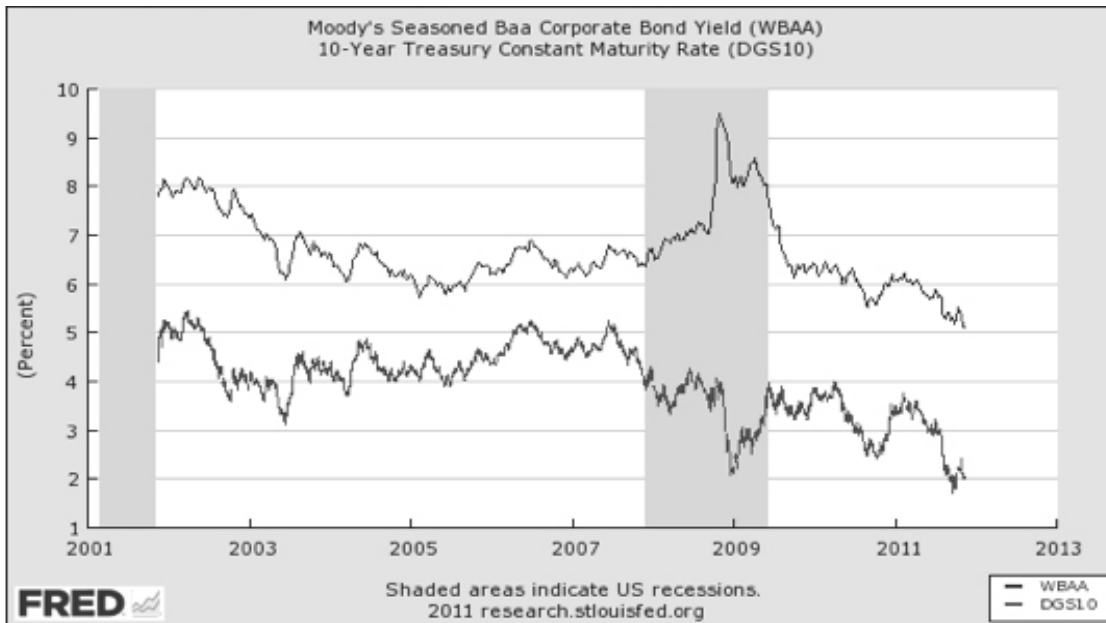


Fig. 2. Personal Saving Rate





Fig. 3. Consumer Prices vs. Housing Prices

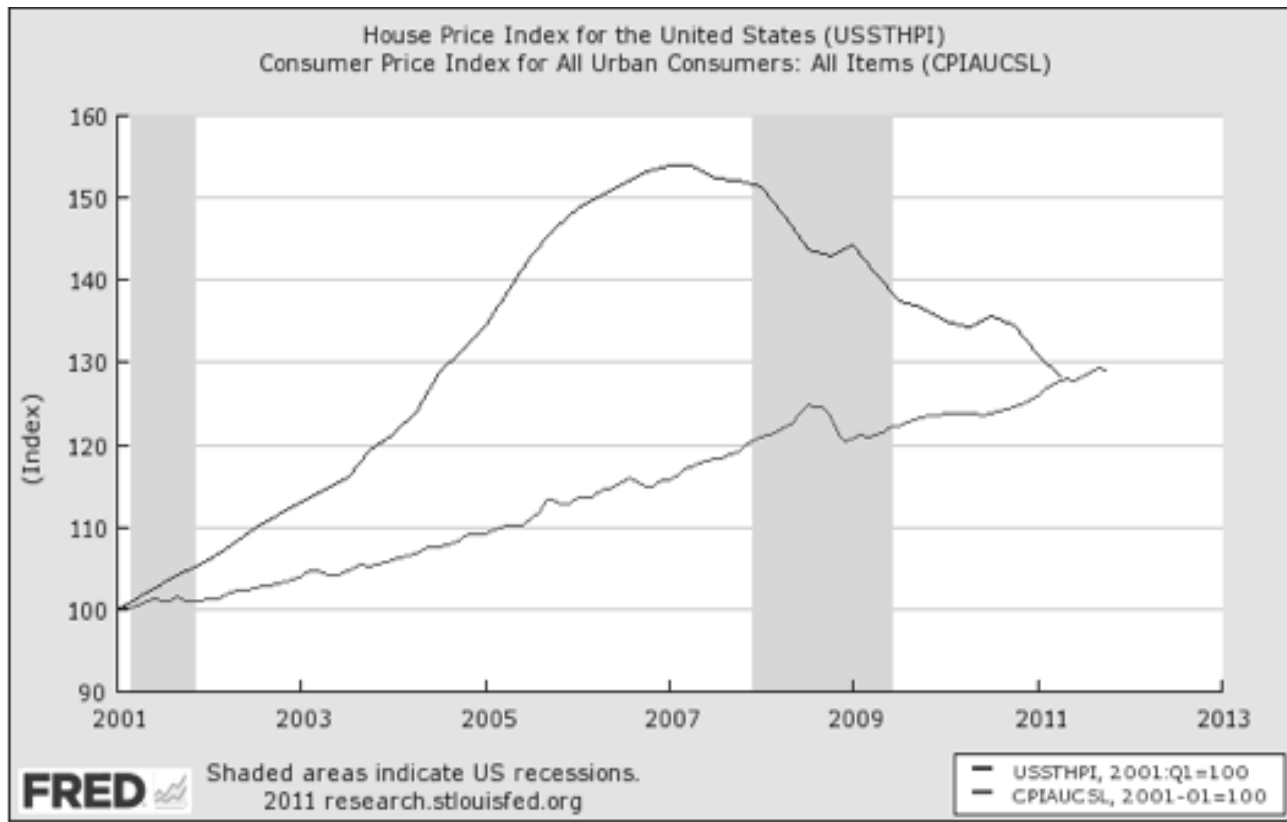


Fig. 4. Labor Force Participation Rate

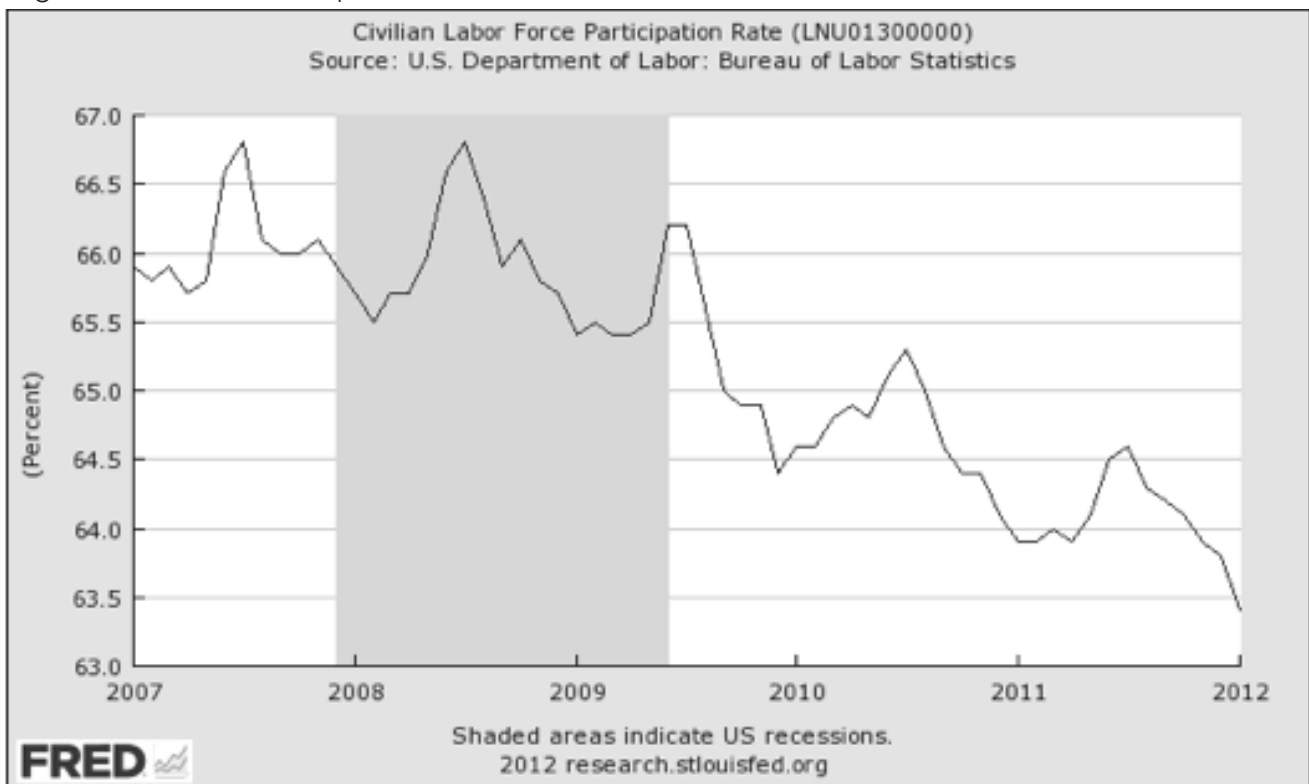


Fig. 5. U.S. Civilian Unemployment Rate (Seasonally Adjusted)

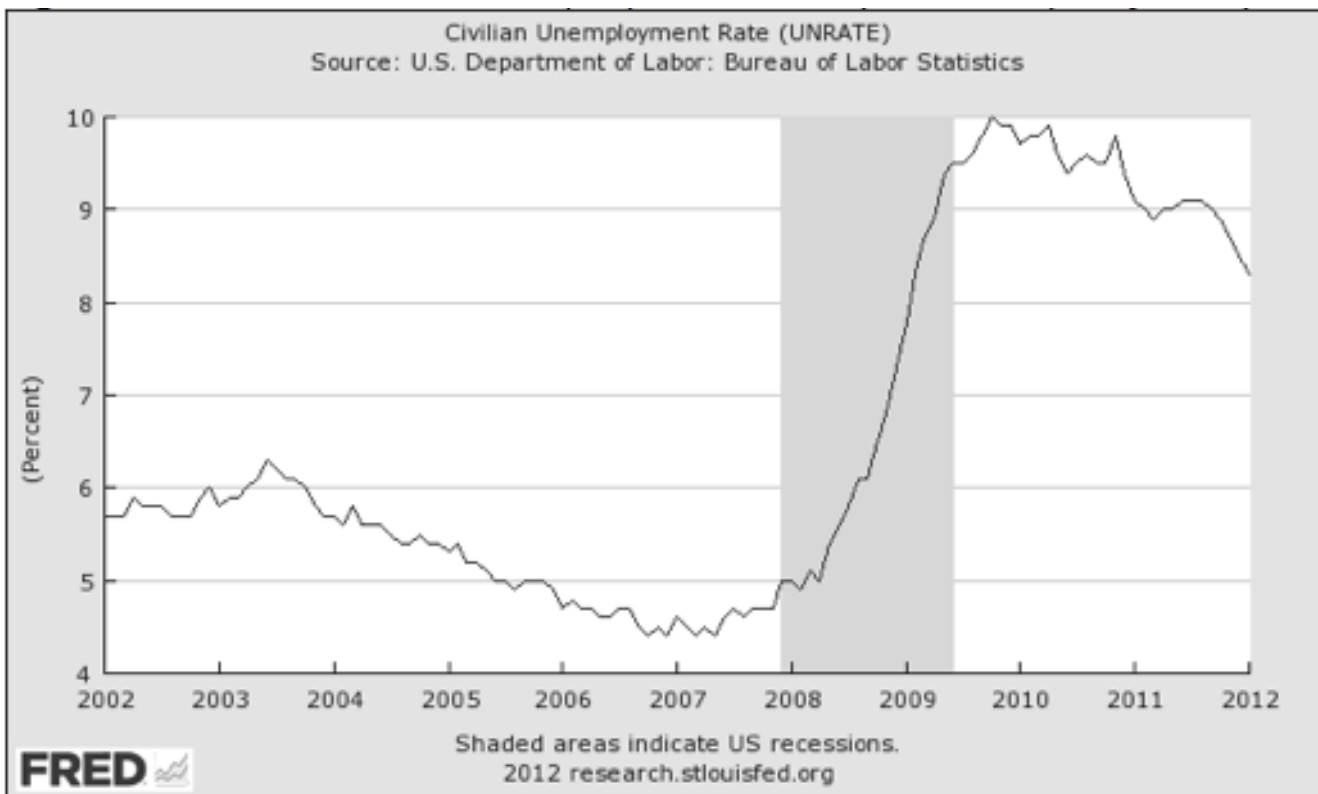
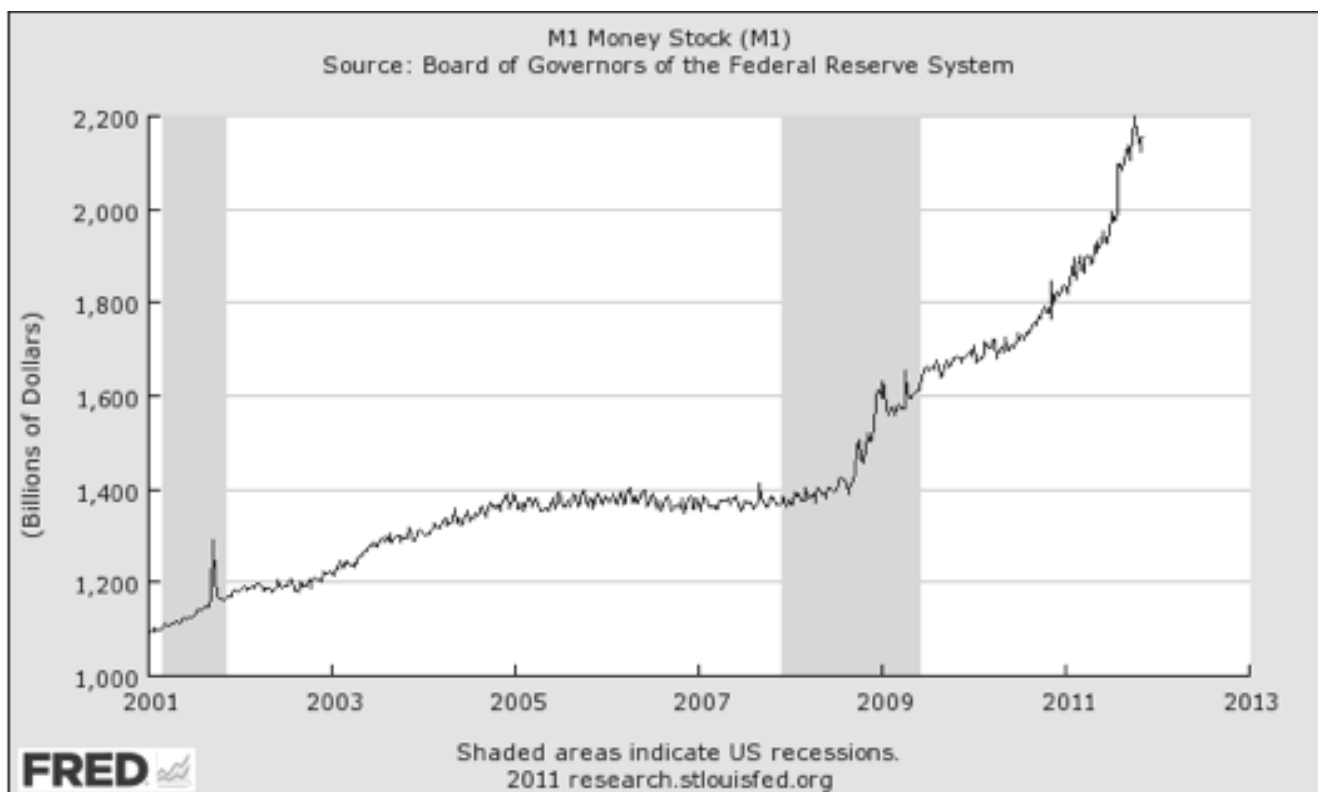


Fig. 6. M1 Money Stock



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# ELECTRICITY: A CURSED RESOURCE?

*Devin Long*

## **I. INTRODUCTION**

As is well documented in the media, the standard of living in many African countries is extremely low. In fact, in the most recent edition of the Human Development Report, released by the United Nations Development Programme (UNDP), thirty-seven of the forty-one countries classified as "low development" (the lowest ranking on the development scale), are African nations. It is equally well-known that many African nations are 'blessed' with valuable natural resource endowments that should bring enormous revenues to these countries. The disparity between theory and reality leads one to wonder, why do these revenues not raise the standard of living for a country's inhabitants? The natural resource curse hypothesis attempts to explain why the revenues are not allocated efficiently.

Kojucharov (2007) clearly explains the theory behind the natural resource curse hypothesis. "Time after time, countries exporting resources such as oil and diamonds have seen enormous amounts of revenue pass through their hands, yet have emerged with fragile economies in which resource wealth has exacerbated the very problems it was envisioned to solve." The curse is essentially broken down in to two categories. Kojucharov calls them the Economic Mechanisms (elsewhere referred to as the Dutch disease) and the Behavioral Mechanisms (also known as the Nigerian disease).

With the Dutch disease, the natural resource export causes a high volume of revenue to flow into the country, raising demand, which drives up prices, causing increased cost of living (assuming that revenues are not evenly distributed). Domestic goods become more expensive than similar goods produced abroad, causing an appreciation of the real exchange rate and reducing the competitiveness of the domestic goods on the world market. The Dutch disease also makes resource exporting countries vulnerable to changes in market prices which can lead to budget deficits if the country does not save "boom" profits to cover "bust" spending (Kojucharov 2007). It is also characterized by an inef-

ficient allocation of resources towards the primary sector, preventing growth of the manufacturing and services sectors (Zenthofer 2011).

In a present-day example of the Dutch disease, Zenthofer (2011) compares Mauritius to Trinidad and Tobago- two countries with very similar histories, ethnic compositions, and resource endowments. He found that Mauritius' decision to diversify has led to a "relatively rich and stable economy," while Trinidad and Tobago, which relies on natural gas revenues, suffers from lower research and development, a less stable government, and low prospect for future growth.

On the other hand, the Nigerian disease deals with fiscal mismanagement of governments. Kojucharov cites a "mountain-top resort in Venezuela and an extravagant new airport in Saudi Arabia" as examples of governments investing resource revenues in high-budget, low-return infrastructure projects that give the impression of growth and development without actually helping the people. This type of project can quickly deplete government funds and lead to deficits. Additionally, the "rentier state theory" explains that, once a government has substantial resource revenues, it has no need to tax its people. In this way, the people who would be taxpayers have less leverage to hold the government accountable, leading to decreased transparency. This sets the stage for corruption and rent-seeking, which takes money away from vital sectors like education and health. The combination of the Dutch and Nigerian diseases often makes the people worse off than before the discovery of the abundant natural resources (Kojucharov 2007). As shown in Section IV of this paper, corruption is a serious problem in African countries. This lends evidence to the hypothesis that, if there is a resource curse in these African nations, it is probably from the Nigerian disease.

In African nations, the electrical grids are often unreliable and not large enough to serve a majority of the population. Especially in under-developed nations, this scarcity makes electricity a very valuable resource. A few of the more

developed countries have learned to produce electricity efficiently enough to export it to the surrounding countries. As the export of electricity should bring substantial revenues into a country and as it is derived from natural resources, I wondered if it too could cause a resource curse. This study aims to determine whether, by means of a resource curse, electricity export revenues negatively impact corruption and quality of life in Africa.

## II. LITERATURE REVIEW

A number of recent studies have found that the Nigerian disease is present in many of today's economies. In an empirical study, Williams (2010) shows that resource rich countries are less transparent, that reduced transparency stems from resource revenues, and that the revenues have a negative effect on economic growth. Avom (2010) finds that Central and Sub-Saharan African countries who rely heavily on natural resources suffer from larger inequalities, smaller human capital development, and smaller revenue growth.

If the results of my study indicate that a resource curse is negatively impacting the people of Africa, there are a few policies that could combat the curse or prevent it in the future. Several studies have examined how to avoid the natural resource curse. Voigt (2011) points to the "Alaskan solution" in which Alaskan residents receive a portion of oil revenues each year. This holds public officials accountable and has been proposed to ensure that Libya's new government can avoid the corruption that has plagued its predecessors. Kojucharov (2007) describes a World Bank plan that was supposed to prevent a resource curse in Chad. In the Revenue Management Plan (RMP), Chad's oil revenues were kept in an offshore account, introducing them gradually to avoid appreciation of the real exchange rate; surplus revenues were kept in a stabilization fund, to keep suppliers immune to market price changes; a large portion of revenues were given to the health, education, rural development, and water/resource management sectors to ensure that the funds were not misused for public gain; and two programs were initiated to provide the citizens of Chad technical and financial training. Although the RMP failed, due to the Chadian government's unwillingness to allow an outside entity to control its revenues, it provided valuable

ideas for avoiding the curse. Avom (2010) suggests government investment in manufacturing to promote diversification of central and Sub-Saharan economies. Pegg (2010) explains that, while Botswana's economy is based on diamond revenues and is unlikely to diversify, its emphasis on saving and investing in infrastructure have led to a stable economy with a relatively high standard of living. Hammond (2011) suggests that Venezuela's decision to use oil revenues to invest in human and physical capital and social welfare is the "cure for the disease."

Oil and mineral revenues are the commonly cited sources of the resource curse. There exists a gap in the literature of alternate sources that have not been examined. Thus, this study adds to existing literature by examining electricity exports, a previously unexplored cause of the curse, one that is derived from natural resources rather than a resource itself. The study also hopes that a solution to poverty may be easier to find from increased knowledge of its causes.

## III. DATA

The data set contains information from 25 African countries from 2005-2008, providing 100 observations. The countries were chosen by availability of necessary data, which could have resulted in an unrepresentative sample if, for example, there was incomplete data for the poorest, smallest, or most corrupt countries. However, the existing data set contains a geographically diverse set of countries as seen in Table 1 on the next page. The set also contains six net exporters of electricity, seven net importers, seven countries that neither export nor import, and five that are net exporters in some years but net importers in others.

The data used comes from four separate sources: the Human Development Index from the UNDP (2011), the CIA World Factbook (2011), the World Development Indicators from the World Bank (2011), and the Worldwide Governance Index (2011) from the World Bank. The Human Development Index (HDI) takes a value between 0 and 1, and uses four indicators (life expectancy at birth, mean years of schooling for adults, expected years of schooling for children, and Gross National Income (GNI) per capita, to measure three dimensions of human welfare: health, education, and standard of living. The HDI statistics are all

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contained in the UNDP's Human Development Report which "requires the highest standards of data quality, consistency and transparency" (<http://hdr.undp.org>). In addition to the HDI, values for GNI per capita and mean years of schooling were found through the UNDP's Human Development Report (2011).

The CIA World Factbook (2011) contains detailed country profiles. These profiles contain information about the government, people, geography, and economy of individual countries. The key variables from this source were electricity exports and imports, measured in kilowatt hours per year.

The World Bank's World Development Indicators (2011) contains data from 209 countries for the past fifty years. While there are over one thousand indicators, those used in this project include: life expectancy at birth, electricity production, oil exports, and mineral exports.

Finally, the World-wide Governance Index (2011) contains a Control of Corruption Indicator that will be used to determine whether electricity exports cause increased corruption. The index "captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption as well as 'capture' of the state by elites and private interests" (<http://info.worldbank.org>). Each country is given a governance rating between -2.5 and 2.5, with the highest scores indicating the least corrupt governments. The rating for each country comes from a specific set of sources. For example, Angola was rated by twelve sources, in-

Table 1: Description of countries included in data set

| Countries by region              | Electricity Net Export/ Import     | Control of Corruption Index | Human Development Index |
|----------------------------------|------------------------------------|-----------------------------|-------------------------|
| Northern Africa                  |                                    |                             |                         |
| Algeria                          | Importer 2 years, Exporter 2 years | -0.44 to -0.4               | 0.65 to 0.67            |
| Egypt                            | Exporter                           | -0.68 to -0.55              | 0.59 to 0.61            |
| Libya                            | Neither                            | -0.91 to -0.8               | 0.73 to 0.74            |
| Morocco                          | Importer                           | -0.31 to -0.21              | 0.54 to 0.56            |
| Sudan                            | Neither                            | -1.47 to -1.13              | 0.36 to 0.37            |
| Tunisia                          | Importer 1 year, Exporter 3 years  | -0.04 to 0.03               | 0.65 to 0.67            |
| Western Africa                   |                                    |                             |                         |
| Benin                            | Importer                           | -0.94 to -0.35              | 0.42 to 0.43            |
| Côte d'Ivoire                    | Exporter                           | -1.3 to -1.14               | 0.38 to 0.40            |
| Nigeria                          | Exporter                           | -1.28 to -0.84              | 0.40 to 0.42            |
| Senegal                          | Neither                            | -0.47 to 0                  | 0.39 to 0.41            |
| Togo                             | Importer                           | -1.13 to -0.75              | 0.39 to 0.42            |
| Central Africa                   |                                    |                             |                         |
| Angola                           | Neither                            | -1.36 to -1.24              | 0.38 to 0.40            |
| Cameroon                         | Neither                            | -1.2 to -0.91               | 0.44 to 0.45            |
| Democratic Republic of the Congo | Exporter                           | -1.54 to -1.27              | 0.22 to 0.24            |
| Gabon                            | Neither                            | -0.98 to -0.51              | 0.63 to 0.64            |
| Republic of the Congo            | Importer 3 years, Exporter 1 year  | -1.11 to -1.07              | 0.47 to 0.48            |
| Eastern Africa                   |                                    |                             |                         |
| Ethiopia                         | Neither                            | -0.77 to -0.62              | 0.29 to 0.32            |
| Kenya                            | Importer 3 years, Exporter 1 year  | -1.02 to -0.88              | 0.44 to 0.46            |
| Mozambique                       | Exporter                           | -0.61 to -0.47              | 0.26 to 0.28            |
| Tanzania                         | Importer                           | -0.78 to -0.28              | 0.37 to 0.39            |
| Zambia                           | Exporter                           | -0.81 to -0.45              | 0.36 to 0.38            |
| Zimbabwe                         | Importer                           | -1.37 to -1.34              | 0.12 to 0.16            |
| Southern Africa                  |                                    |                             |                         |
| Botswana                         | Importer                           | 0.88 to 1.07                | 0.60 to 0.62            |
| Namibia                          | Importer                           | 0.17 to 0.54                | 0.58 to 0.60            |
| South Africa                     | Importer 1 year, Exporter 3 years  | 0.22 to 0.58                | .058 to .059            |

cluding The African Development Bank Country Policy and Institutional Assessments, Global Integrity Index, Economist Intelligence Unit, and nine other expert sources.

The following table, Table 1, contains descriptions of the twenty-five countries included in this study. Attributes included are: geographic

region, whether the country is a net exporter or importer of electricity, the country's highest and lowest values for CCI, and the highest and lowest values for HDI. Table 1 shows that there is likely a connection between standard of living and

geographic location. For example, all of the Western African countries have nearly identical values for HDI. Additionally, the data for Southern Africa suggests a correlation between corruption and standard of living. Southern Africa is the only region with consistently positive CCI values and the only region in which each country has an HDI greater than 0.50.

#### IV. EMPIRICAL DESIGN

Of the twenty-five countries in this sample, ten are considered to be "very corrupt," with CCIs lower than negative one, for at least two years. Only three of the twenty-five countries have CCIs greater than one. Clearly, corruption is widespread in African countries. Two separate Ordinary Least Squares (OLS) regressions will be used to test this study's hypotheses about the Nigerian disease. The first regression tests the hypothesis that electricity exports increase corruption in Africa, and the second regression tests the hypothesis that this corruption leads to decreased quality of life.

H1: Electricity exports cause increased corruption in Africa.  
H2: Increased corruption reduces standard of living in Africa.

Model 1 will determine whether electricity exports cause corruption, while controlling for human development. The dependent variable is CCI. The effects of electricity exports are measured by ELEC, which is the ratio of net electricity exports to total electricity produced. ELEC, OIL, and MINE are dummy variables that take the value of one if a country exports oil or minerals. ELEC, OIL, and MINE test for the resource curse. Controls for the level of human development, life expectancy (LIFEEXPEC), GNI per capita (GNIPC), and mean years of schooling (YSCHOOL) are also included in the regression. The equation for Model 1 follows, and its key variables are explained in Table 2.

$$CCI = \alpha + \beta_1 LE + \beta_2 YSCHOOL + \beta_3 GNIPC + \beta_4 ELEC + \beta_5 OIL + \beta_6 MINE$$

Model 2 will test whether corruption negatively impacts quality of life for the people of Africa. The dependent variable is HDI, and the independent variable is CCI. If Model 1 shows

Table 2: Key variables for Model 1

| Variable              | Description (Unit of measurement)                                      | Expected Sign |
|-----------------------|--|---------------|
| Dependent Variables   |  |               |
| CCI                   | Measure of corruption  | N/A           |
| Independent Variables |  |               |
| LE                    | Life expectancy at birth (years)                                       | +             |
| YSCHOOL               | Mean years of schooling (years)  | +             |
| GNIPC                 | GNI Per Capita (2008 dollars)  | +             |
| ELEC                  | Net Electricity Exports/ Total Electricity Production (kilowatt hours) | -             |
| OIL                   | Takes value of 1 if country exports oil, 0 if not                      | -             |
| MINE                  | Takes value of 1 if country exports minerals, 0 if not                 | -             |

Table 3: Key Variables for Model 2

| Variable                  | Description  | Expected Sign |
|---------------------------|--|---------------|
| Dependent Variable: HDI   | A measure of human development, accounting for income, schooling, and life expectancy  | N/A           |
| Independent Variable: CCI | A measure of corruption, with positive values associated with low levels of corruption | -             |

that electricity exports cause increased corruption, and Model 2 demonstrates that corruption negatively impacts the standard of living, then by the transitive property one can say that electricity exports cause a reduced standard of living. If this is the case, a resource curse may be to blame. The equation for Model 2 is given below and is summarized in Table 3.

$$HDI = \alpha + \beta_1 CCI$$

#### V. RESULTS

The results for Model 1, which predicts corruption as a function of resource exports and a control set of variables, are presented in Table 4. It is important to remember, when reading the results, that CCI values for very corrupt nations are negative. Therefore, a negative coefficient in the regression results indicates an increase in corruption. Interestingly, two of the variables that control for human development (LIFEEXPEC and YSCHOOL), are insignificant; however, the third (GNIPC), is positive and highly significant.

The remaining three variables (ELEC, OIL, and MINE) test for the resource curse and each is significant. Interestingly, MINE has the only positive coefficient. This is consistent with the findings of Pegg (2010), who concludes that Botswana's diamond revenues have not caused a resource curse, thanks to careful government planning



and a willingness to invest the revenues into the vital sectors of health, education, and infrastructure. Perhaps the countries with large mineral deposits, such as Botswana and South Africa are more equipped to appropriately manage the revenues, and have turned their resources into a blessing.

The coefficient for OIL is negative and significant, supporting the natural resource curse hypothesis. This is consistent with the findings of Williams (2010) and Avom (2010) who find that oil revenues cause decreased government transparency, allowing funds to be mismanaged. This finding is also supported by Kojucharov (2007), who reports that, despite the World Bank's best efforts to prevent a resource curse, the Chadian government misused revenues, preventing economic and human development growth.

The most important result of this study is that the coefficient for ELEC is negative and significant. This demonstrates that if a country increases electricity exports, it also increases corruption, and supports the resource hypothesis that electricity exports, which can bring large revenues thanks to power shortages in Africa, can increase corruption, consistent with the Nigerian disease.

Table 5 presents the results of Model 2, which tests whether

| Variable  | Coefficient            |
|-----------|------------------------|
| Constant  | -1.396***<br>(-3.914)  |
| ELEC      | -.086*<br>(-2.065)     |
| OIL       | -.472***<br>(-4.338)   |
| MINE      | .488***<br>(3.941)     |
| LIFEEXPEC | .006<br>(.931)         |
| GNIPC     | 8.746E-5***<br>(5.462) |
| YSCHOOL   | -.016<br>(-.508)       |

\*\*\*significant at the .001 level

\*significant at the .02 level

Dependent Variable: CCI

R-Square: .539

Observations: 100

Numbers in parenthesis are T-values

corruption negatively impacts standard of living. It is important to note that corrupt countries have negative values for CCI, while benevolent countries have positive values. The coefficient for CCI is positive and significant, indi-

Table 5: Regression Results for Model 2

| Variable | Coefficient         |
|----------|---------------------|
| Constant | .544***<br>(29.691) |
| CCI      | .132***<br>(6.319)  |

\*\*\*significant at the .001 level

Dependent Variable: HDI

R-Squared: .290

Observations: 100

Numbers in parenthesis are T- values

cating that an increase in "goodness" causes an increase in HDI. Conversely, increasing corruption negatively impacts HDI. It is interesting to note that the R-squared value for Model 2 is .290, suggesting that nearly thirty percent of the variation of standard of living is explained by the model.

The results of Model 2 intuitively make sense. If a government official is corrupt, and is diverting funds for personal gain, those funds cannot be used to promote health, education, or infrastructure. They are also consistent with the findings of Avom (2010), who determines that corruption that is caused by resource dependency reduces human capital development and revenue growth. Williams (2010), finds that corruption prevents economic growth, further supporting the findings of Model 2.

Combining the findings of Models 1 and 2 demonstrates that electricity exports increase corruption, and therefore reduce quality of life in Africa. Model 1 finds that an increase in electricity exports in Africa causes an increase in corruption. Model 2 finds that corruption decreases standard of living. Thus, by transitive property, electricity exports decrease standard of living, supportive of the resource curse hypothesis.

## VI. CONCLUSION

There exists an electricity shortage throughout most of Africa. Grids are unreliable, causing frequent blackouts. Villages without access to power grids are common, and this greatly lowers quality of life. This shortage causes electricity to be very valuable. Intuitively, the countries that have learned to produce electricity efficiently enough to export it to neighboring nations should be better off than those who haven't. That is, electricity exports should be a 'blessing' to the

people of Africa.

The natural resource curse attempts to explain why the people of resource rich countries often do not receive any benefit from resource revenues. Specifically, in countries affected by the Nigerian disease, corrupt officials misuse revenues for personal gain, diverting funds away from the vital sectors of health, education, and infrastructure. This project helps to determine whether revenues from electricity exports can actually reduce quality of life in African countries, by means of a resource curse. It fills a gap in the literature by testing for a previously unexamined cause of the resource curse.

Two separate OLS regressions are used to test the hypothesis that electricity exports can cause a corruption driven resource curse (the Nigerian disease), and that this harms standard of living in Africa. Model 1 measures whether resource exports increase corruption, while controlling for human development. The model finds that oil and electricity exports do increase corruption, providing evidence of a Nigerian disease. Model 2 attempts to determine whether corruption has a negative impact on quality of life. Unsurprisingly, the model finds that corruption does reduce standard of living. By the transitive property, if electricity exports cause corruption, and corruption reduces standard of living, then electricity exports reduce standard of living. These conclusions support this project's hypothesis that electricity exports cause a Nigerian disease, that negatively impacts the quality of life for the people of Africa. This research could be expanded by compiling a larger data set. If more countries were included over a longer time period, the sample would become a better representative of the African continent. Additionally, a model developed to test for the Dutch disease could provide increased understanding of how this particular instance of the curse operates.

The findings of this study imply that poverty may be a more complex problem than previously imagined, and that there are additional potential causes that must be explored. It also stresses the importance of efficient revenue management for governments, as corruption is a significant determinant of standard of living. Finally, it demonstrates that a natural resource curse is not inevitable, as mineral exports were shown to decrease corruption, thereby promoting quality of life.

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# FINANCIAL AND LABOR MARKET DETERMINANTS OF MORTGAGE DELINQUENCY RATES: MCLEAN COUNTY, IL, 1985-2011

Jake Mann

## I. INTRODUCTION

It is generally understood that the 2007-2009 recession in the United States had its roots in the real estate market. To quote Schiller (2008): "a speculative bubble in the housing market (...) has now caused ruptures among many other countries in the form of financial failures and a global credit crunch" (p. 1). There is a growing body of literature on the economic impact of the bursting of this "speculative bubble". Efforts have been directed at examining how financial institutions have been impacted and at considering different efforts to re-regulate this industry. As the economic recovery from this particular recession has been slower than after previous contractions, particularly in terms of job creation, research efforts have also focused on labor markets. In this paper, we examine the interplay between financial and labor market factors and the real estate market at the local level. We study McLean County, Illinois, since this county, while being the largest in the state in terms of square mileage, has a median income level and a home ownership rate comparable to those of Cook County—where the City of Chicago is located.

As Marciano and Ruprah (2011) report, recent economic literature tends to cast the phenomenon of mortgage default, the precursor to potential property foreclosure, as either an issue of moral hazard or as an issue of inability to pay. Regarding the issue of moral hazard and mortgage defaults significant attention has been devoted to the study of why and when homeowners choose to stop making their monthly mortgage payments. The premise that homeowners will "walk away" from their properties when the value of the mortgage is greater than the home price, a situation known as having "negative equity" or being "underwater", fits a crude cost-benefit analysis of such a situation. Yet, Foote et al. (2008) find that "contrary to popular belief, [...] negative equity is a necessary but not a sufficient condition for foreclosure" (p. 1). In fact, they report that fewer than

10 percent of homeowners experiencing negative equity on their homes eventually experience foreclosure. Moreover, Mian and Sufi (2008) place the onus of foreclosures on the lenders, as "the expansion in the supply of credit driven by disintermediation is responsible for the rapid increase in new loan originations, house price appreciation, and subsequent large increase in default rates" (p. 4). Similar conclusions regarding lending standards and mortgage securitization are reached by Nadauld and Sherlund (2009), Haughwout et al. (2008), and Keys et al. (2008). The prevalence of adjustable-rate mortgage instruments during the build-up of the housing bubble also played a central factor in the buildup of negative equity. As Bucks et al. (2008) point out, borrowers with adjustable-rate mortgages were much more likely to misunderstand the terms of their mortgage contract than their peers. Particularly, they were "likely to underestimate or to not know how much their interest rates could change" (p. 1).

Regarding the issue of inability to pay and mortgage defaults research efforts have been focused on identifying the factors that prevent the homeowners from making their monthly payments. Such factors can be broadly categorized as either financial (e.g. interest rates on the mortgaged principal) or labor-market related (e.g. the employment status of the homeowner). Previous real estate market crises informed the work of Campbell and Dietrich (1983) and Deboer and Conrad (1988), who found that unemployment rates are positively related to mortgage and property tax delinquency levels respectively. More recently, Mayer et al. (2009) find that "In areas with widespread increases in unemployment, house prices generally decline; demand for housing falls as income drops and workers migrate to other areas in search of jobs" (p. 42). Financial factors have also been considered. Gerardi et al. (2007) estimation results indicate that the short-term London Interbank Offered Rate (LIBOR) and unemployment rate are positively associated with

foreclosure levels. Also, Demyanyk and Van Hemert (2009) find that at the outset of the 2006-2007 housing crisis the delinquency rate on fixed-rate mortgages actually fell and that the 'variable' delinquency rate rose enough to cause a cumulative increase in the aggregate delinquency rate.

We focus our study on the arguments related to the inability to pay, rather than on the moral hazard argument, in order to address an ongoing public policy argument: whether mortgage defaults are more strongly influenced by the weakness in the labor market or by the actual costs of financing the mortgages. The policy implications of this argument are enormous. If the costs of mortgages are found to be more relevant than, let's say, the unemployment rate in explaining mortgage defaults, policy efforts should be focused on facilitating debt re-financing; if the inverse is true, policy efforts should prioritize job-creation to stem the mortgage defaults and foreclosures. Cordell et al. (2008) offer their own answer to this question when reporting that the "dead-weight losses" derived from foreclosures could be reduced with "loss mitigation" (i.e. re-financing).

We expect that an increase in either fixed or variable interest rates decreases homeowners' ability to make their mortgage payments, thus increasing delinquency rates. Changes in fixed and variable mortgage interest rates should impact homeowners in slightly different ways. A change in the fixed interest rate will only affect newly granted fixed-rate mortgages for either the acquisition of a new house or for the refinancing of the current one. Homeowners already locked-in with a fixed rate and not looking into re-financing would not be affected. A change in the variable interest rate, however, affects the current cost of financing a house purchase financed through a variable interest instrument. We also expect that a deterioration of the general condition of the local labor market decreases homeowners' ability to make their mortgage payments, thus increasing delinquency rates. An increase in the local unemployment rate would signal a decrease in the current average income from labor.

We focus our study on the McLean County housing market because it could be representative of statewide trends. With a population of nearly 170,000 residents, mostly concentrated in the adjacent City of Bloomington and Town of

Normal, nearly 275,000 mortgage deeds have been granted over the past 26 years. During most of our period of analysis, 1985-2011, the mortgage delinquency rate has wandered around a mean value of 2.00 percent; yet starting in 2005 it began to grow, peaking at a value above 9.00 percent in 2010. The metropolitan unemployment rate has also been increasing and the regional mortgage financing costs have been at, or above, national averages. As mentioned above, the County has a housing market fairly representative of the rest of the state. To begin with, it contains well defined and distinct urban and a rural "submarkets". Also, the county's average population per household (2.46) and homeownership rate (67.70 percent) are within a five percent margin of the national average values.

The remainder of this paper is organized as follows: Section 2 describes the data and methodology, examining the stationarity of the series; Section 3 identifies the best-fitting linear regressions used to examine the behavior of mortgage delinquency rates, discussing our findings; lastly, Section 4 presents conclusions and outlines policy implications.

## II. DATA AND METHODOLOGY

In McLean County, mortgage delinquencies are registered through the issuances of a *lis pendens*, which are notices informing the grantee of a mortgage that the grantor's payments are 90 days past due. These notices are filed with the County's Recorder's Office and are accessible through an online database. By dividing the number of *lis pendens* filings by the total number of mortgage deeds issued, the monthly delinquency rate is computed. Our sample period starts in January 1985 and ends in December 2011: a total of 310 observations. Our sample period contains a total of 274,310 mortgage deeds and 5,887 *lis pendens*, resulting in an average delinquency rate of 2.15 percent. As seen in Figure 1 on the next page, the series displays a period of relative stability between 1985 and 2004, when the monthly delinquency rate oscillates between 1.50 and 2.00 percent. The evolution of the twelve-month moving average of the mortgage delinquency rate suggests a change in the long-term trend by the end of 2005.

National interest rates are obtained from the FRED database maintained by the St. Louis



Federal Reserve Bank. These rates represent an average of the borrowing costs in the United States. Regional interest rates are obtained from the primary Mortgage Market Survey conducted by the federal agency Freddie Mac. These rates represent borrowing costs within the North Central region, comprised of the states of Illinois, Ohio, Indiana, Michigan, Wisconsin, Minnesota, Iowa, North Dakota and South Dakota. We compile both the 30-Year Fixed Rate Mortgage Average and the 1-Year Adjustable Rate Average. Figure 2 compares national and regional fixed interest rates. Figure 3 compares national and regional variable rates. In both cases, secular declining trends are easily observable. Although the fixed rate is generally higher than the variable rate, this difference has ebbed and flowed dramatically in the last decade. In fact, during the most recent recession both rates were effectively identical. In our sample period regional fixed interest rates have been an average of 0.06 percentage points above the national value. Similarly, regional variable interest rates have exceeded national values by an average of 0.15 percent. In December 2011, the end of our sample, the national fixed rate rested at 3.96 percent while the national variable rate was 2.79 percent. In this same month, the regional fixed rate was 3.97 percent while the regional variable rate was 3.06 percent.

Labor market indicators for McLean County are obtained from the Bureau of Labor Statistics' Metropolitan Area Survey. The compiled series, the unemployment rate and the number of unemployed workers, display similar cyclical behavior. Figure 4 and Figure 5 show that both labor market indicators declined between 1990 and 2000, with the unemployment rate reaching a low of 2.2 percent in 1998. Increasing, afterward, the unemployment rate peaked at 5.2 percent in 2005 before declining once again –this time to 3.9 percent in 2007. The latest nation-wide economic contraction has brought the county-level unemployment rate to its highest in 20 years: 9.1 percent.

In order to determine what structural relationship may link financial and labor market variables with the mortgage delinquency rate, we will estimate several linear regression models through Ordinary Least Squares. First, we will study the impact of labor and financial variables on the mortgage delinquency rate separately and then we will combine them into a single regression

equation. The first step in our model-building effort is to determine the order of integration of each series: if a series is integrated of order zero,  $I(0)$ , it follows that it is stationary in levels. We compute the Augmented Dickey-Fuller (ADF) test statistic to determine the presence of a unit root in the series. Following econometric convention, we first compute the natural logarithmic value of the series in order to induce linearity. Table 1 reports the results of the ADF tests of the variables in log-levels (top section) and in first-order differences of the log-levels (bottom section). Except in the case of the mortgage delinquency rate we fail to reject the null hypothesis that any of the series in log-levels has a unit root within a 95 percent confidence interval. We will put forward the argument that the pseudo-stationary behavior of the mortgage delinquency rate between 1985 and 2005 influences the value of the ADF test statistic for the whole sample period. When the first-order differences of the log-level values are considered the reported ADF test statistics strongly reject the null hypothesis of the presence of a unit root in any of the series. Thus, we conclude that all the series are integrated of order one,  $I(1)$ , and that they should be incorporated into our subsequent regression efforts in terms of growth rates.

In order to check the robustness of our findings we also compute the Kwiatkowski-Phillips-Schmidt-Shim (KPSS) test statistic to directly ascertain the potential stationarity of the series. Table 2 reports the results of the KPSS tests of the variables in log-levels (top section) and in first-order differences of the log-levels (bottom section). In the case of the mortgage delinquency rate and the labor market indicators we strongly reject the null hypothesis that, in log-levels, these series are stationary; in the case of the financial market indicators we fail to reject the null hypothesis of stationarity within a 95 percent confidence interval. When the first-order differences of the log-level values are considered the reported KPSS test statistics allow us not to reject the null hypothesis of stationarity for all the series. As above, we conclude that all the series are integrated of order one,  $I(1)$ , and that they should be incorporated into our subsequent regression efforts in terms of growth rates.

### III. ESTIMATION RESULTS

We now turn to estimating a structural model of county-level mortgage delinquency

rates as a function of labor and financial market factors. We study each of these sets of factors separately and then combine them in order to present the best-fitting linear regression model. We employ an Ordinary Least Squares (OLS) methodology to estimate the parameters of these families of models.

Our first set of estimating equations relates the mortgage delinquency rate with labor market factors. Besides the growth rate in the number of unemployed workers and the growth rate in the unemployment rate we considered the growth rate in the number of employed workers as a potential explanatory variable. Because none of our estimation formulations including this last variable yielded any significant result we chose not to include this equation in our discussion of results. Table 3 presents the estimation results of Model A and Model B. In both models we incorporate a lagged ( $t-1$ ) value of the dependent variable as an independent variable in order to capture the concept of persistence in the behavior of mortgage delinquency rates. The regression parameter associated with this variable is highly significant and almost identical across model specifications. Its negative sign indicates that an increase (decrease) in the mortgage delinquency rate during any given month is followed the next month by a decrease (increase) in the mortgage delinquency rate. For example, when the mortgage delinquency rate increases by 10 percent during the previous month we should expect a 3.63 (on average) percentage decrease in its value this month. Thus, the mortgage delinquency rate does not increase continually. We also include a dummy variable in order to capture an abnormally large drop in the value of the mortgage delinquency rate during the early months of 1992: during the first quarter of the year the number of recorded *lis pendens* notices was less than three a month. We attribute these low values to either a clerical issue related to the recording the notices or to a possible change in the legal process regarding the issuing of a *lis pendens* notice itself. The parameter associated with this dummy variable is highly significant and, as should be expected, negative in sign.

Model A examines the relationship between the county-level mortgage delinquency rate and the metropolitan area unemployment rate. Due to the delay between the time a homeowner becomes unemployed and the time a

mortgage is considered to be in default – recall that in the State of Illinois a mortgage is in default after 90 days of non-payment – we lag this variable by four (4) periods. The regression parameter associated with this variable is highly significant and positive in sign. We find that a one percent increase (decrease) in the unemployment rate four months ago translates into a 0.70 percent increase (decrease) in the mortgage delinquency rate during the current month. Lastly, Model B examines the relationship between the county-level mortgage delinquency rate and the metropolitan area number of unemployed individuals. For the same reasons discussed above, we lag this variable by four (4) periods. The regression parameter associated with this variable is highly significant and positive in sign. We find that a one percent increase (decrease) in the number of unemployed individuals four months ago translates into a 0.76 percent increase (decrease) in the mortgage delinquency rate during the current month. We hypothesize that a change in the number of unemployed workers has a larger impact on the mortgage delinquency rate than a change in the unemployment rate due to the structure of the local labor market. Due to the limited range of horizontal mobility in terms of potential employers in the county we expect that when a worker becomes unemployed she or he leaves the area in order to become occupied in a similar activity. Thus, when the actual number of unemployed workers residing in the area increases, its impact on mortgage delinquency rates is larger than that of an identical increase in the area unemployment rate. The explanatory power of our linear regression efforts focused on labor market factors yield very similar R-squares: we explain (on average) 23 percent of the variance in the rate of growth of the delinquency rate. The residual diagnostics yield mixed results. Although we can strongly reject the null hypothesis of heteroskedasticity in the residuals, we cannot conclude definitely that the regression residuals are not autocorrelated or that they are normally distributed. Our second set of estimating equations relates the mortgage delinquency rate with national and regional financial market factors. Table 4 presents the estimation results of Model C and Model D. As before, in both models we incorporate a lagged ( $t-1$ ) value of the dependent variable as an independent variable in order to capture the concept of persistence in the behavior of mortgage delinquency rates. Our findings are almost identical to those presented above and we will refer



the reader to that section of the paper in order to economize space. The dummy variable discussed above is also incorporated in these models.

Model C examines the relationship between the county-level mortgage delinquency rate and national-level fixed and variable interest rates. Due to the delay between the time fixed interest rates change and the time a homeowner notices changes in her or his potential mortgage financing costs we lag this variable by two (2) periods. The regression parameter associated with this variable is highly significant and positive in sign. We find that a one percent increase (decrease) in the national-level fixed interest rate on mortgages two months ago translates into a 2.71 percent increase (decrease) in the mortgage delinquency rate during the current month. Somehow, surprisingly, we cannot establish any significant statistical relationship between the national-level variable interest rate on mortgages and the county-level mortgage delinquency rate. We put forward the hypothesis that the local real estate market, while moving along with national trends of ballooning activity between 2003 and 2007, did not share the "bubble" qualities associated with large volumes of adjustable-rate mortgages prevalent in other areas. Therefore, only a small fraction of local homeowners was exposed to the variable financing costs brought about by these financial instruments. Lastly, Model D examines the relationship between the county-level mortgage delinquency rate and regional-level fixed and variable interest rates. For the same reasons discussed above, we lag this variable by two (2) periods. The regression parameter associated with this variable is highly significant and positive in sign. We find that a one percent increase (decrease) in the regional-level fixed interest rate on mortgages two months ago translates into a 2.27 percent increase (decrease) in the mortgage delinquency rate during the current month. Again, we cannot establish any significant statistical relationship between the variable interest rate on mortgages and the mortgage delinquency rate, even though in this case we consider regional-level variable interest rates. We will refer the reader to the argument we put forward above. The explanatory power of our linear regression efforts focused on financial market factors yield very similar R-squares: we explain (on average) 21 percent of the variance in the rate of growth of the delinquency rate. The residual diagnostics yield mixed results. Although we can strongly re-

ject the null hypothesis of heteroskedasticity in the residuals, we cannot conclude definitely that the regression residuals are not autocorrelated or that they are normally distributed.

Our final estimation effort combines labor and financial market factors. Besides the one-period lagged value of the growth rate in the mortgage delinquency rate and the event dummy discussed above we include the growth rates in the regional fixed interest rate on mortgages and in the area-level number of unemployed. As before, we lag these variables in order to capture the delay in the reaction of the mortgage delinquency rate that follows a change in both labor market and mortgage financing conditions. The regression parameters associated with these variables are highly significant and positive in sign. We note that when considered simultaneously the magnitude of the parameter linking the number of unemployed with the mortgage delinquency rate increases (by 2.33 percent) while the magnitude of the parameter linking the fixed interest rate on mortgages with the mortgage delinquency rate decreases (by 17.66 percent). Nevertheless, the impact of changes in financial factors is 2.38 times larger than the impact of changes in labor market factors. In fact, a 10 percent increase (decrease) in the fixed interest rate on mortgages translates into an 18.69 percent increase (decrease) in the mortgage delinquency rate, while a 10 percent increase (decrease) in the number of unemployed individuals translates into a 7.85 percent increase (decrease) in the mortgage delinquency rate. This regression yields the highest R-square of all of our models: we are able to explain 24 percent of the variance in the rate of growth of the delinquency rate. Finally, the residual diagnostics yield mixed results. Although we can strongly reject the null hypothesis of heteroskedasticity in the residuals, we cannot conclude definitely that the regression residuals are not autocorrelated or that they are normally distributed.

#### IV. CONCLUSION

Our study of the behavior of the mortgage delinquency rate in McLean County, IL attempts to explain it as a function of several different factors. We consider, independently and jointly, labor market indicators such as the number of unemployed and the unemployment rate and financial market indicators such as the 30-year fixed and 1-year variable mortgage interest rates. Both na-

tional-level and regional-level mortgage interest rates are, alternatively, examined as potential explanatory variables. We find that the OLS regression yielding the best overall fit is capable of explaining 24 percent of the variance in the growth rate of the mortgage delinquency rate over time. More importantly, we find that when the number of unemployed individuals or the fixed mortgage interest rate change, even by the same percentage amount, the reaction of the mortgage delinquency rate is remarkably different in terms of order of magnitude. In our sample period the impact of changes in financial factors on the county-level mortgage delinquency rate is 2.38 times larger than the impact of changes in labor market factors.

This empirical finding is potentially useful to address an ongoing local debate on whether it is the job losses associated with the latest recession or the onerous financing terms of properties suddenly devalued by the collapse of the real estate market that is resulting in larger numbers of mortgage defaults and, eventually, foreclosures. Our conclusion that financial market indicators play a larger role than labor market indicators could help focus the policy responses to the ongoing problem of property foreclosures. We will argue that policy efforts in this area should emphasize loss-mitigation (i.e. refinancing) instead of job-creation. In that light, we are happy to report that a lender-borrower mediation process has been recently implemented as part of the legal foreclosure proceedings in the local court system. On the other hand, our research leads us to believe that recent reductions in the unemployment rate, both at the national and local levels, would not have as much of a dampening effect on the number of county-level mortgage defaults as many would expect. Finally, we will point out the fact that although local and regional policymakers may be able to influence, to a degree, labor market conditions in the area their degree of influence over financial market conditions is severely constrained. In other words, regulation and control of financial market conditions is mostly conducted at the national level, where local and regional interests and priorities are multiple and often conflicting.

In terms of potential avenues of future research we propose to study the time series characteristics of the filings of lis pendens notices by themselves. A visual examination of this series

seems to indicate a semi-continuous process: a month with a relatively high number of lis pendens notices filed is frequently followed by a month with a relatively low number of lis pendens notices filed. The resulting seesaw plot of the series may provide a clue regarding the prevalent rejection of the null hypothesis of autocorrelation in the regression residuals. A potential manipulation of these series through some sort of moving average or filtering process could merit future research efforts.

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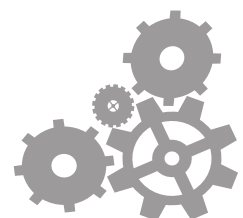
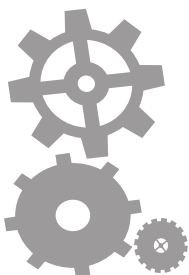
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## APPENDIX

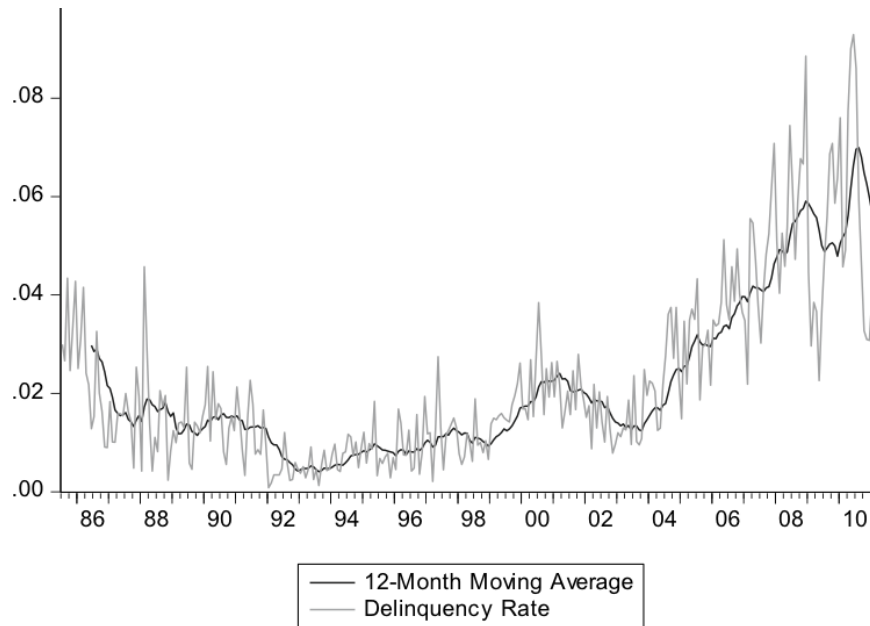


Fig. 1. Histogram of Delinquency Rate and 12-Month Moving Average

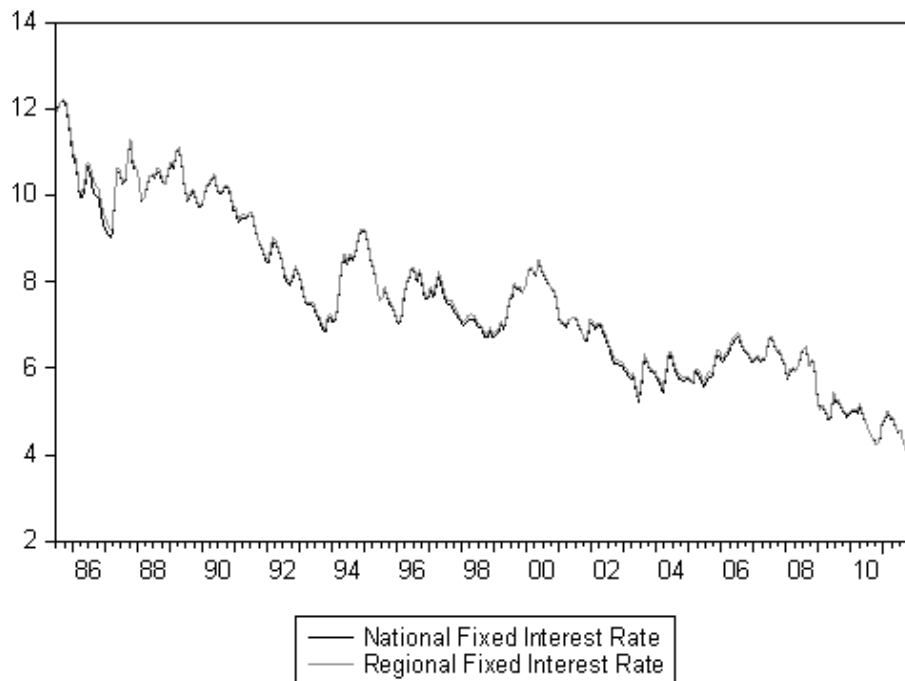


Fig. 2. Histogram of Regional and National 30-Year Fixed Mortgage Interest Rate

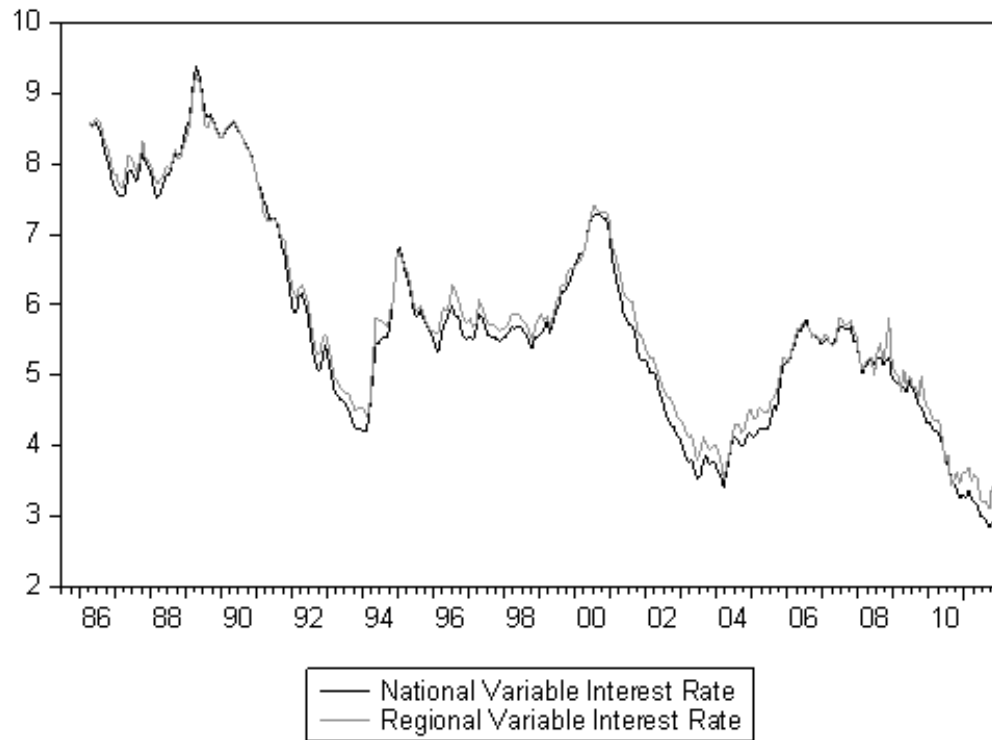


Fig. 3. Histogram of Regional and National 1-Year Variable Mortgage Interest Rates

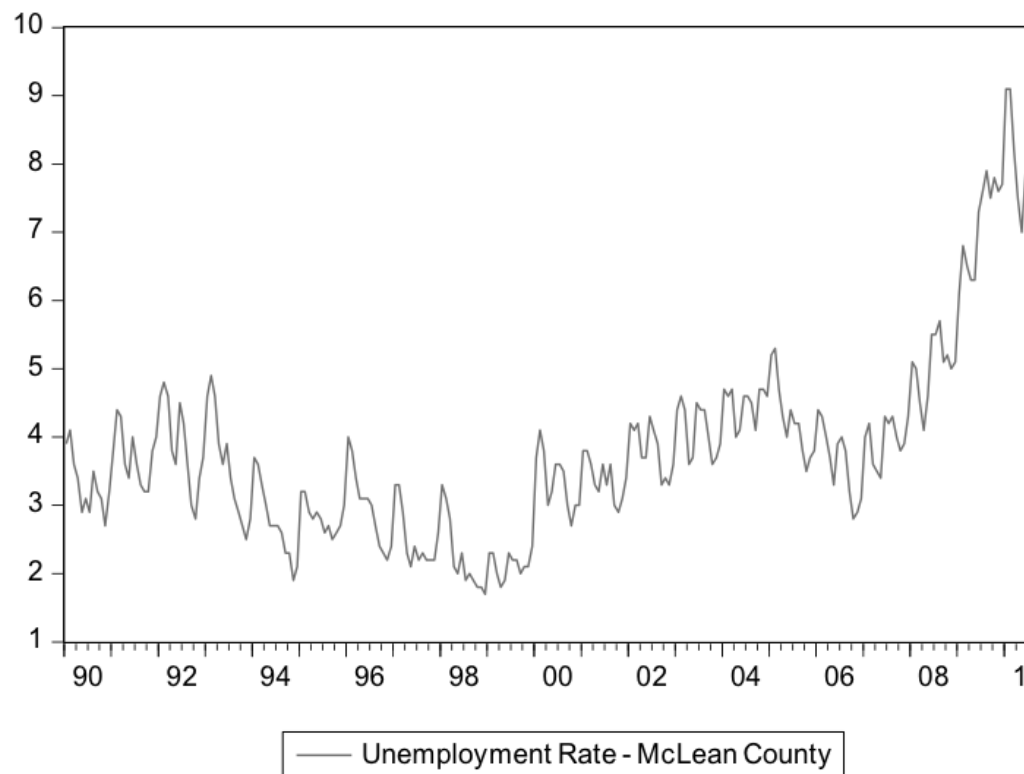


Fig. 4. Histogram of Bloomington-Normal Metropolitan Unemployment Rate

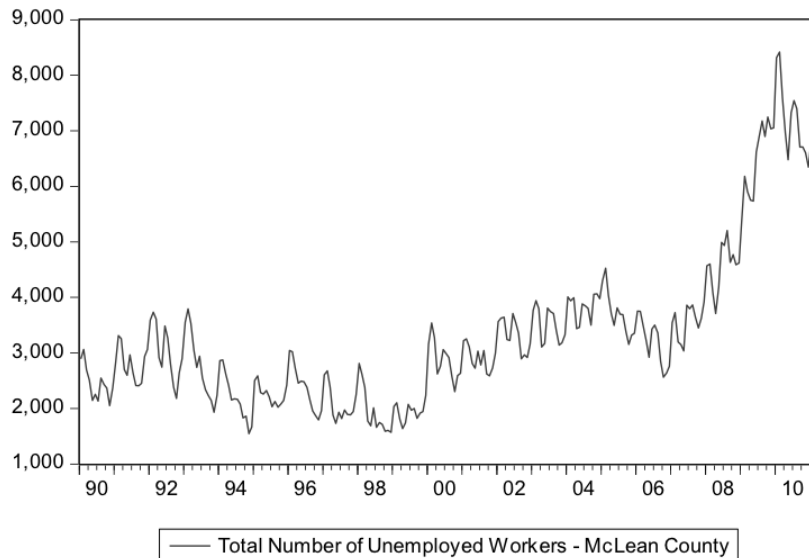


Fig. 5. Histogram of Number of Unemployment Individuals in the  
Bloomington-Normal Metropolitan

Table 1: Results of the ADF Test for Unit Roots

|   | Constant+trend | Significance |
|---|----------------|--------------|
| Variables in logarithms                             |                |              |
| The null hypothesis is non-stationarity             |                |              |
| Delinquency rate                                    | -3.8881        | **           |
| Unemployment rate                                   | -2.3174        |              |
| Unemployed  | -2.2151        |              |
| Fixed interest rate, regional                       | -3.2723        | *            |
| Fixed interest rate, national                       | -3.2888        | *            |
| Variable interest rate, regional                    | -1.5903        |              |
| Variable interest rate, national                    | -1.7320        |              |
| Critical values (%)                                 |                |              |
| 1   | -3.9875        |              |
| 5   | -3.4242        |              |
| 10  | -3.1351        |              |
| Variables in logarithms and first order differences |                |              |
| The null hypothesis is non-stationarity             |                |              |
| Delinquency rate                                    | -11.18235      | ***          |
| Unemployment rate                                   | -3.6219        | **           |
| Unemployed  | -3.8281        | **           |
| Fixed interest rate, regional                       | -12.8864       | ***          |
| Fixed interest rate, national                       | -12.8054       | ***          |
| Variable interest rate, regional                    | -14.8323       | ***          |
| Variable interest rate, national                    | -10.3244       | ***          |
| Critical values (%)                                 |                |              |
| 1   | -3.9875        |              |
| 5   | -3.4242        |              |
| 10  | -3.1351        |              |



Table 2: Results of the KPSS Test for Stationarity

|   | Constant+trend | Significance |
|---|----------------|--------------|
| Variables in logarithms                             |                |              |
| The null hypothesis is stationarity                 |                |              |
| Delinquency rate                                    | 0.3899         |              |
| Unemployment rate                                   | 0.3755         |              |
| Unemployed  | 0.3714         |              |
| Fixed interest rate, regional                       | 0.0765         | ***          |
| Fixed interest rate, national                       | 0.0706         | ***          |
| Variable interest rate, regional                    | 0.0859         | ***          |
| Variable interest rate, national                    | 0.0836         | ***          |
| Critical values (%)                                 |                |              |
| 1   | 0.2160         |              |
| 5   | 0.1460         |              |
| 10  | 0.1190         |              |
| Variables in logarithms and first order differences |                |              |
| The null hypothesis is stationarity                 |                |              |
| Delinquency rate                                    | 0.1223         | **           |
| Unemployment rate                                   | 0.0926         | ***          |
| Unemployed  | 0.1076         | ***          |
| Fixed interest rate, regional                       | 0.0514         | ***          |
| Fixed interest rate, national                       | 0.0485         | ***          |
| Variable interest rate, regional                    | 0.0924         | ***          |
| Variable interest rate, national                    | 0.0845         | ***          |
| Critical values (%)                                 |                |              |
| 1   | 0.2160         |              |
| 5   | 0.1460         |              |
| 10  | 0.1190         |              |

Table 3: Estimation Results Model A And Model B

Dependent variable: % D in the Delinquency Rate (t=0)  
n = 259

|   | Model A                 | Model B                 |
|---|-------------------------|-------------------------|
| Constant                                | 0.0139<br>(0.4606)      | 0.0132<br>(0.4375)      |
| % D in Delinquency Rate<br>(t - 1)      | -0.3637***<br>(-6.6027) | -0.3628***<br>(-6.5951) |
| % D in Unemployed Population<br>(t - 4) |                         | 0.7675***<br>(2.7845)   |
| % D in Unemployment Rate<br>(t - 4)     | 0.7022***<br>(2.6791)   |                         |
| Dummy variable<br>(January 1992)        | -2.6546***<br>(-5.4579) | -2.6737***<br>(-5.5040) |
| R-squared                               | 0.2292                  | 0.2309                  |
| P (F-stat)                              | 0.0000                  | 0.0000                  |
| Residual Diagnostic Tests, P-values     |                         |                         |
| White's test (heteroskedasticity)       | 0.0960                  | 0.0741                  |
| Breusch-Godfrey (autocorrelation)       | 0.0000                  | 0.0000                  |
| Jarque-Bera (normality)                 | 0.0158                  | 0.0145                  |

Table 4: Estimation Results Model C and Model D

Dependent variable: % D in the Delinquency Rate (t = 0)  
n = 305

|   | Model C                 | Model D                 |
|---|-------------------------|-------------------------|
| Constant  | 0.0258<br>(0.8340)      | 0.0223<br>(0.7287)      |
| % D in Delinquency Rate<br>(t - 1)                | -0.3888***<br>(-7.5430) | -0.3853***<br>(-7.5220) |
| % D in National Fixed Interest Rate<br>(t - 2)    | 2.7128***<br>(2.6631)   |                         |
| % D in National Variable Interest Rate<br>(t - 3) | 1.0225<br>(0.8562)      |                         |
| % D in Regional Fixed Interest Rate<br>(t - 2)    |                         | 2.2710***<br>(2.1401)   |
| % D in Regional Variable Interest Rate<br>(t - 1) |                         | 1.1483<br>(1.0855)      |
| Dummy variable<br>(January 1992)                  | -2.6319***<br>(-4.9260) | -2.620***<br>(-4.9016)  |
| R-squared   | 0.2176                  | 0.2161                  |
| P (F-stat)  | 0.0000                  | 0.0000                  |
| Residual Diagnostic Tests, P-values               |                         |                         |
| White's test (heteroskedasticity)                 | 0.1784                  | 0.1893                  |
| Breusch-Godfrey (autocorrelation)                 | 0.0000                  | 0.0000                  |
| Jarque-Bera (normality)                           | 0.0000                  | 0.0000                  |

Table 5: Regression Result for Model E

Dependent variable: % D in Delinquency Rate (t = 0)  
n = 259

|  | Model E                 |
|--|-------------------------|
| Constant                                       | 0.1963<br>(0.6506)      |
| % D in Delinquency Rate<br>(t - 1)             | -0.3709***<br>(-6.7568) |
| % D in Regional Fixed Interest rate<br>(t - 3) | 1.8698**<br>(1.9049)    |
| % D in Number of Unemployed<br>(t - 4)         | 0.7854***<br>(2.8624)   |
| Dummy variable<br>(January 1992)               | -2.6450***<br>(-5.4704) |
| R-squared                                      | 0.2417                  |
| P (F-stat)                                     | 0.000                   |
| Residual Diagnostic Tests, P-values            |                         |
| White's test (heteroskedasticity)              | 0.0703                  |
| Breusch-Godfrey (autocorrelation)              | 0.0000                  |
| Jarque-Bera (normality)                        | 0.0075                  |

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# RETURNS FROM SELF-EMPLOYMENT: USING HUMAN CAPITAL THEORY TO COMPARE U.S. NATIVES AND IMMIGRANTS

*Nikola Popovic*

## I. INTRODUCTION

An article in USA today written by John Hopkins (2007) explains what it takes to be a successful self-employed person. Looking at the list of characteristics, education and experience are missing from the equation. What Hopkins lists as crucial is being a risk taker, knowing how to manage money, and even having the right genetics. The fact that education and experience are viewed by Hopkins to have minimal influence on the success of being self-employed is odd considering that those are some of most important factors for being successful according to economic theory which is later discussed in this paper, which is why I hypothesize that education and experience will have a significant impact on the success of a self-employed individual.

People who are self-employed or who start small businesses have significant influence on the economy. For example, according to facts compiled by the US Small Business Administration (2008), small businesses accounted for the employment of 52 percent of the US workforce in 2001, and were responsible for 75 percent of jobs created from 1990 to 1995. Starting a business has also allowed for innovation and increased competition in the markets. Since the Internet boom, new technology has provided opportunities to start a small business, be it one large enough to have employees or just for an individual.

An increase in opportunities to become self-employed has not only affected the native population but the minority as well. The steady increase of the immigrant population in the United States has provided the domestic small business scene with diversity of both culture and knowledge, with Mexico being the highest supplier of immigrants followed by China, India, and the Philippines (CIS, 2010). According to a study by AnnaLee Saxenian (1999), 25.3 percent of 2000 surveyed companies in Silicon Valley reported that at least one of their key founders was an

immigrant. Immigrants provide abilities that are unique to the American economy as well. A one percent increase in college educated immigrants increases patents per capita by 6 percent (Hunt and Gauthier-Loiselle, 2010). These figures start to address the significance that immigrants have on the advancement of the US economy. The increase in the immigrant population has caused the number of loans given to minorities to increase dramatically starting from the mid 90s (US SBA, 1999). This increase in business loans can be attributed to the fact that there are more immigrants coming to this country, but other factors, like education, could be at play.

This paper will study the effects that education and age have on earnings for self-employed individuals and will control for the country of birth. This research will attempt to find a correlation between the amount of human capital invested in an individual and the amount of returns they receive from self-employment, and then examine whether being a native to the US has a different effect than being an immigrant. I hypothesize that more human capital investment will result in higher earnings from self-employment, according to the theory that will be discussed later in this paper. I also hypothesize that immigrants will earn more than natives when controlling for educational attainment. The literature supports this reasoning because immigrants possess different skill sets coming from different cultural and educational backgrounds, which might influence how much income they receive. The immigrant groups selected for this study are from Mexico, China, India, and the Philippines.

## II. THEORY AND LITERATURE

There has been limited research done on the returns from self-employment when controlling for investments in human capital. Where the literature lacks completely is in finding a relationship between the returns from self-employment

among natives and immigrants based on human capital investment in the US. It is common to find literature, however, on the success of individuals who dropped out of college to start their own multi-billion dollar firms. The focus of this paper is on finding the general trend of returns from education and experience, rather than on the few whose success stories are extremely rare.

The hypothesis and models for this study will be built off of a study done by Justin van der Sluis, Mirjan van Praag, and Arjen van Witteloostuijn (2007). Their research compares the returns from human capital of self-employed and privately employed individuals. They find that investment in human capital in fact does have a significant effect of the returns to self-employment. My paper will use the findings of Sluis, Praag, and Witteloostuijn combined with a study by George Borjas (2007) to form the hypothesis that investments in human capital will similarly affect immigrants.

The underlying theory that I base my hypothesis on is human capital theory. This theory states that the more one invests in his or her education, the more returns s/he should receive in the form of earnings. There are two different applications of this theory: general and specific human capital.

General human capital theory states that skills obtained through education and experience in one's lifetime is what develops an intuition for successful business behavior due to a broad set of skills that are transferable between occupations (Brixy and Hessels, 2010). In this sense, both natives and immigrants should theoretically have the same advantages when looking at the success of a business because there are no statistical implications that would suggest one nationality has a higher quality life experience than the other. This conclusion can be made because the data set allows for the immigrant groups to become assimilated to the host country by setting the minimum age at 25. Leonid Azarnert (2011) suggests that an increasing immigrant population will in fact lower the return from human capital for natives because the increased competition discourages native workers. I will attempt to account for this issue by controlling for country of origin to find a general trend of returns from general human capital.

Specific human capital suggests that in-

dividuals possess skills that are directly relevant to their occupation (Brixy and Hessels, 2010). For example, an education and work experience in the auto mechanic field should result in higher economic success for an individual starting an auto shop compared to an education and experience in music for an individual trying to start the same auto shop. George Borjas (2007) discusses the significant difference between different countries when it comes to quality of education in certain areas. Borjas states that a higher percentage of Indian students study computer science than American students; therefore, using specific human capital theory, this would suggest that Indians would be more successful in starting a business in the technology field compared to Americans, simply because they have more related educational attainment. Generally speaking, the immigrant population has skills that are scarce to the US economy, and therefore these skills are in high demand which results in higher earnings.

Borjas does not ignore the fact that there are challenges when migrating to a new country, such as learning a new language and culture. These challenges might decrease the amount of potential earnings an immigrant can make from self-employment, but Borjas argues that the positive effect of having unique skills will be greater than the negative effect of migrating to a new country. This argument supports my hypothesis that self-employed immigrants will earn more than self-employed natives when controlling for the same level of upper level educational attainment.

When considering age, Gary Becker (1975) uses an empirical model to prove that earnings towards the end of one's career decrease because investments in human capital by the individual decrease over time. It is more likely that someone in their 20's will decide to go back to school to pursue higher education than someone in their 50's. This idea has become accepted in the economic community and therefore suggests that individuals in this study will see a slowdown in the amount of their earnings increase as they age because they will no longer be motivated to invest in their own human capital as they near retirement.

This theory is slightly more straightforward on its connection to natives, but there are other factors involved when considering investments in

human capital for immigrants. Immigrants need time to assimilate to the culture and language, which usually is a larger challenge for low skilled immigrants than high skilled. The amount of skills that immigrants possess will have an impact on the policy implications of this study which explores how immigrants benefit the US economy by starting their own businesses. If most of the immigrants in the sample are low skilled, their economic success, as measured by earnings, might not be as significant as natives'. However, if a significant portion of immigrants are skilled, the findings of this study might suggest that the US change its immigration policies to encourage the migration of educated immigrants.

### III. DATA

The data for this study comes from the IPUMS Current Population Survey as conducted by the Minnesota Population Center. The data is taken from a survey conducted in March 1999. The reason for this year is because 1999 was on the tail end of strong economic growth for the US. This will attempt to reduce the effect of the economic cycle on the earnings for individuals. It will also give new immigrants opportunities to get assimilated during a time of economic growth. The sample consists of 6000 self-employed individuals from ages 25 through 65. These individuals report their income for the year of the survey. The immigrant groups that are compared to US natives are immigrants from Mexico, China, India, and the Philippines. What defines an immigrant in this study is an individual that was born outside of the US, with the year of migration not taken into account. The large number of variables available from this survey, as well as a large sample size, makes for a strong set of data.

This database is also beneficial to this study because the variable which defines the class of

worker includes codes for self-employed, making it simple to identify, and isolate, which individuals apply to this study.

### IV. NATIVE / IMMIGRANT COMPARISON

To find descriptive statistics of earnings for natives and immigrants, I compiled general information about the education level and average age of each group using the data set, detailed in Table 1.

When observing the education levels for each ethnic group, the Mexican sample population stands out as having the least amount of education, about 75 percent having a High School diploma or below. The Chinese, Philippine, and Indian sample populations all have about the same percent of college educated individuals when compared to the Natives, but they have a noticeably larger percentage of individuals that have graduate levels of education. Considering the spread of data, I hypothesize that Chinese, Filipino, and Indian immigrants will have a higher income from being self-employed than the Native population; Mexican immigrants will have the lowest amount of income, when basing this reasoning on human capital theory.

The other aspect of human capital theory, experience, can be observed from the average ages of the sample groups. Mexican immigrants average a younger age than the rest of the groups, further supporting my hypothesis that they will have the least amount of income from self-employment. Chinese and Philippine immigrants have a higher average age than the Natives, which also supports the hypothesis that they will earn more than natives. The only contradiction is that the age of Indian immigrants is slightly lower; however the slight difference will be offset by a more substantial difference in education be-

Table 1: Average Ages and Percentages of Individuals in Educational Groups for Natives and Immigrants

| Immigrant Group | HS diploma and below (%) | Above HS through Bachelors (%) | Above Bachelors through Masters (%) | Above Masters (%) | Average Age |
|-----------------|--------------------------|--------------------------------|-------------------------------------|-------------------|-------------|
| Native          | 38.47                    | 49.41                          | 4.99                                | 7.13              | 45.35       |
| Mexico          | 75.84                    | 20.81                          | 2.01                                | 1.34              | 40.78       |
| China           | 39.29                    | 50                             | 0                                   | 10.71             | 48.21       |
| Philippines     | 21.74                    | 47.83                          | 4.35                                | 26.09             | 46.22       |
| India           | 7.69                     | 50                             | 23.08                               | 19.23             | 45.12       |



tween them and the Native population.

## V. EMPIRICAL MODEL

This study will be divided into three tests. The first test shows the general differences in earnings that immigrants and natives have; the second test sees how well human capital theory can explain these differences, and the final test compares the earnings between self-employed immigrants and natives with the same amount of upper level education. The tests are represented in Tables 2, 3, and 4, including the expected sign of each variable as described by the hypothesis. The dependent variable will be total personal income. The data will control for the self-employed, both incorporated and non-incorporated, by only including the individuals that fit these two categories. Total personal income will be used instead of total business income because the individuals that are categorized as self-employed and incorporated report their earnings under wages, instead of business income. Using total income while controlling for both types of self-employment will assure that the data is not affected by how earnings are reported. The first test will control for country of origin to account for the general differences in skill levels between immigrants and natives, as shown in Table 2. The groups in this model are Mexico, India, China, Philippines, and Native, where Native is the omitted group, as shown in Model 1. Mexican immigrants are the only group with an expected negative relationship with natives, as concluded in the Native/Immigrant Comparison section of this paper.

$$\text{Model 1: Total Personal Income (TPI)} = \beta_0 + \beta_1(\text{Mexico}) + \beta_2(\text{China}) + \beta_3(\text{Phil}) + \beta_4(\text{India})$$

The second test will add human capital variables of education and age to Model 1, as shown in Table 3. The independent variable education will be divided into groups. It will consist of four groups represented by dummy variables: high school diploma and below, above high school through bachelor's degree, above bachelor's through master's degree, and anything above a master's degree. The omitted variable will be high school diploma and below to show the effects of increasing amounts of education. The variable Age will be used to show the change in earnings for an additional year of experience, and AgeSquared will show a rate of change for an additional year of experience. The expected sign for Age is positive and AgeSquared is negative because younger individuals invest more in their human capital compared to older individuals, as hypothesized in earlier sections of the paper. Keeping the age range from 25 to 65 captures the ages where most people have obtained an education, as well as had a couple of years to become settled after their college years. For immigrants, it allows a couple years to become assimilated to the new country, as well as removing the individuals that have moved on into retirement. The complete model is shown in Model 2.

$$\text{Model 2: Total Personal Income (TPI)} = \beta_0 + \beta_1(\text{Mexico}) + \beta_2(\text{China}) + \beta_3(\text{Phil}) + \beta_4(\text{India}) + \beta_5(\text{BachDeg}) + \beta_6(\text{MasDeg}) + \beta_7(\text{AboveMas}) + \beta_8(\text{Age}) + \beta_9(\text{AgeSquared})$$

To test the hypothesis that Borjas presents, that immigrants have unique skills to the US workforce, a third model will be tested using interaction variables of each immigrant group and if they have an education above a bachelor's degree. These groups will be compared to the native population with the same level of education to see

if indeed the immigrants have unique skills that give them an economic advantage. This level of education has been chosen because individuals who have an education above a bachelor's degree have the most specialized skills. Table 4 and Model 3 illustrate the regression model as well as the variables with their expected signs.

Table 2: Model 1 Variables with Expected Signs and Definitions

| Predicted Sign          | Variable | Definition                            |
|-------------------------|----------|---------------------------------------|
| Dependent Variable -    |          |                                       |
|                         | TPI      | Total personal income (Self-employed) |
| Explanatory Variables - |          |                                       |
| Omitted                 | Native   | Population born in the US             |
| -                       | Mexico   | Population born in Mexico             |
| +                       | China    | Population born in China              |
| +                       | Phil     | Population born in the Philippines    |
| +                       | India    | Population born in India              |

Model 3: Total Personal Income (TPI)  
 $=\beta_0 + \beta_1(\text{Mexico}) + \beta_2(\text{China}) + \beta_3(\text{Phil})$   
 $+ \beta_4(\text{India}) + \beta_5(\text{AboveBachelors})$   
 $+ \beta_6(\text{Mexico*AboveBachelors})$   
 $+ \beta_7(\text{China*AboveBachelors})$   
 $+ \beta_8(\text{Phil*AboveBachelors}) +$   
 $\beta_9(\text{India*AboveBachelors})$

Table 3: Model 2 Variable with Expected Signs and Definitions

| Predicted Sign          | Variable   | Definition   |
|-------------------------|------------|--|
| Dependent Variable -    |            |  |
|                         | TPI        | Total personal income (Self-employed)              |
| Explanatory Variables - |            |  |
| Omitted                 | Native     | Population born in the United States               |
| -                       | Mexico     | Population born in Mexico                          |
| +                       | China      | Population born in China                           |
| +                       | Phil       | Population born in Philippines                     |
| +                       | India      | Population born in India                           |
| Omitted                 | HSDep      | High School diploma and below                      |
| +                       | BachDeg    | Above High School diploma through Bachelors Degree |
| +                       | MasDeg     | Above Bachelors Degree through Masters Degree      |
| +                       | AboveMas   | Above Masters Degree                               |
| +                       | Age        | Ages 25 through 65                                 |
| -                       | AgeSquared | Age * Age  |

## VI. RESULTS

The regression results of Model 1 show that the difference in earnings between self-employed immigrants and natives can be predicted by looking at the general level of education between each group. The Mexican immigrants are the only group predicted to have lower earnings than natives, and this held true. The coefficients for the other immigrant groups had correct signs and reasonable values. It is interesting to note the significant difference between the immigrant groups and natives, even if the Chinese and Filipino immigrant variables were not statistically significant, which is shown in Table 5. There is about a 50,000 dollar difference from the highest earning group, Indian, and the lowest earning group, Mexican.

Model 2 included the variables for educational attainment as well as age. All of the human capital variables were highly significant while the immigrant group variable were no longer significant. This shows that when controlling for hu-

man capital variables the difference in earning amount self-employed immigrants and natives is no longer significant. The size of the difference in earnings between the groups is much less than in the first regression; only about 12,000 from the lowest to the highest group. This regression shows how

the differences in earnings among self-employed can be largely explained by human capital variables, as hypothesized.

The values of the coefficients for the human capital variables were all reasonable, which supports the findings by Sluis, Praag, and Witteloostuijn (2007) who found that human capi-

Table 4: Model 3 Variables with Expected Signs and Definitions

| Predicted Sign          | Variable              | Definition  |
|-------------------------|-----------------------|---|
| Dependent Variable -    |                       |   |
|                         | TPI                   | Total personal income (Self-employed)                 |
| Explanatory Variables - |                       |   |
| Omitted                 | Native                | Population born in the United States                  |
| -                       | Mexico                | Population born in Mexico                             |
| +                       | China                 | Population born in China                              |
| +                       | Phil                  | Population born in Philippines                        |
| +                       | India                 | Population born in India                              |
| +                       | AboveBachelors        | Individuals with above a bachelor's degree            |
| Omitted                 | Native*AboveBachelors | Natives with an education above a bachelor's degree   |
| +                       | Mexico*AboveBachelors | Mexicans with an education above a bachelor's degree  |
| +                       | China*AboveBachelors  | Chinese with an education above a bachelor's degree   |
| +                       | Phil*AboveBachelors   | Filipinos with an education above a bachelor's degree |
| +                       | India*AboveBachelors  | Indians with an education above a bachelor's degree   |

tal investments have a positive relationship with self-employed income. The argument discussed by Becker (1975), that individuals invest less in their human capital as they get older, can be supported by observing the coefficients of Age and AgeSquared. The positive value for Age shows that as a self-employed individual get older, he or she earns about 2066 dollars more per year. The value for AgeSquared shows that the effect of an additional year of experience is decreased by about 324 dollars per year. These values show that Becker's argument is true, even for the self-employed.

The positive and significant interaction terms in Model 3 show that immigrants with the same amount of upper level educational attainment as natives have higher returns to education than natives, except for Indian immigrants whose interaction variable was not significant. Table 6 on the next page details the estimated earnings between each immigrant group when compared to natives.

The fact that natives have higher earnings than immigrants, in cases where educational attainment is at the bachelor's degree level and below, can be attributed to Borjas' (2007) argument that low skilled immigrants face greater challenges when migrating to a new country. The negative sign of the immigrant group variables shows that being an immigrant, regardless of country of birth, shares a negative effect with the amount of income a self-employed immigrant earns. Even if only two out of the four groups were statistically significant, all of the coefficients share the same sign.

When observing individuals that have an education above the bachelor's degree level, the results show an opposite relationship between country of birth and earnings. Natives, in this case, had the lowest amount of earnings when com-

Table 5: Regression Results for Models 1, 2, & 3

|                       | Model 1                 | Model 2                  | Model 3                 |
|-----------------------|-------------------------|--------------------------|-------------------------|
| Constant              | 45195.08<br>(52.287)    | -27375.59<br>(1.874)     | 37031.31<br>(43.062)    |
| Mexico                | -19600.58***<br>(3.694) | -5364.331<br>(1.101)     | -15075.09***<br>(2.991) |
| China                 | 10956.82<br>(.905)      | 7537.90<br>(.685)        | -8912.87<br>(.746)      |
| Phil                  | 16974.82<br>(1.271)     | -3028.95<br>(.249)       | -22215.31*<br>(1.488)   |
| India                 | 24292.69*<br>(1.934)    | 4348.69<br>(.380)        | -3091.78<br>(.201)      |
| BachelorDegree        |                         | 17430.97***<br>(10.457)  |                         |
| MastersDegree         |                         | 39826.16***<br>(10.808)  |                         |
| AboveMasters          |                         | 104246.16***<br>(33.037) |                         |
| Age                   |                         | 2066.371***<br>(3.129)   |                         |
| AgeSquared            |                         | -18.15**<br>(2.517)      |                         |
| AboveBachelors        |                         |                          | 67317.24***<br>(27.26)  |
| Mexico*AboveBachelors |                         |                          | 41103.34*<br>(1.51)     |
| China*AboveBachelors  |                         |                          | 194328.32***<br>(5.324) |
| Phil*AboveBachelors   |                         |                          | 88274.62***<br>(3.255)  |
| India*AboveBachelors  |                         |                          | 16705.87<br>(.702)      |
| N                     | 5692                    | 5692                     | 5692                    |
| Adjusted R Square     | .003                    | .176                     | .133                    |

Note: Numbers in parenthesis are absolute t-statistics

\* Significance at .10 level

\*\* Significance at .05 level

\*\*\* Significance at .01 level

pared to the immigrant groups. All of the interaction variables except for Indian immigrants were statistically significant and positive. This means that for each immigrant group there is an additional effect of being an immigrant, as well as having as education about a bachelor's degree level. These results show that Borjas' claim that immigrants have unique skills that are in demand in the US economy, and therefore have higher earnings from self-employment, is plausible.

## VII. CONCLUSION

There has been extensive literature and debate on the effects of immigration on the US economy and labor force; however, there is a lack of discussion

on the effect that skilled immigrants have on small business creation. The findings of this study effectively show how an increase in human capital, represented by education and age, result in an increase in earnings from self-employment, and effectively support the theory and past literature, particularly the study by Sluis, Praag, and Witteloostuijn (2007). It also proposes that Borjas' (2007) theory that immigrant skills are in high demand in the US is reasonable. One suggestion for further research could be to analyze which particular skills immigrants have, and if immigrants with an education or experience in a particular subject earn more as self-employed individuals than immigrants that are self-employed in a field that is not related to their past education or experience. Perhaps additional variables, such as family history or standard of living, could be added as independent variables to see if there are additional effects on the returns from self-employment and how they can be related to the immigrant population. The results presented in this study tell us that educated, experienced immigrants are what can help turn the economy around, and help create much needed jobs for American laborers.

Recently, there has been an increase in demand for skilled immigrants, particularly in the high-tech industries due to the computer age and globalization (Chiswick, 2005). Changing immigration policies to encourage skilled individuals to come to the US will fulfill this excess demand for workers, and also provide opportunities for them to start their own high-tech companies. Maskus, Mushfiq, and Stuen (2010) provide perspective on the idea of how important the diversity in education brought by immigrants is in the US economy. They state that a 10 percent decrease in foreign doctoral students decreases research by 5 to 6 percent. More skilled immigrants provide opportunity for the US economy to be exposed to individuals with unique abilities. As with immigrants,

American natives need to be encouraged to further their education and invest in their human capital so that they may become more successful in creating their own businesses.

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Table 6: Estimated Income Distribution for Natives and Immigrants

| Immigrant Group | Has Bachelor's or Below | Has Above Bachelor's |
|-----------------|-------------------------|----------------------|
| Natives         | 37031*                  | 104348*              |
| Mexico          | 21956*                  | 130376*              |
| China           | 28119                   | 289764*              |
| Philippines     | 14815*                  | 170407*              |
| India           | 33940                   | 117962               |

Note: Values are self-employed income

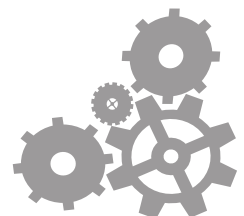
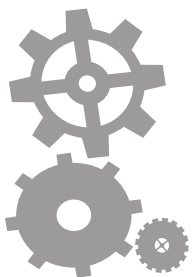
\* statistically significant

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# ECONOMICS OF SALARY DISPERSION IN THE NATIONAL BASKETBALL ASSOCIATION

*Dan Schouten*

## I. INTRODUCTION

In the business world, every firm faces salary allocation decisions. Managers and executives of companies have to ask themselves how to allocate salaries across positions. This question also applies to teams within the National Basketball Association (NBA). NBA players provide a differing amount of value to their respective team and therefore are worth different amounts of money in comparison to one another. General managers have to decide which players to sign as well as figure allocation decisions of the salary they distribute to their signed players. An important research question to consider is: What is the best way to allocate salary amongst a NBA team? The term "best" in this situation can be interpreted in different ways. First, "best" can be viewed as a salary distribution that maximizes wins. Wins are obviously important to fans and are also important to management. In addition to win maximizing, "best" can also be viewed as a salary distribution that maximizes revenue as each team is attempting to make money.

There are many reasons as to why this research question is important, both in terms of the NBA and other businesses. With regards to the NBA, the answer to this question could play a significant role in the shaping of the league. General managers will hopefully be able to construct their teams better and more appropriately after this study and also be able to understand how the distribution of the salaries that they give out will affect their goals for the season.

With general managers' knowledge of team construction increasing, the competitive balance of the NBA might also be able to increase. The biggest problem any sports league faces is competitive imbalance. A large amount of imbalance can lead to a contraction in the number of teams, or even the disbanding of the entire league (Rosen et al, 2000). The NBA has the biggest competitive imbalance problem of any of the four major sports leagues when it comes to number of wins and amount of revenue generat-

ed. As of the end of the 2010-11 NBA season, two teams, the Boston Celtics and Los Angeles Lakers, have won a combined 33 NBA Championships in the 65 year existence of the NBA. In addition to this fact, differences across teams in the amount of revenue generated are enormous. Within the last five years, there has been up to a 254% difference between the top and bottom teams in total revenue. The competitive imbalance problem deals with a problem at the league level, whereas the research question at hand deals with the team level disparity. They are connected, however, because if salary dispersion on a team level affects wins and revenues, general managers would be able to use this knowledge and create their teams to be more competitive against the rest of the league. This would increase the health of the league and therefore everyone involved with the NBA would reap the benefits.

In addition to these facts on the importance of this topic in the NBA, this research can also be extremely beneficial to other firms, companies and industries. The research done during this study can possibly expose a new system of managing and a new way to organize firms, similar to the way the book *Moneyball* by Michael Lewis changed perceptions throughout the business world. Every firm faces salary allocation decisions, but the fact that outcomes are more easily measured in sports than in other business firms makes studying research topics such as this one easier to complete when applying it to a sports organization. Basketball players' productivity is much more easily measured than workers in other firms because of the statistics that are compiled with the sport.

This study aims to determine the optimal amounts of salary dispersion to maximize wins and maximize revenue. Based on economic theory provided in the following section, I hypothesize that the optimal amount of salary dispersion will be different for teams that have a goal of maximizing wins and teams that have a goal of maximizing revenue. In addition, the theory in the following



section also helps generate other hypotheses. In terms of win maximization, I hypothesize that the greater the dispersion the greater the number of wins achieved. In terms of revenue maximization, I also hypothesize that the greater the dispersion, the greater the amount of revenue generated. However, I believe the effect of dispersion will be greater for revenue.

## II. THEORY AND LITERATURE REVIEW

There has been a large amount of literature on topics related to this research question pertaining to wage disparities within a firm, but not a great amount done specifically on salary dispersion in the NBA and its effects. The majority of the literature that is similar to this topic deals with the effect of salary dispersion on the number of wins and does not even consider revenue. The literature that deals with wins and salary dispersion is relatively new (Berri et al, 2004). This is a result of the Collective Bargaining Agreement (CBA) between the NBA owners and players' union that was developed at the start of the 1995 NBA season. This was the first time in NBA history where the salary dispersion within teams really exploded. The "middle-class" of the NBA was basically lost and teams had very high salary players and low salary players (Berri et al, 2004). Many teams, as a result of the terms of the new CBA, took the path of devoting a substantial amount of team payroll to a few stars and then complete their roster with players offered the NBA minimum wage or close to it.

David Berri and Todd Jewell (2004) saw this rapid change in distribution of salaries as a chance for a natural experiment to understand how changes in disparity impact team/firm performance. Hajime Katayama and Hudan Nuch (2011) completed a similar study. Each study defined the dispersion variable differently, but both came to the same conclusions. Both studies found the amount of salary dispersion among a team to have no significant effect on team performance. The authors say that, for this industry at least, the idea of tournament theory, which states that pay inequality results in higher worker productivity, and pay compression school of thought, which states that wage equality will enhance cooperation and therefore performance, are both inapplicable (Berri et al, 2004). The datasets used, however, were admittedly somewhat small and both Berri and Katayama believe there

could be a significant effect if the sample size was larger (Kayama et al, 2011). Another similarity of these authors was their conclusion that salary dispersion might not affect team performance because the lower salaried players will perform to their best abilities to maximize the amount of salary they can obtain on their next contract.

Stefan Kesenne (2007) discusses the multiple objectives of professional sports teams in his book *The Economic Theory of Professional Team Sports*. He acknowledges that professional sports organizations are businesses that attempt to maximize revenue and profit, but at the same time many teams are focused on maximizing wins. Studies have been shown to be inconclusive in accepting or rejecting the profit or win maximization goals. Kesenne provides a simple diagram that leads to the underlying hypothesis of this paper, which is that revenue maximizing teams and win maximizing teams will have a differing amount of salary dispersion. Figure 1 shows the different amount of talent demand levels depending on team goals. The number of talents, or superstars, is represented on the horizontal axis and total revenue and cost is represented on the vertical axis. The variables  $t_1$ ,  $t_2$ , etcetera, on the horizontal axis do not specifically mean one superstar, two superstars, and so forth. They represent different possible number of talents on a team, but not incremental increases in talents. The farther to the right on the horizontal axis, the higher the total amount of talents on a team. Total cost increases as the number of talents increases, but the revenue curve is concave. According to Kesenne, this is a result of revenue increasing with the team becoming more successful, but then decreasing if the team becomes too good and public interest fades because of lack of uncertainty. A revenue maximizing team will hire at the  $t_2$  amount of talents on this graph, where the revenue curve is at its highest point. Under the assumption that the more talents there are on a team, the team will be more talented overall, and therefore a more successful team, a win maximizing team would want to hire as many talents as financially possible. Therefore, a win maximizing team will hire  $t_4$  amount of talents on this graph, where they can maximize the amount of talents without losing any money (Kesenne, 2007). This analysis makes clear that the revenue maximization point and win maximization point requires a different amount of talents and therefore a differing amount of salary dispersion.

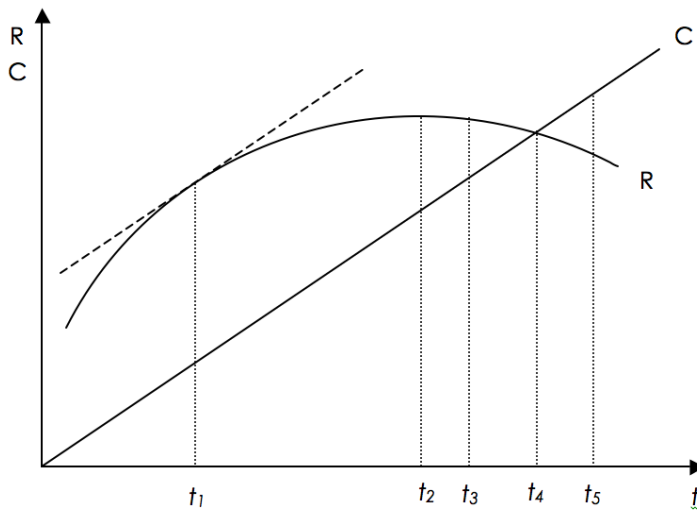


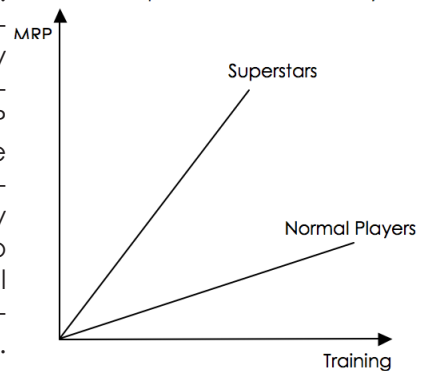
Fig. 1. Kessenne's Theory of Sports Teams

The effect of superstars on revenue has also been extensively studied. Sherwin Rosen (1981) and Walter Oi (2008) have studied the economics of superstars. Rosen discusses that the settings in which superstars are found share two common elements. These are a close connection between personal reward and the size of a person's own market, and a strong tendency for market size and reward to be skewed toward the most talented people in a specific activity. Oi believes that superstars' gigantic income and rare talents is what attracts attention. They both acknowledge that superstars are of interest to fans and therefore create attention. In most circumstances superstars are considered entertaining and it is the search for entertainment, admiration, and a desire to understand how they are as good as they are at what they do that creates the increase in revenue generated for their firm. Jerry Hausman and Gregory Leonard (1997) studied the effect that NBA superstars had on both team and league revenue during a number of seasons in the 1990's. Some of the avenues that superstars help produce revenues are through increased television ratings, increased attendance at games, and an increase in sport paraphernalia sales. They found that not only does a superstar positively impact his team's total revenue, but he also positively impacts other teams' revenue (Hausman et al, 1997). This means that small market teams would attempt to free-ride off large market teams. According to Hausman, a suggestion to fix this free rider benefit is the institution of a salary cap. A salary cap, however, will over correct the superstar externality. The NBA has tried

to correct this problem by instituting a soft salary cap (Coon, 2011). This means that there are a few exceptions to the salary cap rule and teams are able to have a payroll that exceeds the salary cap, but are fined when payrolls exceed a certain luxury tax level. The luxury tax level is determined by a complicated formula, but is typically in the range of \$12-13 million above the salary cap.

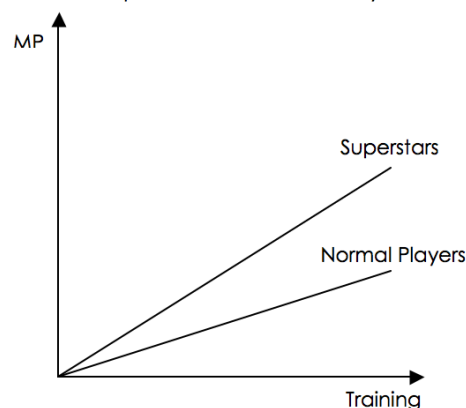
With Kessenne's theory and the effects of superstars understood, the specific questions of win maximization and revenue maximization have to be dealt with. Salary dispersion and the effect it has on teams can be explained within the framework of demand theory. Marginal revenue product (MRP) is the underlying component of a demand for labor curve.

Fig. 2. Marginal Revenue Product curve of Superstars and Normal Players



Human capital theory is underlying the MRP curve since human capital is directly related to the marginal productivity of workers. Human capital refers to the productive capabilities of human beings as income generating components in the economy (Rosen, 2008). According to human capital theory, the higher the productivity that is obtained through investments in education and training, the higher amount of income a person should achieve. Also, human capital theory suggests that the returns to investments in education and training are directly related to the individual's innate ability and physical endowments.

Fig. 3. Marginal Productivity Curve of Superstars and Normal Players



Therefore, the higher the basketball player's skill, the higher the amount of income he should generate and the higher his MRP.

According to Oi (2008), small differences in talent can be associated with large differences in income, especially when the market size is big, which is definitely the case with the NBA. This idea is illustrated in Figures 2 and 3. Figure 3 shows that with increased training all players' marginal product increases, but superstars' marginal product increases by a larger amount. The same thing occurs in Figure 2 with marginal revenue product increasing with training, but superstars' marginal revenue product increases by an even greater amount than it did with marginal product in comparison to the normal players. This large difference in MRP allows superstars to earn a high income compared to normal players and could cause great salary dispersion within a team.

Teams, in essence, construct their own demand curve and have different curves than other teams (Rosen et al, 2000). With the knowledge of MRP of players and the presence of a salary cap, demand curves can be understood. With a larger number of high skilled players, a large amount of the team's total salary, which is limited as a result of the salary cap and luxury tax level, is devoted to a few players and therefore the demand curve would be very steep and inelastic. Teams with more balanced salary dispersion will have a flatter, more elastic demand curve (Rosen et al, 2000). This idea is represented in Figures 4 and 5. Figure 4 represents a MRP curve of a team that employs a few superstars and the rest below average players, therefore creating an uneven distribution of talent. The superstars, as a result of

Fig. 4. Team With High Salary Dispersion

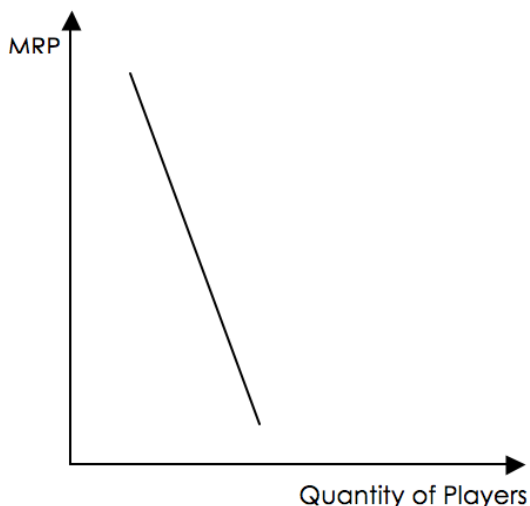
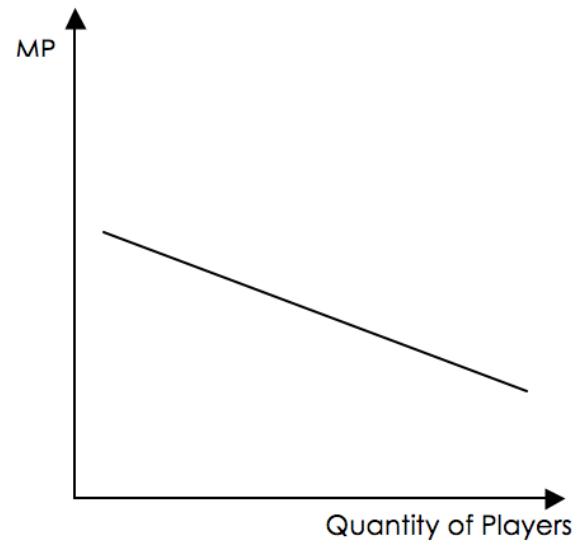


Fig. 5. Team With Low Salary Dispersion



their high skill level, require larger salaries. Given the salary constraints a team faces, the rest of the team is filled with below average skill level players who only require smaller salaries. This uneven distribution of talent, therefore, creates a large amount of salary dispersion and an inelastic MRP curve. Figure 5 represents a MRP curve for a team with players of similar abilities. As a result of the abilities of players being similar, the salary each player receives should be somewhat similar. Certain players would still make more than others, but the overall salary dispersion for the team would be much less. This more balanced distribution of talent, therefore, creates little salary dispersion and an elastic MRP curve.

Free agency in the NBA allows players to negotiate their contracts. This enables the player to have power over receiving their full worth. Teams have to bid for players and players can decide if they believe the offer is fair. The potential producer surplus obtained by the team that signs the player is squeezed out by the player as a result of the ability to negotiate. At the extreme, players receive their personal MRP and teams receive no producer surplus. An interesting part to this is that teams offer salaries to players at what they believe the player's future MRP will be. The amount paid to each player in comparison to his true MRP will determine the amount of revenue each team brings in. The decision process of whom to sign and for what price enables each team to create their own demand curve (Rosen et al, 2000).

Kesenne's theory of professional sports teams along with demand for labor theory sets the stage for the remainder of this research study. When looking into the effects of salary distribution amongst NBA teams, both of these theories are relevant.

### III. DATA

Two different regressions are going to be utilized using cross-sectional data in order to determine the best way to allocate salary amongst an NBA team. This section discusses all the data that is needed to be obtained in order to carry out these regressions. The next section specifically discusses the variables used in these regressions in terms of each variable's definition, importance, and expected affect.

In the first regression, the Wins Regression, the number of wins a team achieved during the regular season is the dependent variable. Only regular season wins, and not playoff wins, are being included in this study because every team participates in the same number of regular season games whereas not every team makes the playoffs. Using only regular season wins allows the study to be more consistent and accurate. This data is compiled from the NBA's website ("NBA.com"). In the second regression, the Revenue Regression, the team's total revenue of each season is the dependent variable. Forbes publishes valuations and other reported money figures, such as revenue, of sports teams every year (The Business of Basketball, 2011). The years of data for this study are from the seasons of 2006-07 to 2010-2011. The Wins Regression, which has wins as the dependent variable, uses all five seasons of data. The Revenue Regression, which has revenue as the dependent variable, uses only the first four seasons of data as a result of the NBA not reporting the 2010-11 season revenue figures until January 2012.

Total television market size in each NBA team's metropolitan area needs to be accounted for as that could play a role in the revenue and possibly wins a team is able to generate. This data is reported by Nielson Ratings, which is the most credible source when it comes to television monitoring ("Local Television Market Universe Estimates"). One limitation to the Nielson Ratings, however, is that it only reports figures for cities in the United States. The NBA is a multinational

league with one team being located in Toronto, Canada. The Bureau of Broadcast Measurement (BBM) is Canada's equivalent of the United State's Nielson Ratings. The only year of data reported, during the range of this study, for Toronto's television market size was for the 2008-09 year. The other four years of television market size data for Toronto are estimations based on Toronto's population.

Another piece of data that is pertinent to this study is the luxury tax level in the NBA for each of the seasons. These figures are widely reported but for this study the data is taken from the NBA's website ("NBA.com").

Finally, the last data that are needed are total team salaries to see if each given team is above or below the luxury tax level and a breakdown of team salaries by player in order to analyze the amount of wage dispersion for each given team. This data is reported by USA Today, which is a very reliable source for this type of data, however, there was a problem with some of the information retrieved from this source ("National Basketball Association Salaries"). When analyzing the salary data of the 2009-10 Houston Rockets, it was evident that the database double counted one player. Yao Ming, a player on the Houston Rockets, was included twice, and therefore, that needed to be corrected. The false Yao Ming was removed in order to make the study more accurate. Another shortcoming from this source was that it did not include the 2006-07 and 2007-08 Seattle Supersonics in its database. The Seattle Supersonics relocated to Oklahoma City after the 2007-08 season and therefore became Oklahoma City in the database. The salary figures for the two years of data in this study where Seattle did have an NBA team comes from the NBA's website ("NBA.com").

### IV. EMPIRICAL MODEL

#### A. Dependent Variable

In this study, OLS regressions will be used to analyze the effect salary dispersion has on team performance and revenue. The dependent variable changes from the Wins Regression to the Revenue Regression. In the Wins Regression, number of wins a team achieved during the regular season will be the dependent variable, where in the Revenue Regression the total revenue generated

by a team will be the dependent variable.

### B. Explanatory Variables

The explanatory variables remain the same in both models. Table 1 provides a short explanation about each variable and also reports descriptive statistics of each variable. Despite the fact that this study is attempting to find the "best" amount of salary dispersion for an NBA team, other variables must be included in this model to control for other circumstances.

The most important variable to this study is the wage dispersion factor. This variable is defined as the summation of sal-

ary of the top three paid players on an NBA team divided by the summation of salary of the next nine highest paid players. Twelve players are being taken into account for each team because it is a requirement in the NBA that a team has at least 12 signed players at a time. There are many more players that are signed to teams throughout a season, but they normally are signed for 10-day or 1-month contracts and therefore would be outliers in this study. This definition of dispersion is different than every other study reviewed that was designed to test the effect salary dispersion has on performance and revenue. At the same time, however, it is a definition that completely takes into account the salary of superstars and is a good representative measure of the dispersion

factor that exists on a team. As mentioned previously, the predicted effect of the dispersion factor is positive for both number of wins and amount of revenue.

Another variable to be tested is the dispersion factor squared variable. The value of this is simply the square of the dispersion factor. This is used in the empirical model to attempt to see if there is a parabolic curvature to the effect dispersion has on both wins and revenue. If there is, the maximum point on that curve would represent the "best" amount of dispersion for wins or revenue respectively. The predicted sign of this variable is negative, which would create a concave curve and, therefore, a maximum point representing the "best" possible dispersion level.

Table 1: Explanation and Descriptive Statistics of Variables

| Variable              | Definition  | Minimum      | Maximum      | Mean    | St. Dev.     |
|-----------------------|---|--------------|--------------|---------|--------------|
| Dependent Variables   |   |              |              |         |              |
| Model A               |   |              |              |         |              |
| Wins                  | Number of Regular Season Wins per NBA Team  | 12.00        | 67.00        | 41.00   | 12.89        |
| Model B               |   |              |              |         |              |
| Revenue               | Total Revenue of NBA Team   | \$81,000,000 |              |         | \$31,594,769 |
| Explanatory Variables |   |              |              |         |              |
| Models A & B          |   |              |              |         |              |
| TVMarketSize          | Number of Homes with Television in Metropolitan Area of Each NBA Team's Home City                     | 566,960.00   | 7,515,330.00 |         | 1,822,547.28 |
| DispersionFactor      | Average Salary of Top 3 Highest Paid Players Divided By Average Salary of Next 9 Highest Paid Players | 0.52436      | 3.60562      | 1.25268 | 0.47619      |
| DispersionFactor2     | Square of DispersionFactor  | 0.27496      | 13.00046     | 1.79445 | 1.71732      |
| LuxuryTaxAbove        | A Team With Total Salary That is Above the Luxury Tax Level   | 0.00         | 1.00         | 0.39    | 0.49         |
| LuxuryTaxBelow        | A Team With Total Salary That is Below the Luxury Tax Level   | 0.00         | 1.00         | 0.60    | 0.49         |
| Fixed Effect 06-07    | Team Competing in the 2006-07 Season  | 0.00         | 1.00         | 0.20    | 0.40         |
| Fixed Effect 07-08    | Team Competing in the 2007-08 Season  | 0.00         | 1.00         | 0.20    | 0.40         |
| Fixed Effect 08-09    | Team Competing in the 2008-09 Season  | 0.00         | 1.00         | 0.20    | 0.40         |
| Fixed Effect 09-10    | Team Competing in the 2009-10 Season  | 0.00         | 1.00         | 0.20    | 0.40         |
| Fixed Effect 10-11    | Team Competing in the 2010-11 Season  | 0.00         | 1.00         | 0.20    | 0.40         |



The television market size is the next variable. This takes into account the number of homes with a television in the metropolitan area of each NBA teams' home city. It seems obvious that the size of a team's market should have an impact on the amount of revenue generated throughout a season. It is also plausible to suggest that the market size could have an impact on wins as well considering the possibility of there being more money available from increased revenue for big market teams. There has historically been very little revenue sharing in the NBA, which makes the possibility of market size having an impact on wins even greater (Dosh, 2001). The market size variable is predicted to contain a positive effect on both team wins and revenue.

The next explanatory variable is a dummy variable that takes into account a team's salary position relative to the luxury tax level. The luxury tax level is needed in comparison to the salary cap level. This is because teams can have payrolls that exceed the salary cap due to certain league exceptions and are not punished for that, but are punished for exceeding the luxury tax level threshold. As a result of this, most teams have a payroll that does exceed the salary cap, but a much smaller portion of NBA teams have a payroll that exceeds the luxury tax level. One of the variables in the model will be a dummy variable representing if a team has a salary that is over the luxury tax threshold. The above luxury tax dummy variable, in this sense, is a good proxy for the level of a team's payroll and is predicted to be positively correlated with wins and revenue. If teams are spending enough money to have a payroll that exceeds the luxury tax level, they most likely have a number of superstars that should create more wins and revenue.

The last variables included in the empirical model are fixed effect variables for time. These are included to deal with the possible omitted variable bias. The goal of this variable is to control for things not already controlled for in the regression. There might

be some reason why revenue or wins are affected by omitted variables that are related to time. These variables will be dummy variables for each year except for 2010-11 in the Wins Regression and 2009-10 in the Revenue Regression which are the reference years for each respective regression. Each of the five seasons has its own fixed effect for time dummy variable associated with it. There is no logical predicted relationship of the fixed effect variable for time on both wins and revenue.

$$\text{Wins Regression: Wins} = \beta_0 + \beta_1(\text{MRKT}) + \beta_2(\text{LXTABOVE}) + \beta_3(\text{DISP}) + \beta_4(\text{DISP2}) + \beta_5(\text{FE06-07}) + \beta_6(\text{FE07-08}) + \beta_7(\text{FE08-09}) + \beta_8(\text{FE09-10}) + \mu$$

$$\text{Revenue Regression: Revenue} = \beta_0 + \beta_1(\text{MRKT}) + \beta_2(\text{LXTABOVE}) + \beta_3(\text{DISP}) + \beta_4(\text{DISP2}) + \beta_5(\text{FE06-07}) + \beta_6(\text{FE07-08}) + \beta_7(\text{FE08-09}) + \mu$$

## V. RESULTS

The results proceed in two separate sections. The first presents the results of the Wins Regression and the effect dispersion has on the number of wins a team achieves, and the second deals with the results of the Revenue Regression and the effect dispersion has on the amount of

Table 2: Regression Results Predicting Wins

| Dependent Variable  | Wins Regression         |                        |
|---------------------|-------------------------|------------------------|
|                     | Model 1<br>Wins         | Model 2<br>Wins        |
| Constant            | 24.475 / (3.914)***     | 32.436 / (9.695)***    |
| Dispersion Factor   | 16.833 / (2.212)**      | 7.693 / (3.793)***     |
| Dispersion Factor2  | -2.624 / (-1.246)       | -                      |
| Market              | -1.690E-6 / (-3.206)*** | -1.701E-6 / (-3.223)** |
| LuxuryTaxAboveDummy | 10.485 / (4.917)***     | 10.566 / (4.947)***    |
| Fixed Effect 06-07  | 0.342 / (.116)          | .235 / (.079)          |
| Fixed Effect 07-08  | -0.901 / (-.304)        | -1.095 / (-.369)       |
| Fixed Effect 08-09  | -0.135 / (-.045)        | -.577 / (-.195)        |
| Fixed Effect 09-10  | -4.774 / (-1.499)       | -5.148 / (-1.620)      |
| Fixed Effect 10-11  | -                       | -                      |
| Adjusted R2         | 0.215                   | 0.212                  |
| F-Value             | 6.088                   | 6.709                  |
| Sample Size         | 150                     | 150                    |

Note: Values in parantheses are absolute t-statistics.

\*\*\* = significant at .01 level

\*\* = significant at .05 level

\* = significant at .10 level



revenue a team generates.

### A. Wins Regression

Two different regressions need to be completed in order to understand the effect salary dispersion within a team has on team wins. Table 2 presents the results of the two OLS regressions.

In Model 1, all the explanatory variables are utilized. The market size variable is the only variable to have an opposite effect than what was predicted. This is a result that, at first, appears to have no logic. After reviewing the data, however, a reason for the size of the market negatively affecting wins emerges. A number of the big markets in the United States have two NBA teams. Both of these teams in each respective market technically, by reported figure standards, have the same market size. In reality, however, one team most likely dominates the popularity within the market. For example, the New York Knicks and New Jersey Nets share the same New York City metropolitan market. The Knicks, however, are the much more popular team, while the Nets do not have nearly as many followers. This, in effect, means the Nets really have a lower market size than would be reported by ratings systems. This effect is one possible explanation for the market size negatively affecting the number of wins achieved by an NBA team.

Every other variable behaves according to the presumed logic. Only three of the variables included in the regression, however, are significant. These are the market size, dispersion factor, and luxury tax above dummy variable. With the dispersion factor squared variable being insignificant, it is no longer possible to determine the exact "best" amount of salary dispersion for an NBA team. This is because the dispersion factor squared variable is responsible for creating the parabolic shape to the curve, and, therefore, a max value of wins according to dispersion. With dispersion factor squared being insignificant, the parabolic curve that it creates is insignificant and the "best" amount of dispersion/max number of wins point on the curve is not relevant.

Table 3: Regression Results Predicting Revenue

| Dependent Variable  | Revenue Regression   |                       |
|---------------------|----------------------|-----------------------|
|                     | Model 1              | Model 2               |
| Constant            | 8.031E7 / (5.390)*** | 8.551E7 / (10.448)*** |
| Dispersion Factor   | 6.074E6 / (.342)     | -1.078E6 / (-.226)    |
| Dispersion Factor2  | -2.015E6 / (-.418)   | -                     |
| Market              | 6.752 / (5.2151)***  | 6.753 / (5.235)***    |
| LuxuryTaxAboveDummy | 3.328E7 / (6.320)*** | 3.334E7 / (6.356)***  |
| Fixed Effect 06-07  | 1.234E7 / (1.702)*   | 1.255E7 / (1.741)*    |
| Fixed Effect 07-08  | 1.305E7 / (1.891)*   | 1.320E7 / (1.921)*    |
| Fixed Effect 08-09  | 1.487E7 / (2.141)**  | 1.482E7 / (2.142)**   |
| Fixed Effect 09-10  | -                    | -                     |
| Adjusted R2         | 0.368                | 0.373                 |
| F-Value             | 10.914               | 12.798                |
| Sample Size         | 120                  | 120                   |

Note: Values in parantheses are absolute t-statistics.

\*\*\* = significant at .01 level

\*\* = significant at .05 level

\* = significant at .10 level

Model 2 uses every explanatory variable except for the dispersion factor squared. This creates the curve to now be linear, in comparison to the parabolic curve from Model 1. With a linear function, a specific "best" amount of dispersion cannot be interpreted, but instead, the "best" amount will occur at either zero dispersion or maximum dispersion, depending on whether the function is downward sloping or upward sloping. The market size is still the only variable to have the opposite effect of what was expected, and has a negative effect on number of wins, which is possibly a result of the multiple teams in a single market problem discussed earlier.

The market size, dispersion factor, and luxury tax above dummy variable are all significant, with market size being significant to the .05 level and the other two being significant to the .01 level. Every fixed effect variable is shown to be insignificant to the model. The fixed effect variables, while not being significant, still control for the possible omitted variable bias. The negative effect of the market size is considerable. For every 1,000,000 people in a market, the regression states that an NBA team will lose another 1.7 games. In more realistic win-loss terms, a team with a mean market size, which is 2,350,181 people, will lose an

additional 4.00 games as a result of being in that market. To put the amount of wins in perspective, each team only competes in 82 games in a season. The luxury tax dummy variable also shows a sizeable relationship to a team with a total salary over the luxury tax level on wins compared to a team below the luxury tax level. Teams that have a total salary above the luxury tax level will win an additional 10.556 games as a result of their high total salary. The dispersion factor, the main focus and most important variable in this study, exhibits a smaller but still somewhat large effect on wins. An increase of one in the dispersion factor will lead to 7.693 more wins.

With the results of Model 1 being insufficient to obtain a specific "best" amount of salary dispersion, Model 2 seems to be the best model to describe the effect dispersion has on wins. The best amount of salary dispersion, in terms of generating wins, is the maximum amount possible given the salary constraints. Model 2's results predict that for every increase of one to the dispersion factor of a team, the team will win 7.693 more games.

## B. Revenue Regression

Two different regressions need to be completed in order to understand the effect salary dispersion within a team has on team revenue. Table 3 presents the results of the two OLS regressions.

In Model 1, all explanatory variables are utilized. All of the explanatory variables also have the expected positive or negative effect that was assumed from the empirical model. All of the variables besides the dispersion factor and the dispersion factor squared are significant. With the dispersion variables being insignificant, the "best" amount of salary distribution for a revenue maximizing team cannot be predicted. This result means, according to this model, that salary dispersion does not affect revenue.

In an attempt to improve the significance and deal with the insignificant parabolic curve of Model 1, Model 2 is completed. The explanatory variables in Model 2 include all but the dispersion factor squared variable. This creates the curve to now be linear, in comparison to the parabolic curve from Model 1. With a linear curve, a specific "best" amount of dispersion cannot be interpreted, but instead, the "best" amount will occur

at either no dispersion or maximum dispersion depending on whether the linear function is upward sloping or downward sloping.

The dispersion factor in Model 2 contains the opposite effect of what theoretically makes sense and is also insignificant once again. The dispersion factor carries a negative effect on revenue according to Model 2. Based on the theory presented earlier, one would expect the opposite to be true as a result of higher dispersions occurring from a higher number of superstars on a team, which is supposed to lead to an increase in fan fare and thus revenue. The negative effect found is statistically insignificant, however, which makes it somewhat irrelevant to the discussion. Every other explanatory variable in Model 2 is significant with the size of the market and luxury tax dummy variable significant at the .01 level, the fixed effect variable for the 2008-09 season significant at the .05 level, and the fixed effect variables for the seasons of 2006-07 and 2007-08 significant at the .10 level. The fixed effect variables are reported in comparison to the omitted fixed effect variable of the 2009-10 season.

For every 1,000,000 people in a market, an NBA's team revenue would increase by \$6,753,000. In terms of the mean market size of 2,350,181 people, the size of the market would have a direct positive impact of \$15,870,772.29 on revenue. The coefficient for the luxury tax dummy variable reports that a team will earn \$33,340,000 more in revenue if a team's total salary is above the luxury tax level compared to teams with a total salary that is below the luxury tax level. The fixed effects variables, which are less significant than the market and luxury tax dummy variable, display that a team would generate an extra \$12,550,000; \$13,200,000; and \$14,820,000 during the 2006-07, 2007-08, and 2008-09 seasons respectively in comparison to the 2009-10 season. This can be the result of many different circumstances. The fixed effect variables are included to control for any possible omitted variable bias, and the fact that these variables are significant to the regression proves that there are other explanatory variables that revenue depends on during these years.

The biggest result taken away from these two Models is that it is not possible to determine a "best" amount of salary dispersion for revenue maximizing teams because the dispersion fac-

tor is insignificant in both models. In addition to this, despite the statistically insignificant result, the negative effect the dispersion factor is found to have on revenue in Model 2 is opposite of the hypothesis that was generated from relevant economic theory.

## VI. CONCLUSIONS

The relatively new phenomenon of large disparities in salary among an NBA team has allowed a number of studies to be completed to test the effect that salary dispersion has on an organization. The aim of this study was to determine the "best" amount of salary dispersion for both a win maximizing NBA team and a revenue maximizing NBA team. Using data from the 2006-07 season to the 2010-11 season, two empirical models were constructed that could help determine the "best" amount of dispersion for both types of teams.

It is interesting to discover, however, that after these models were tested, a specific "best" amount of salary dispersion is not able to be determined from the results. Despite this, the effect salary dispersion has on the number of wins a team achieves and amount of revenue a team generates is able to be determined. Based on the results of this study, the dispersion factor has a significant positive effect on the number of wins a team achieves throughout a season. This relationship suggests that the "best" amount of salary dispersion is the maximum amount of dispersion possible given the salary constraints a team faces. The results also indicate that the dispersion factor has a negative but statistically insignificant effect on the amount of revenue a team achieves. As a result of the insignificance, there does not seem to be an optimal level of salary dispersion for generating revenue. Both of these results are in contradiction to previous literature.

Berri and Jewell (2004) performed a study in an attempt to relate salary dispersion and the number of wins an NBA team achieves. They found there to be no significance between the amount of salary dispersion on a team and number of wins. Their definition of dispersion was based on the standard deviation of the Herfindahl-Hirschman Index, which is a different definition than employed by this study, which could be the reason for the difference in results.

Katayama and Nuch (2011) also completed a study attempting to relate the salary dispersion among an NBA team and the number of wins achieved. They tested three different dispersion levels (players participating in every game for a given team, players participating in at least half of the games for a given team, and every player on payroll for a given team) and found salary dispersion to have no significant effect on the number of wins a team achieves. Once again, the definition of dispersion differed from Katayama and Nuch's study to this study.

Hausman and Leonard (1997) executed a study to determine if superstars in the NBA increase their team's total revenue. They found superstars to have a high positive effect on total team revenue. The study just completed does not necessarily look at superstars specifically and their effect on revenue, but instead, the effect salary dispersion has on team revenue. Built into the dispersion factor variable, however, is the effect a superstar should carry. Teams with more superstars will have a higher dispersion factor, and therefore, if superstars did affect revenues positively, the dispersion factor would have a significant positive effect on revenue. The fact that the dispersion factor does not have a significant effect on team revenue alludes to the idea that superstars do not have a significant effect on revenues, which is in complete contradiction to Hausman and Leonard's study. Hausman and Leonard's study, however, took place during the time period of the NBA where there was no maximum salary for players, which is not the case for the study that was just completed here. According to Rosen and Oi (1981, 2008) part of the reason people are attracted to superstars is the extreme amount of money they receive. If this is in fact true, it is possible that setting a maximum salary for an individual player does not allow fans to reach their highest level of intrigue and therefore provide less revenue to the firm.

Whatever the reasons may be, both the findings for the effect salary dispersion has on wins and the effect/absence of effect it has on revenue are in complete contradiction to the previous literature.

Based off the results from this study, an NBA team that wants to maximize wins should try to acquire as many superstars as possible and then fill the remaining spots on their roster with low

salary players. This seems to show that there must not be that great of a drop-off in talent level of the lower salaried players in the league and the middle salaried players. The greater the amount of dispersion, the better in terms of number of wins, but that does not mean general managers should create dispersion for the purpose of creating it. Players still need to be paid the value they bring to the team, but for a win maximizing team, general managers should get as many high-skilled, and therefore high-paid, players signed to their team as possible and then complete the roster with low-paid players instead of signing all middle-value players. Those teams that are most successful at signing superstars will have the most success.

This result can be connected back to the competitive imbalance problem that exists in the NBA today. The fact that greater salary dispersion leads to greater number of wins suggests one reason for the competitive imbalance problem. As already noted, teams most successful at signing superstars will have the most success on the court. With superstars in limited supply and the NBA instituting a soft salary cap with many exceptions to the rule, certain teams are presented the opportunity to become more successful in signing superstars. These teams that are able to do so will dominate the league in terms of number of wins. As noted earlier, these results might be able to be translated into other fields of business. Based on these results, it is possible that in some business environments where team performance is important, like it is in the NBA, managers may benefit from hiring as many top notch employees at each respective job and then hire lower skilled or cheaper workers to round out the company in order to possibly increase performance.

In terms of policy implications of salary dispersion and revenues, no conclusions can be drawn from this study. With salary dispersion having no significant effect on revenue it is impossible to state what an NBA team or outside firm should strive to do in terms of salary dispersion to generate the most revenue.

Further research should be conducted on this topic to clarify the effect salary dispersion has on firm performance and generating revenue. The simple fact that this study contradicts many before it represents the need to further explore and understand the relationship that exists be-

tween these factors. One possible way to further explore this research is to create different definitions of salary dispersion and test each one. The way dispersion is calculated may have a significant impact on the effect it has on both performance and revenue. With a better and more complete understanding of how salary dispersion affects firm performance and revenue, NBA teams and possibly other companies will be able to construct their teams/companies more appropriately.

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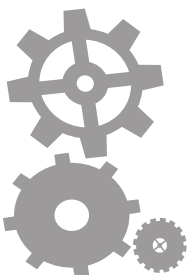
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# DETERMINANTS OF AMERICAN STOCK PRICES ON A FIRM-SPECIFIC LEVEL

Cory Sloan

## I. INTRODUCTION

As of January 2011, there were \$ 14 trillion invested in the New York Stock Exchange (NYSE) and \$55.6 trillion invested in all stock exchanges around the world (World Federation of Exchanges, 2011). To put that number into perspective, the US gross government debt at the same time was \$13.5 trillion (US Government Debt, 2011). The US annual GDP, which is the highest in the world, was \$14.58 trillion (WorldBank, 2011). Stocks are equities that allow investors to put their money into a company with the hopes of achieving a higher return than that of a savings account or bond. Stock prices fluctuate often and are considered indicators of how well a company is doing. Due to uncertainty there is risk, but if one is skilled at picking stocks then there is the potential for great reward as well. This fact makes knowing the determinants of stock prices very valuable and extensively studied.

This paper uses the idea of semi-strong form market efficiency in order to determine which variables to look at. Essentially the semi-strong hypothesis is that the stock prices are determined by all the publicly available information. Much of the past literature takes this to mean that any changes in a company's financials would soon be reflected in the stock price. This study will go a step further and try to incorporate information beyond the financials such as the point in the business cycle, the volume of a stock being traded, and variables for recent news about a company. This analysis will be done on eight companies from the Dow, each from a different industry.

Section II looks at past literature on stock price predictability and develops the theory behind this study. Section III presents the empirical model. Section IV shows the results of the study. Section V concludes.

## II. THEORY AND LITERATURE REVIEW

There have been a number of studies

done on stock price predictability and the theory has evolved greatly, but first the existence of stock price predictability must be established. "It is often argued that if stock markets are efficient then it should not be possible to predict stock returns, namely that none of the variables in the stock market regression (1) should be statistically significant" (Pesaran, 2003). Skeptics of stock price predictability argue that markets are efficient and any opportunity to make money will disappear as soon as it arises due to markets acting efficiently. So, any change in a company will be immediately reflected in the stock price. In theory this is sound but a number of studies have found fundamental variables to be significant when predicting stock movements. "Recently, a large number of studies in the finance literature have confirmed that stock returns can be predicted to some degree by means of interest rates, dividend yields and a variety of macroeconomic variables exhibiting clear business cycle variations." (Pesaran, 2003) This can be attributed to stock investor error. Stocks are traded based on human action. One must actually go through the action to sell or buy the stock. Sometimes an investor will not always hear of changing information right away and thus it takes time for investors to sell their existing shares or buy new ones. This creates a lag from the time new information is introduced in the market and when it is actually reflected in the stock price. This leads one to assume that it would be possible to predict the movements of stock prices by using the current market information.

This brings us to the theory on market efficiency. There are three believed forms of market efficiency: weak-form, semi-strong form, and strong form. Weak-form was the initial theory and was believed to be true in the 1970's. Proponents of the weak-form hypothesis believe that stock prices follow a random walk and the only significant predictor of stock prices would be the past value of the prices themselves. This has some merit as it can be a good indicator of how variable a stock tends to be. "Estimating ARMA models, Conrad and Kaul find that the auto-regressive



coefficients for weekly returns on stock portfolios are positive, near 0.5, and can explain up to 25 per cent of the variation in the returns on a portfolio of small-firm stocks." (Ferson, 2008) For example, Microsoft has been quite stagnant at \$25 per share for years, so the past value can predict the future value very easily. The same is true for Apple as it has generally followed an upward trend for the past decade and the past values can show that. The weak-form hypothesis can also account for seasonal effects by accounting for when a certain company's stock tends to be higher or lower. However, it is too basic to create any truly accurate predictions, so the semi-strong form hypothesis arose. This paper focuses on the semi-strong form theory. It assumes that stock prices are determined by a vector of all publicly available information.

This is most commonly assumed to be the company's financials such as sales, net income, book value, dividends, etc. Many studies have looked at numbers such as these and found many to be significant, giving further proof of the existence of both stock price predictability and semi-strong form efficiency. Ferson (2008) looked at a number of past studies on stock return regressions and found variables such as cash flows over price, dividend-price ratios and book value to be significant.

The last form of market efficiency is strong form, which assumes that stock prices are a vector of all information, including insider information. This would include everything from insider trading to predictions of future performance of the company. This would be ideal to study but impossible due to the fact that investors do not have access to insider information and must thus make decisions based on publicly available information.

When looking at the semi-strong form market efficiency, current literature only looks at company financials. However, the theory is that all publicly available information affects a stock's price. This study will attempt to fill some gaps in other literature by adding variables that are not found on a balance sheet or income statement. The proposed variables will account for recent events such as acquisitions, divestitures and management changes. There will also be a control variable for the state of the economy. A dummy variable for whether or not the economy is in a state of recession will be included as well due to

its correlation with stock prices (Ferson, 2008). The magnitude of the effect of a changing economy is not known, however, so we will also include changes in the Dow Jones Industrial Average (DJIA) to show the relative strength of the stock market as a whole.

The majority of past literature looks at predicting various stock market indices such as the S&P 500 or the Dow Jones Industrial Average and has come into some success with that. Taubee (2001) successfully predicted about 67% of the variation in the S&P 500. This is due to the fact that by averaging a number of stock movements it is easier to see the effect of a variable on a number of stocks. The problem with these studies is their limited use and application. Knowing where the stock market as a whole is likely to go provides knowledge on when to invest but not where to invest. Even in times of expansion there are still stocks that drop in value and stocks that do not increase significantly. A firm-specific model could compare each firm and allow you to invest in the highest expected earners.

This study uses a firm-specific model and will use a diverse set of firms from all sectors of the economy. The finance sector was left out due to the fact that it reports different variables on its quarterly reports than any other sector. The companies were chosen from the 30 companies which make up the DJIA. Much analysis has been done on which companies best represent the stock market as a whole and this paper will use the companies already deemed to be the best representations of the stock market. There were eight companies (tickers) chosen: Caterpillar (CAT), Procter & Gamble (PG), McDonald's (MCD), Walmart (WMT), Intel (INTC), Johnson & Johnson (JNJ), Exxon Mobil (XOM) and AT&T (T). The rationale for choosing these companies from the Dow is that they are all from different sectors. Different sectors tend to perform differently during different economic times. For example, in times of recession, consumers tend to demand fewer normal goods so the sale of luxury goods decreases drastically. However, necessities such as health care are somewhat independent of the business cycle and consumers will spend on these goods regardless of the economic conditions. In order to control for these effects, we picked companies from all sectors to diversify as much as possible.

$$\text{Stock Price} = \beta_0 + \beta_1 (\text{Vector for all Publicly Available Information}) + u$$

The above equation is the theoretical model for the study and would be the most accurate representation of the semi-strong hypothesis. This theoretical model is obviously impossible to predict perfectly as there are too many variables to put into one study. Many of the variables may not have a quantitative value to use in this equation. So, the challenge is to create a model that best represents this theory in the hopes that an accurate prediction will be achieved. This study uses data from the past quarter in order to predict the current value of stocks. We can then use that equation to forecast future values even though we will not be able to check their accuracy until the next quarter. The reason for using quarterly data is twofold: 1) Dividends have been found to be significant in past studies (Pesaran, 2003) and since they are only given once per quarter this was the shortest possible time-frame and 2) Accounting for high-frequency trading and daily fluctuations causes more problems than it solves. High-frequency trading is a new form of stock trading that involves buying stocks in large quantities and quickly selling them when the price goes up by a small margin. A study done by Kyle Portnoy has proven this to be insignificant on any horizon longer than one week so it will be left out of this study (2011). It has also been established that longer term trends, such as one quarter, have more predictive accuracy and applicable use. "The R-squares are larger for longer-horizon returns" (Ferson, 2008).

### III. EMPIRICAL MODEL

The regressions for our prediction model will be organized as panel data. The software used is SPSS. It is used to run linear regressions as well as test for any diseases such as autocorrelation or heteroscedasticity.

The financial variables in this study were collected from EDGAR's (2011) Filings and Forms. EDGAR's Filings and Forms is a government website that saves all of a company's quarterly reports and the data is audited to ensure accuracy. The stock prices, dividends, DJIA and volume variables were downloaded from Yahoo! Finance. The recession variable comes from the National Bureau of Economic Research (NBER), the organi-

zation that declares the start and end of a recession. The recent news variables were collected from a company timeline on AlacraStore.com. All the variables and their expected signs can be seen in Table 1.

For each variable on the table, with the exception of dummy variables, there was another variable created that reflected the change in the past quarter. It was calculated the same way that the percent return variable was calculated.

The rationale behind this was that if stock prices already reflect all available information, then the new information should have the most significant effect on the future price.

The initial dependent variable is the current stock price instead of predicted returns. Many studies in the past try to predict returns and it has been found that you can get more accurate predictions if you attempt to predict the price of the stock rather than its percentage of expected return (Kaboudon, 2000). Next, I run a regression attempting to predict the returns to see if there are any similarities in the significant independent variables and as a way to standardize the stock price across the eight different companies. This will allow for more results as well because it will give an insight into which method is more accurate and also which method gives more applicable results. With respect to the independent variables, there are dozens of financial ratios available; however, they tend to stem from the same numbers. One

can assume then that if you include the common numbers you will account for many of these ratios as well. This will also attempt to minimize issues of autocorrelation by selecting fewer financial ratios which often share variables. These ratios tend to be correlated with one another, which is a common problem in stock price research.

Current assets were chosen because they are an aggregate of cash and other easily liquidated assets. This is a good indicator of how well a company can handle unexpected financial hiccups. If they suddenly incur a huge expense they will need to have the capital on hand to deal with that. Total assets were chosen because as a company grows it will accumulate assets not covered by current assets such as land, new

buildings, or equipment. The more assets a company has, the better it is expected to do.

Current Liabilities measures the debt that the company has in the short-term (within one year). As this number rises the company gets into bigger trouble as it must worry about paying back its debtors very soon. Total Liabilities show how much the company owes. This can be to bondholders and other debtors alike. This is also closely tied to Stockholder's equity. A strong company would finance expansion through equity, not debt. Equity means that people want to invest in the company because they think it is very strong.

Earnings is another key variable. Expanding earnings leads to growth and intuitively, a higher stock price. Net Income is very important as that is the company's profit for the quarter. It should also be compared to earnings to see how much a company is actually getting in profit from each sale. It is more beneficial to have a high net margin because if costs of goods (materials, labor) rise or the price of their good falls (increased competition, lower demand) they have more of a buffer to stay profitable than a company who is barely making any profit off of each sale. The EPS ratio is one variable that will cause some auto-correlation but it is included because it gives a way to standardize earnings with respect to size of the company. Also the earnings variable consists of very large numbers and the EPS ratio is more manageable, and changes in it may be more significant.

Cash Flow and Dividends were found in the literature to be significant for stock prices as well (Ferson, 2008). Higher dividends will attract

more risk-averse investors and cash flow will help a company deal with issues of illiquidity, attracting even more risk-averse investors. The past stock price is an independent variable as well. Simply because weak-form efficiency isn't 100% true is not sufficient reason to leave it out. It has been proven to show some benefits and it is a publicly available piece of information so it will be included.

The non-financial variables were chosen because investors may also take them into account. Recessions are shown to be highly correlated to the stock market. It was estimated that nearly \$7 trillion dollars was lost in investments

Table 1: Empirical Model

|                         | Variable                 | Description   | Expected Sign |
|-------------------------|--------------------------|---|---------------|
| Dependent Variable:     |                          |   |               |
|                         | Stock Price              | Stock Trading Price   | NA            |
|                         | % Return                 | Current Trading Price – Past Trading Price<br>Past Trading Price  |               |
| Independent Variable    |                          |   |               |
| Financial Variables     |                          |   |               |
|                         | Stock Price (T-1)        | Stock Price of Past Quarter   | +             |
|                         | Dividends                | Amount Paid per Share   | +             |
|                         | Current Assets           | Assets that are easily Liquidated   | +             |
|                         | Total Assets             | Current Assets + Illiquid Assets  | +             |
|                         | Current Liabilities      | Debt due within One Year  | -             |
|                         | Total Liabilities        | Current Liabilities + Long-Term Debt  | -             |
|                         | Total Stockholder Equity | Capital Received from Sale of Stock + Donated Capital + Retained Earnings                                     | +             |
|                         | Earnings                 | Gross Earnings for the Quarter  | +             |
|                         | EPS                      | Earnings per share  | -             |
|                         | Net Income               | Net Profit or Loss  | +             |
|                         | Cash Flow                | Change in Cash during the Quarter   | +             |
| Non-Financial Variables |                          |   |               |
|                         | Volume                   | Current Number of Share being Traded  | +/-           |
|                         | Recession                | Dummy variable for state of economy. 1=Recession 0=Expansion  | -             |
|                         | DJIA (T-1)               | Value of the Dow Jones in the Previous Quarter  | +             |
| Recent News Variables   |                          |   |               |
|                         | Acquisition Small        | Dummy Variable for whether or not there was an Acquisition/Merger under \$10 million, 1=Yes, 0=No             | +             |
|                         | Acquisition Med.         | Dummy Variable for whether or not there was an Acquisition/Merger between \$10 and \$100 million, 1=Yes, 0=No | +             |
|                         | Acquisition Large        | Dummy Variable for whether or not there was an Acquisition/Merger over \$100 million, 1=Yes, 0=No             | +             |
|                         | Divestitures             | Dummy Variable for whether or not there was a Divestiture that quarter, 1=Yes, 0=No                           | -             |
|                         | Mgmt Change              | Dummy variable for whether they changed CEO's that quarter, 1=Yes, 0=No                                       | -             |

during the last recession (World Federation of Exchanges, 2011). That is 50% of the value of the NYSE as a whole. The DJIA is another variable that will be an indicator of the business cycle. It represents the strength of the stock market as a whole and using real numbers may be more beneficial than using a dummy variable. I take past movement of this index in an effort to predict future movements of an individual company based on momentum.

Volume refers to the demand for a stock and how many shares are traded. This could be either buy or sell orders. This means that the coefficient could have either sign. This variable is more correlated with stock price volatility but it is still an important component found on nearly every stock analysis so it will be included in this regression as well.

The last five variables are dummy variables to judge the effect of acquisitions, divestitures and changes in CEO. These events are not numerical and are not reflected in the financials but could all have significant effects on a company. Acquisitions are divided into three categories: small (under \$10 million), medium (\$10-\$100 million) and large (over \$100 million). These should have a positive coefficient if significant because they would grow the company thus increasing future expected business and earnings. Divestitures should have a negative sign because the company is shrinking and may worry investors due to the fact that the company needs to sell off parts of their business for excess cash. On the other hand, some divestitures may help a company if they are selling off failing parts of their business. We assume the first effect will be stronger so the coefficient will still be negative.

Management Changes explain when a new CEO took over. This is expected to have a negative sign due to uncertainty of the effectiveness of the new CEO. This is another variable that could go either way if the new CEO turns out to be stronger than the old CEO. Depending on the sign, it will give interesting information as to what tends to happen when CEO's are replaced. These variables will also give insight into how long it takes for an event like this to have an effect. The dummy variables will be marked

as 1 as soon as the event is announced under the assumption that investors and the companies are future-oriented.

#### IV. RESULTS

The results of this paper are divided into three sections: the regressions run attempting to predict future stock prices, the regressions run attempting to predict the returns, and a section looking at comparative results. We compare which method is more effective for an investor to use to find promising stocks to invest in. As expected the R-squared for the return regressions were much lower than for the price regressions.

Table2: Dependent Variable Stock Price

|                    | Model A     |             | Model B     |             |
|--------------------|-------------|-------------|-------------|-------------|
|                    | Coefficient | t-statistic | Coefficient | t-statistic |
| (Constant)         | 7.998       | 2.696       | 4.023       | 3.064       |
| Price(t)           | .971        | 26.218***   | 0.946       | 41.82***    |
| Recession          | -.953       | -.942       | -           | -           |
| Volume             | .000        | -1.353      | -3.50E-08   | -2.081**    |
| Acq Small          | -1.061      | -1.319      | -           | -           |
| Acq Med            | 1.047       | .588        | -           | -           |
| Acq Large          | .764        | .653        | -           | -           |
| Divestitures       | -.664       | -.911       | -           | -           |
| Management Changes | .978        | .493        | -           | -           |
| Dividends          | 5.060       | 1.881*      | 4.013       | 1.796*      |
| CA                 | .000        | 1.717       | -           | -           |
| CL                 | .000        | -2.058**    | 0           | -2.696***   |
| SE                 | .000        | -1.313      | -           | -           |
| TL                 | .000        | 1.159       | -           | -           |
| Revenues           | .000        | 1.419       | 6.43E-05    | 2.626***    |
| NI                 | .001        | 1.740*      | -           | -           |
| EPS                | -2.686      | -1.561      | -           | -           |
| Cash               | .000        | -1.621      | -           | -           |
| %change over Q     | 2.731       | .729        | -           | -           |
| % change div       | -1.439      | -.669       | -           | -           |
| % change CA        | 1.156       | .367        | -           | -           |
| % change TA        | 7.449       | .792        | -           | -           |
| % change CL        | .799        | .755        | -           | -           |
| % change SE        | -1.853      | -.555       | -           | -           |
| % change TL        | -6.331      | -1.560      | -           | -           |
| %change rev        | 2.149       | 1.393       | -           | -           |
| %change NI         | .075        | .044        | -           | -           |
| %change Eps        | -.729       | -.438       | -           | -           |
| %change cash       | -1.285      | -1.048      | -           | -           |
| DJI                | .000        | -1.386      | -           | -           |
| ChangeDJI          | 5.166       | .885        | 9.585       | 2.258**     |
| R-squared          | .943        |             | 0.938       |             |
| Durbin Watson      | 2.008       |             | 1.863       |             |

\* means significance at the 0.1 level

\*\* means significance at the 0.05 level

\*\*\* means significance at the 0.01 level

In Table 2, you can see the results of the regressions run with Current Market Price as the dependent variable.

Model A was the initial regression run using all independent variables and their relative changes over the past quarter. The R-squared was .943 which means 94.3% of the variation was explained. This at a first glance looks very promising however when we delve deeper into the numbers we run into some core problems. Model B is Model A after dropping one variable at a time until only significant variables remain. As you can see the R-squared only drops to .938 but eliminates the majority of the variables. This seems very good, however, if only the past price variable is used we were still able to get an R-squared of .933. We attribute this to the fact that this model is predicting prices, not movements. So if the stock price is \$100 and the past price is \$95 then it would be very close but it would not do anything to predict that \$5 movement. This gives support to weak-form market efficiency that the past price would be the best predictor. The Model B semi-strong regression still does get a slightly higher R-squared value but finds some variables to be significant. Also in Model B, none of the percent change variables remain significant. This is counter-intuitive to the semi-strong theory that the new information would be the determinant of future movements. Also counter to this paper's hypothesis, none of the dummy variables for recent news were significant. This could mean they are either insignificant in predicting stock movements or just insignificant one quarter after the event happens. It may take a year or more for a new CEO or acquisition to have any effect on the company. It could take more time than a quarter for large changes to have an effect. Another theory is that they might have an effect on stock movement but not the stock price in levels.

The significant variables are past price, volume, dividends, current liabilities, and revenues. Past price is by far the most significant, which can be expected as stocks don't tend to change drastically so this number is always very similar to the dependent variable of current stock prices. Volume was interesting in that it was sig-

Table 3: Dependent Variable: % Return

|                | Model C     |             | Model D     |             |
|----------------|-------------|-------------|-------------|-------------|
|                | Coefficient | t-statistic | Coefficient | t-statistic |
| (Constant)     | .201        | 3.510       | 0.156       | 3.038       |
| Price(t)       | -.001       | -1.510      | -           | -           |
| Recession      | -.019       | -.968       | -0.036      | -2.323**    |
| Volume         | .000        | -1.715*     | -           | -           |
| Acq Small      | -.018       | -1.152      | -           | -           |
| Acq Med        | .022        | .639        | -           | -           |
| Acq Large      | .007        | .312        | -           | -           |
| Divestitures   | -.026       | -1.875*     | -0.023      | -1.849*     |
| CEO Changes    | -.012       | -.302       | -           | -           |
| Dividends      | .079        | 1.516       | -           | -           |
| CA             | .000        | 1.882*      | -           | -           |
| CL             | .000        | -1.997*     | -           | -           |
| SE             | .000        | -1.121      | -           | -           |
| TL             | .000        | 1.120       | -           | -           |
| Revenues       | .000        | 1.253       | -           | -           |
| NI             | .000        | 1.316       | -           | -           |
| EPS            | -.037       | -1.108      | -           | -           |
| Cash           | .000        | -1.517      | -           | -           |
| %change over Q | .106        | 1.456       | 0.137       | 2.427**     |
| % change div   | -.016       | -.382       | -           | -           |
| % change CA    | .030        | .495        | -           | -           |
| % change TA    | .230        | 1.262       | -           | -           |
| % change CL    | .015        | .720        | -           | -           |
| % change SE    | -.059       | -.913       | -           | -           |
| % change TL    | -.186       | -2.372**    | -0.097      | -2.727***   |
| %change rev    | .038        | 1.264       | -           | -           |
| %change NI     | -.005       | -.140       | -           | -           |
| %change Eps    | -.011       | -.355       | -           | -           |
| %change cash   | -.028       | -1.163      | -           | -           |
| DJI            | .000        | -1.681*     | -1.03E-05   | -2.269**    |
| ChangeDJI      | .067        | .592        | -           | -           |
| R-squared      | .174        |             | 0.084       |             |
| Durbin Watson  | 2.158       |             | 2.123       |             |

\* means significance at the 0.1 level

\*\* means significance at the 0.05 level

\*\*\* means significance at the 0.01 level

nificant with a negative sign. That means that as more shares are traded it actually leads to a lower share price. This could mean investors are pessimistic and tend to sell in mass rather than buy in mass. Revenues and dividends both agree with past studies in that they should be significant. Dividends however were only significant at the 10% level. When we look at the three variables used to most accurately rate the effect of a recession, only one is significant. It agrees with past literature and has the predicted sign. It seems though that at least when predicting prices the



past movement of the Dow is a more accurate measure than a dummy variable or the actual value of the Dow. Past literature has also found cash flows to be highly significant as well as ratios involving total assets. Our study was the only one that included past price which was so highly significant it could have hurt the significance of other variables. That could be why other studies found a number of other variables significant.

The results of the past section show that there is some merit in market efficiency as you can get close to estimating the price using publicly available information. However, it gives little to no help in determining what the future returns will be and what causes stock price changes. This is very limited in its use because one could simply look up the stock price, there is no reason to try and predict it. The next section runs regressions attempting to predict returns which should be more difficult but give much more applicable information. The regressions can be seen on the in Table 3.

By looking at the R-squared, it is very easy to see that predicting returns is a much more daunting task, however the results generate much more applicable information. Model C is a regression using all the variables. There were only a few significant variables including volume, divestitures, current assets, current liabilities, percent change over past quarter, percent change of Total liabilities and the DJIA. Only the percent change of total liabilities was significant past the 0.1 level. In Model D we dropped variables one by one until only significant variables remained. This time we were left with recession, percent change over the past quarter, percent change of total liabilities, divestitures and DJIA. This regression's R-squared was hurt a lot by taking out all the extra variables, however, because the variables were insignificant, it could have been that they were correlated with the error term and the R-squared was artificially high in the Model A. Having the change over the past quarter significant gives more proof that weak-form efficiency does have some

merit. This is the only regression in which divestitures are significant, and it was only significant at the 0.1 level. It is interesting to note that this was the only recent news variable that was significant. One would think that the large acquisition would have more importance because it is typically larger in scale. However, this information points to the fact that an investor would prefer to invest in a company that doesn't have any divestitures than a company that has acquisitions. In this regression we find the change in total liabilities to be highly significant. That supports our findings in terms of divestitures that investors may tend to be slightly more pessimistic and would prefer to not see anything negative.

All of the variables had the expected sign except for DJIA. Its coefficient was negative but one would expect that an increase in the overall stock market would lead to an increase in a firm's stock price. This phenomenon could be due to simple math. If a company's stock price is \$100 then a \$5 dollar change would only be 5%, while if a \$10 company had a change of \$5 it would be 50%. When the DJIA is very high, the returns are diminished and stock prices are always highest before a recession. The same is true for when

Table 4: Comparison Table

|                             | Model B     |             | Model D     |             |
|-----------------------------|-------------|-------------|-------------|-------------|
|                             | Coefficient | t-statistic | Coefficient | t-statistic |
| Constant                    | 4.023       | 3.064       | 0.156       | 3.038       |
| Price(t-1)                  | 0.946       | 41.82***    | -           | -           |
| CL                          | 0           | -2.696***   | -           | -           |
| Volume                      | -3.50E-08   | -2.081**    | -           | -           |
| Dividends                   | 4.013       | 1.796*      | -           | -           |
| Revenues                    | 6.43E-05    | 2.626***    | -           | -           |
| % ChangeDJl                 | 9.585       | 2.258**     | -           | -           |
| Divestitures                | -           | -           | -0.023      | -1.849*     |
| % price change over Quarter | -           | -           | 0.137       | 2.427**     |
| % change TL                 | -           | -           | -0.097      | -2.727***   |
| Recession                   | -           | -           | -0.036      | -2.323**    |
| DJl                         | -           | -           | -1.03E-05   | -2.269**    |
| R-squared                   | 0.938       |             | 0.084       |             |
| Durbin Watson               | 1.863       |             | 2.123       |             |

\* means significance at the 0.1 level

\*\* means significance at the 0.05 level

\*\*\* means significance at the 0.01 level



stock prices are at their lowest. That is when they tend to increase and experience the highest returns because their values are deflated.

When comparing the two types of regressions to each other we can come up with some results regarding the overall effectiveness of each variable. Table 4 shows them side by side.

When looking at each regression side by side we can see how difficult it is to predict stock movements. The regressions shared none of the same significant variables. However there are some results to pull from the data. In the price regression (Model B), it found past price, current liabilities and percent change of DJIA all to be significant. In the return model (Model F), it found percent price change over the past quarter, percent change total liabilities and the recession dummy variable to be significant. It would seem that the past value, state of the economy and some measure of debt would be significant when looking at predicting stock movements. It would just differ depending on the dependent variable.

When comparing which model is more useful we would find that Model D and using returns as the dependent variable offer for important findings. This is because even though Model B had a higher R-squared, it has very limited application from its results. An investor would be interested in a stock's future movements, not its actual price. Model D did find significance in some variables, both in recent news variables and financial variables. Even if the results had small effects it still improved the regression over using just past price movements so semi-strong theory does have merit.

## V. CONCLUSION

While the regression did not by any means prove conclusively that it could predict stock prices it did bring some interesting facts into view. It is in fact much easier to run a regression to estimate stock prices; however that does not necessarily mean that it can predict stock movements as shown in the return regressions. This study was able to shed some light on the effectiveness of market efficiency. The high R-squared in the price regression could mean that a stock price is a vector of all publicly available information; however it does not necessarily mean that changes in its fundamentals will dictate future movements of the

price. Another implication one could take from this study is that strong efficiency is a much better predictor than semi-strong form. That would mean that insider trading and other variables that would not be accessible are really what determine stock price movements rather than their fundamentals or recent news. An interesting finding was that variables that tended to be related with negative events (divestitures, liabilities) were significant and their more positive counterparts (acquisitions, assets) were not. This means that investors tend to be cautious and pessimistic. An investor doesn't like a positive event as much as he or she likes to avoid a negative event.

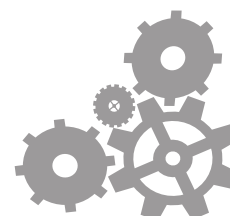
There are a number of ways that this study could be improved upon. One issue with this study is that stock prices react to information on a quarter by quarter basis. That is a gross over-assumption. In future studies one could test the predictive power of returns for one week, one month, or one year. The longer horizon might be more able to capture long term trends and the shorter-horizon might better represent the investors that use high-frequency trading strategies. Another way to expound upon this study would be to add lags further back than one quarter. It could be markets are acting faster or slower than one quarter and if they are acting slower then more lags would better capture changes. This would also better capture momentum. As percent change over the past quarter was shown to be significant in predicting returns, these regressions would "forget" that past quarter as soon as the new quarter was introduced. If we added more lagged terms it could better show trends longer than one quarter. A third improvement on this study would be to either add in more companies or to increase how long each company was measured for. If more recessions were included then we could get a better idea of that effect. This effect could also help the CEO change variable become more accurate as no company had more than one CEO change in the recorded 7.5 years. A fourth and final improvement would be to find a better way to account for recent events than a dummy variable. We had attempted to differentiate acquisitions based on size however it was not effective enough. If there was any way to quantify any of this data beyond a 1 or 0 then it could lead to more accurate predictions.

Even though this study only got an R-squared of 8.4%, Soderlind only got an R-squared

of 10.4% and his estimates were able to beat analyst estimates (2010). A low R-squared is to be expected in studies such as this as any abnormal return would throw off the regressions by a large amount. It could predict the stock price going up but then be off entirely on the magnitude of the increase. It would be interesting in the future to run the regressions found and calculate what return this investment strategy would actually earn.

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# BILATERAL AID TO LEAST DEVELOPED COUNTRIES: A STUDY OF THE U.S., THE U.K., FRANCE, AND JAPAN

Dave Warren

## I. INTRODUCTION AND LITERATURE REVIEW

Bilateral aid allocation is affected by a number of factors on the donor side. It has been found that public satisfaction with government positively affects the willingness to give bilateral aid (Gradstein and Chong, 2007). Economic and strategic interests of the donor country play a role in determining bilateral aid allocation (Tingley, 2009). Perhaps the most interesting finding is that ideology has a significant impact on bilateral aid allocation (Fleck and Kilby, 2001) (Milner and Tingley, 2010).

The relationship between ideology and aid allocation is not one-dimensional, meaning in some situations conservatives actually give more bilateral aid than liberals. However, liberal-conservative shifts in ideology tend to cause bilateral aid allocation to shift in a way that reflects the priorities of the ideology in control. Specifically, when the more liberal leaning party is in control, bilateral aid with humanitarian concerns and bilateral aid to low-income countries increases (Tingley, 2010). On the other hand, when the more conservative leaning party is in control, bilateral aid allocation tends to shift away from humanitarian concerns toward economic and trade driven concerns (Fleck and Kilby, 2001) (Ram, 2003). This makes sense due to the differences between liberal and conservative ideology. Conservatives place an emphasis on limiting the role of government. Thus limiting the ability of government to be used as a tool to eradicate inequality (Hicks and Swank, 1992). Furthermore, the conservative ideology places an emphasis on shrinking the state budget which could lead to shrinking foreign aid budgets (Adams, 1998). This contrasts with liberals who place a greater emphasis on humanitarian concerns and believe in using the state as a tool to eradicate poverty (Hicks and Swank, 1992). Adding to this argument, it has been found that those who consider themselves left-leaning are more likely to approve of government humanitarian aid than those who consider themselves right-leaning (Chong and Gradstein, 2008).

Multiple studies have viewed the role ideology plays on bilateral aid allocation specifically for the United States. Fleck and Kilby (2006) review party control in U.S. Congress and presidential control in relation to foreign bilateral aid. The study breaks up foreign bilateral aid into four categories: development concerns, strategic importance, commercial importance, and democratization. The major finding in the study is that when the president and Congress are more liberal, development concerns receive more weight than when the president or Congress are more conservative. On the other hand, the study finds that when Congress is more conservative, commercial concerns have more weight than when Congress is liberal. Three separate regressions are used in the study. The dependent variable in regression 1 is whether or not a country receives aid. The dependent variable in regression 2 is whether or not the region (group of countries) receives aid. The dependent variable in regression 3 is the amount of aid a country receives. The independent variables in the study are the same for all three regressions. They include: amount of aid given by small donor countries, U.S. exports, U.S. imports, UN voting, Democracy (of U.S.), GDP, and Population (of U.S.). The regressions run over several time periods to separate the effects of the cold war. The study uses panel data from 1960 through 1997.

Fleck and Kilby published a follow up study in 2010 focusing on the same issues with the addition of the War on Terror. Their 2010 study reviewed the U.S. bilateral aid budget from 1955-2005 with respect to party control in Congress and the presidency. The main finding of the study is that aid flows to all developing countries have increased recently, including those countries closely involved in the War on Terror and those countries not involved with the War on Terror.

Moss and Goldstein (2005) viewed the U.S. bilateral aid allocation situation using some different methods than Fleck and Kilby. Their research question was: Are there differences through time

between the Republicans and the Democrats in terms of providing aid to Africa? The study used data from OECD on U.S. bilateral flows of overseas development assistance to Sub-Saharan Africa from 1961-2000. There are several dependent variables in the study including: bilateral aid given to Sub-Saharan Africa in U.S. dollars adjusted for inflation; and the percentage of all bilateral aid given to Sub-Saharan African countries. The independent variables in the study are measures of political party control by year operationalized by dummy variables. Moss and Goldstein (2005) found that it is the relationship between Congress and the president that provides the most influence on how much aid is given. Specifically, they found that when one party has control of at least the presidency and house, aid flows to African developing countries are much higher than when the president and all of Congress are at odds.

The purpose of this study is to view ideology's effect on bilateral aid allocation to LDCs, by focusing on the bilateral aid giving countries. This study will attempt to isolate precisely which pieces of government (if any) actually affect bilateral aid given to LDCs.

## II. HYPOTHESIS AND TESTING

This study's hypothesis is that, all factors held constant, the more liberal a government is the more that government will give bilateral aid to LDCs. To test the relationship between ideology and bilateral aid to LDCs, the top four bilateral aid donors are analyzed. These donors are the United States, The United Kingdom, France, and Japan. For each country two regressions are run: one spanning from 1960-2009 and the other spanning from 1980-2009. The purpose of the 1980-2009 regression is to control for the possibility that the importance of aiding LDCs changed over time. The results of the second regression should be more consistent with the current ideological views and current events. In all eight regressions the dependent variable is bilateral aid to LDCs in current U.S. dollars. All eight regressions also include two independent variables GDP in current U.S. dollars and GDP growth with one year of lag applied. These data are from the World Bank. The inclusion of both GDP and bilateral aid in current U.S. dollars controls for the U.S. economy interfering with the study. Because both variables are in the same terms, changes in the U.S. economy due to inflation or international purchasing power affect

both variables equally. GDP is expected to have a significant positive effect on bilateral aid given to LDCs. GDP growth is included in all eight equations to control for the economic cycle in each country. This study hypothesizes that in the years following an economic boom, countries will be more likely to give larger amounts of aid to LDCs. This is why one year of lag is given to the GDP growth variable. All economic data are from the World Bank. The final variable in each equation measures the political ideology that has control of the country. This variable is different for each country, since the political system in each country is different. The data for the political variables are from European Election Database, Uselectionatlas.org and Electionresources.org. The base regression equation with a place holder for the political variable is as follows:

$$\text{Bilateral aid to LDCs} = \text{GDP} + \text{GDP growth} \\ (\text{Lagged 1 year}) + \text{Political Variable}$$

Variables that represent significant time periods are also present for certain equations. As mentioned before, Moss and Goldstein (2005) suggested the Cold War era may have an impact on bilateral aid. This variable is included in the U.S. regressions. Fleck and Kilby (2010) found a rise in aid coinciding with the beginning of the War on Terror. This "War on Terror" variable is included in the final equations for both the United States and the United Kingdom. It is found insignificant for the France equation.

Appendix A contains a list of current LDCs for reference as of 2010. It should be noted that the countries contained in this list have changed slightly over time. The data used in the regressions reflect these changes.

### Ideology Variable for the United States

In the U.S., The Democratic Party is more liberal while the Republican Party is more conservative. The President of the United States has significant power in determining the foreign policy of the country. The House and the Senate in the U.S. both have the power to vote down an appropriations bill. Therefore, the ideology of all three will be included in the U.S. political variable. This study codes the party control of the House, Senate, and Presidency into a three letter variable. The first letter of the variable represents which party has control of the House. The second represents which party has control of the Senate. The



third represents the party that has control of the Presidency. For example, if the Republicans controlled the House and the Senate, while the Democrats controlled the presidency, the variable would be "RRD". Five different combinations of party control in the U.S. have occurred since 1960. The combinations are "DDD," "DDR," "RRD," "RDR," "DRR," and "RRR". The combination that has not occurred from 1960-2009 is "RDD". In the regression equations for the U.S. DDD is not included because it is the control variable. This means that all the other political variables are in terms of full democratic control. Since full democratic control means full liberal control for the purposes of this study, all other U.S. political variables are predicted to have a significant negative impact on the amount of bilateral aid given to LDCs. These political variables are constructed in the same way that the Moss and Goldstein (2003) constructed their political variables.

$$\text{U.S. aid to LDCs} = \text{GDP} + \text{GDP growth} - \text{DDR} - \text{RRD} - \text{RDR} - \text{DRR} - \text{RRR}$$

### III. RESULTS: UNITED STATES

Table 1 shows the results for the U.S. equations. GDP was positive and significant at the .01 level across both equations. The War on Terror variable was also significant at the .01 level across both equations. It accounted for an extra \$1.9 billion in bilateral aid in the full equation and an extra 1.2 billion bilateral aid dollars in the 1980-2010 equation. The Cold War variable however, was not significant in the 1980-2010 equations and was only significant at the .1 level in the full equation. The "War on Terror" results agree with the findings of the most recent Fleck and Kilby (2010) study.

Table 1: Regression Results For Both U.S. Equations

|                            | U.S. 1960-2009             | U.S. 1980-2009             |
|----------------------------|----------------------------|----------------------------|
| GDP (Current U.S. dollars) | .0003745***<br>(-0.913)    | .00047558***<br>(-0.856)   |
| GDP Growth (1 Year of Lag) | -79767710 ***<br>(-.102)   | -116575058*<br>(-.121)     |
| War on Terror (1 = Yes)    | 1934041998 ***<br>(-0.477) | 1206057149 ***<br>(-0.472) |
| Cold War (1= Yes)          | 659594293 *<br>(-0.185)    | 496931025<br>(-0.169)      |
| DDR                        | -238740658<br>(-.064)      | -698157135 **<br>(-.156)   |
| DRR                        | -208934383<br>-0.039       | -20543046<br>(-.004)       |
| RRD                        | -1382599605 ***<br>(-.255) | -1816575842 ***<br>(-.366) |
| RDR                        | -2602987158 ***<br>(-.290) | -2956482333 ***<br>(-.372) |
| RRR                        | -1252985346 ***<br>(-.193) | -1368485098 ***<br>(-.234) |
| Adjusted R Squared         | 0.937                      | 0.935                      |

1. Significant at .1 =\* ; .05 =\*\* ; .01 = \*\*\*

2. Number in parenthesis = Beta weights

3. Political Variables are in terms of full Democrat (left-wing) Control "DDD"

4. Political Variable code = first letter is House control, second letter is Senate control, third letter is Presidency control

When using full liberal government as the control for the U.S. there is a significant reduction in bilateral aid given in three out of the other five government combinations across both equations. These government combinations are represented in table 1 by RRR, RDR and RRD variables. Each is significant at the .01 level. The years that they span are: 2003-2006 (W. Bush administration "RRR"), 2001-2002 (W. Bush administration "RDR"), and 1995-2000 (Clinton administration "RRD"). The DDR variable is significant (in the negative direction) at the .05 level in the 1980-2010 equation only. It includes 1987-2002 (Regan and Bush administrations) and 2007-2008 (W. Bush administration). The only political combination that did not have significantly lower bilateral aid given to LDCs was the DRR variable which occurred from 1981 through 1986 during the Reagan administration.

These results generally support the hypothesis that more conservative governments give less bilateral aid to LDCs. However, the 1981-1986 (Reagan administration) "DRR" variable does not support the hypothesis. Figure 1 shows a plot of U.S. bilateral aid to LDCs over time.

#### Ideology Variable for the United Kingdom

In the U.K. the Labour Party represents the more liberal ideology while the Conservative Party represents the more conservative party. Foreign policy in the U.K. is determined by the prime minister and the cabinet ministers. Cabinet ministers are appointed by the prime minister. Appropriation bills in the U.K. are passed by the House of Commons. Therefore, the government groups that have the most power to influence bilateral aid to LDCs are the Prime Minister and the House of Commons. Since the party that controls the House of Commons also controls the Prime Minister seat, the variable for the U.K. is reduced down to a single dummy variable called "Prime Minister." A "1" indicates a liberal Prime Minister (and liberal majority in the House of Commons), and a "0" indicates a conservative Prime Minister (and conservative majority in the House of Commons). The full regression equation for the United Kingdom is as follows:

$$\text{U.K. aid to LDCs} = \text{GDP} + \text{GDP growth} + \text{Prime Minister}$$

#### IV. RESULTS: UNITED KINGDOM

For the United Kingdom, the GDP variable and the War on Terror variable were both posi-

tive and significant at the .01 level across the full equation and the 1980-2009 equation. The results are shown in Table 2. Similar to the results for the United States, the War on Terror has had a substantial effect. The full model shows an extra 600 million bilateral aid dollars given to LDCs as a result of the War on Terror and the 1980-2010 model shows an extra 450 million dollars given. Figure 2 shows a timeline of United Kingdom bilateral aid allocation.

The political variable for the United Kingdom was not significant in either equation, which does not support the hypothesis of this study. There are several possible explanations why the ideology variable was insignificant in the United Kingdom case. The most obvious answer is that the Conservative Party and the Labour Party simply do not differ in their views on foreign policy and, more specifically, on bilateral aid allocation. This explanation should be given some degree of credit; recently, the Labour Party has begun moving closer to the position of the Conservative Party on a number of issues, including economic issues. Another explanation is omitted variable bias. The House of Lords was an omitted variable in these equations and may have had an impact.

#### Ideology Variable for France

In France the more liberal ideology is represented by an alliance of political parties including the Socialist Party, the French Communist Party, the Greens, the Radical Socialist Party, and the Citizen's Movement Party. The more conservative ideology is represented by a different alliance of parties including the Union for Popular Movement,

the Rally for the Republic, and the Union for French Democracy. This means that the political variables in the equations for France represent the alliances instead of individual parties.

Executive Powers are split between the

Table 2: U. K. Regression Results For Both Equations

|                                     | U.K. 1960-2009                  | U.K. 1980-2009                |
|-------------------------------------|---------------------------------|-------------------------------|
| GDP (Current U.S. dollars)          | .00079900887124 ***<br>(-0.898) | .0009844897909***<br>(-0.924) |
| GDP Growth (1 Year of Lag)          | -19263319.46<br>(-.050)         | -42981144<br>(-.102)          |
| Labour Party Prime Minister (1=Yes) | 58771709.23<br>(-0.043)         | 29943316.52<br>(-0.020)       |
| War On Terror (1=Yes)               | 593834247.78 ***<br>(-0.319)    | 448709281***<br>(-0.271)      |
| Adjusted R Squared                  | 0.884                           | 0.865                         |

Significant at .1 =\* ; .05 =\*\* ; .01 = \*\*\*  
Number in parenthesis = Beta weights



president and the prime minister. Both have power in determining foreign policy. Appropriation bills are voted on by both the National Assembly and the Senate. The Senate has been conservative controlled since 1960. The ideology in control of the National Assembly of France is also the ideology in control of the Prime Minister position. Therefore, the political variable for France is reduced down to two dummy variables. In this equation those variables will be called the "President variable" and the "Prime Minister" variable. The "Prime Minister" variable is a "1" if the liberal alliance controls the Prime Minister position (also means control of National Assembly) and a "0" if the conservative alliance controls the position. The President dummy variable works in the same way. The full regression equation for France is as follows:

$$\text{France's bilateral aid to LDCs} = \text{GDP} + \text{GDP growth} + \text{Prime Minister} + \text{President} + \text{GDP} + \text{GDP growth} + \text{liberal control}$$

## V. RESULTS: FRANCE

The GDP variable for France was significant and positive at the .01 level across both equations. Table 3 shows the final regression equations for France. A War on Terror variable was attempted for both of the France regressions and was found insignificant. Results for the France equations with the War on Terror variable included are found in Appendix B.

The prime minister variable for France was found insignificant across both equations. The

Table 3: Final Regression Results For France

|  | France 1960-2009             | France 1980-2009              |
|--|------------------------------|-------------------------------|
| GDP (Current U.S. dollars)                                   | .00059414550 ***<br>(-0.765) | .000501698854 ***<br>(-0.714) |
| GDP Growth (1 Year of Lag)                                   | -14908190.65<br>(-.050)      | -4311037.16<br>(-.011)        |
| President (1=Liberal)  | 466857912.52 ***<br>(-0.369) | 376003464.676**<br>(-0.423)   |
| Lower House (1=Majority Liberal)<br>(Prime Minister liberal) | 34481836.77<br>(-0.026)      | -11558884.21<br>(-.013)       |
| Adjusted R Squared   | 0.707                        | 0.187                         |

1. Significant at .1 =\* ; .05 =\*\* ; .01 = \*\*\*

2. Number in parenthesis = Beta weights

president variable was found positive and significant for both equations. The president variable is significant at the .01 level in the full model and is significant at the .05 level in the 1980-2009 model.

The results from the presidency variable support the hypothesis of this study, but the results from the prime minister variable do not. Both the prime minister's party and the president's party have varied consistently over time. From 1960-1980, the President of France was of the conservative party alliance. From 1981-2009 the president was of the liberal party alliance. Figure 3 shows a plot of France's bilateral aid allocation over time.

Similar to the United Kingdom situation, there are a number of possibilities to explain why the prime minister variable is not significant in the equation. One explanation is that the ideology of the left alliance in the National Assembly and prime minister seat are not that different from the ideology of the right alliance. However, this explanation is not as plausible in this case as it was in the case of the U.K. because it includes the president variable that is significant. Since the president variable is significant in this case, it suggests that the party alliances do act differently when they are in power (in regards to bilateral aid allocation). An alternative explanation is that the Prime Minister seat and majority control on the National Assembly have less power over bilateral aid distribution than the presidency does.

## Ideology Variable for Japan

In Japan the liberal ideology is represented by an alliance of parties (also known as the total opposition): The Social Democratic Party, People's New Party, and New Party Nippon. The conservative ideology is represented by a separate alliance of parties (also known as the ruling coalition): The Liberal Democratic Party (LDP), New Komeito Party, and Japan Renaissance Party. Appropriation bills in Japan are voted on by the House of Representatives (lower house). The Prime Minister of Japan

has substantial power in determining foreign policy. The Prime Minister of Japan and the House of Representatives have been controlled by the conservatives over all years of this study (except for a 3-year situation from '93-'96').

After the election of '93, members of both alliances cast a vote of no confidence against the newly elected Prime Minister Morihiro Hosokawa. Hosokawa in return dissolved the House of Representatives, which caused members of the LDP to defect and form new parties. Some of these newly formed parties were allied with the more liberal opposition alliance which ultimately gave the liberal opposition alliance a slight majority in the Lower House. This lasted until '96 when the LDP regained majority. This three year period from '93-'96 will be represented by the dummy variable called "liberal control". The regression equation for Japan is as follows:

$$\text{Japan's bilateral aid to LDCs} = \text{GDP} + \text{GDP growth} + \text{liberal control}$$

## VI. RESULTS: JAPAN

GDP is positive and significant at the .01 level across both equations for Japan. However, the political variable for Japan is not significant in either equation. Table 4 shows the regression results for Japan.

Similar to the models for France and the United Kingdom, there are several possible explanations for why the political variable for Japan was insignificant. The bilateral aid allocation ruling coalition may not differ substantially from the bilateral aid allocation of the opposition alliance. Another possible explanation involves the data set used to test the Japan model. As mentioned before, the opposition alliance only controlled the House of Representatives (and prime minister seat) for a total of three years over the course of this study. During that three year period, a number of former ruling coalition members joined the opposition coalition and one of the sessions of the House of Representatives was dissolved by the prime minister. It is possible that there was not enough time to make a meaningful change

Table 4: Regression results for both equations for Japan

|                                 | Japan 1960-2009            | Japan 1980-2009             |
|---------------------------------|----------------------------|-----------------------------|
| GDP (Current U.S. dollars)      | .000277851 ***<br>(-0.909) | .0001824182 ***<br>(-0.671) |
| GDP Growth (1 Year of Lag)      | -3251078.98<br>(-.021)     | 14804663.58<br>(-0.087)     |
| No Confidence / Split (1 = yes) | 74225811.48<br>(-0.032)    | 351561898.41 **<br>(-0.287) |
| Adjusted R Squared              | 0.872                      | 0.707                       |

1. Significant at .1 =\* ; .05 =\*\* ; .01 = \*\*\*

2. Number in parenthesis = Beta weights

in policy, specifically foreign policy involving bilateral aid allocation, during this period. A plot of Japan's bilateral aid allocation to LDCs over time is shown in figure 4.

## VII. LIMITATIONS

Aside from aforementioned limitations, there are several areas where the models do not capture exactly what they are intended to capture. The GDP growth variable which was present in every equation is either insignificant or significant in the negative direction. These results do not support the hypothesis of this study. The GDP growth variable is intended to control for the economic cycle. These findings suggest that either GDP growth is not an accurate indicator of the economic cycle for this equation or that the economic cycle has no effect on bilateral aid allocation to LDCs. Future research in this area may be needed to find a more accurate indicator for the economic cycle if it does affect bilateral aid allocation.

Another limitation of this study is that the political variable across each equation only roughly captures the actual ideology. The political variables in the equations used here capture only the ideology of the party or alliance of parties and not the ideology of the actual political office holder. Therefore, variations in ideology across the same party or party alliance are not captured here. A very liberal office holder in the more liberal party is counted equally with a centrist liberal in the same party even though their ideologies and the impacts they have on policy are likely different.

Perhaps the most serious limitation of this study is that disasters and events are unaccount-

ed for (except the World War era and the War on Terror). This means that whichever side happens to be in power when these events and disasters occur will experience a boost to their bilateral aid output. Examples of these disasters and events include the genocide in Rwanda, and Hurricane Irene.

## VIII. CONCLUSION

The findings of this study indicate that ideology affects bilateral aid allocation differently in each country. In the United Kingdom and in Japan the results suggest that ideology may not have a substantial impact on bilateral aid allocation to LDCs. However, these results disagree from what past studies have found. The measure of ideology in this study is systematically different than it was in the previous studies. Most prior studies employed an ideology index similar to the indexes proposed by Budge (1993) and Potrafke (2009). This could have played a role in the differing results. In France, only the president is found to have a significant impact on bilateral aid allocation while the results suggest that the Prime Minister and National Assembly control has no substantial effect on bilateral aid allocation. The War on Terror variable was significant and powerful in the United Kingdom yet it was insignificant in France. The results for France somewhat agree with the hypothesis of this study and past literature. It specifically raises the possibility that in France, it is not the ideology of the entire government that matters, but just that of the president in regards to bilateral aid allocation to LDCs.

The results for the U.S. in this study indicate that a fully liberal controlled U.S. government gives more bilateral aid to LDCs than a split U.S. government or a fully conservatively controlled U.S. government. These differ from the results found in the Moss and Goldstein (2005) study even though the political variable was constructed in the same way. In the Moss and Goldstein (2005) study, only the RDR and RRD variables were found to have significantly reduced level of bilateral aid given. Their conclusion was that only certain split government administrations saw lower bilateral aid given.

This may be due to a number of differences between the two models. The database used for the Moss and Goldstein (2005) study included only Sub-Saharan African countries (which largely

coincide with LDCs, see appendix A) and only spanned from 1961-2001. The economic control variables in the Moss and Goldstein (2005) study also differ from the economic control variables used in this study. The results of the impact of ideology on bilateral aid given do, however, agree with the findings of all three of the Fleck and Kilby studies (2001) (2003) (2010). Ultimately, when addressing aid allocation from the U.S, this study adds more weight to the argument that liberals do give more bilateral aid to developing countries than conservatives.

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United States Election Atlas [uselectionatlas.org](http://uselectionatlas.org)

## APPENDIX A

LDC countries as of 2010

Africa – (33) Angola, Benin, Burkina Faso, Burundi, Cape Verde, Central African Republic, Chad, Comoros, Dem. Rep. of Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, Somalia, Sudan, Tanzania, Togo, Uganda, Zambia

Asia – (10) Afghanistan, Bangladesh, Bhutan, Cambodia, Lao PDR, Maldives, Myanmar, Nepal, Timor-Leste, Yemen

Pacific - (4) Kiribati, Samoa, Solomon Islands, Tuvalu Vanuatu

Caribbean – (1) Haiti

### Appendix B Supplemental France Regression Results

#### Model Summary

| Model | R     | R Square | Adjusted R Square | Std. Error of Estimate |
|-------|-------|----------|-------------------|------------------------|
| 1     | 0.864 | 0.747    | 0.716             | 3.17 E+ 08             |

a. Predictors: (Constant), GDPgrowth, majority Parliament, President, WARonTERROR, GDP

#### Coefficients

| Model              | Understandized Coefficients<br>B | Std. Error | Standardized Coefficients<br>Beta | t-statistic | Sig.  |
|--------------------|----------------------------------|------------|-----------------------------------|-------------|-------|
| 1 (Constant)       | 16790947.44                      | 1.78E+08   |                                   | 0.094       | 0.925 |
| President          | 5.14E+08                         | 1.24E+08   | 0.399                             | 4.164       | 0     |
| majorityParliament | 262765.323                       | 1.19E+08   | 0                                 | 0.002       | 0.998 |
| WARonTERROR        | -17311282.07                     | 2.09E+08   | -0.011                            | -0.083      | 0.934 |
| GDP                | 0.001                            | 0          | 0.832                             | 5.682       | 0     |
| GDPgrowth          | 16019323.43                      | 31006134   | 0.057                             | 0.517       | 0.608 |

a. Dependent Variable: LDCaid

## APPENDIX C

Fig. 1. Time of U.S. bilateral aid to LDCs

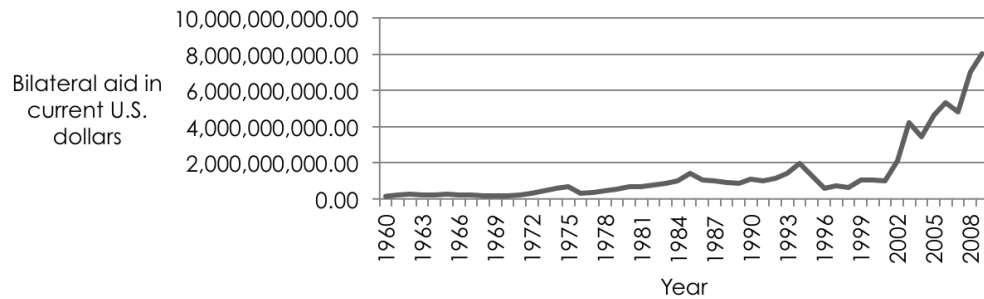


Fig. 2. U.K. Bilateral aid allocation timeline

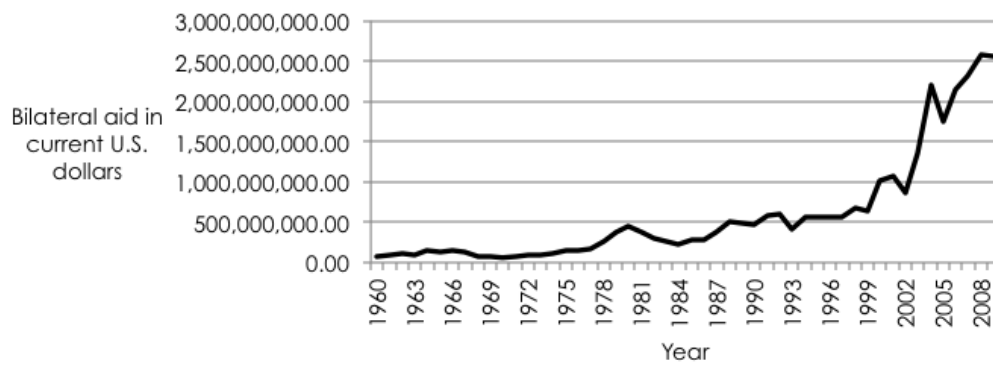


Fig. 3. France's bilateral aid allocation over time

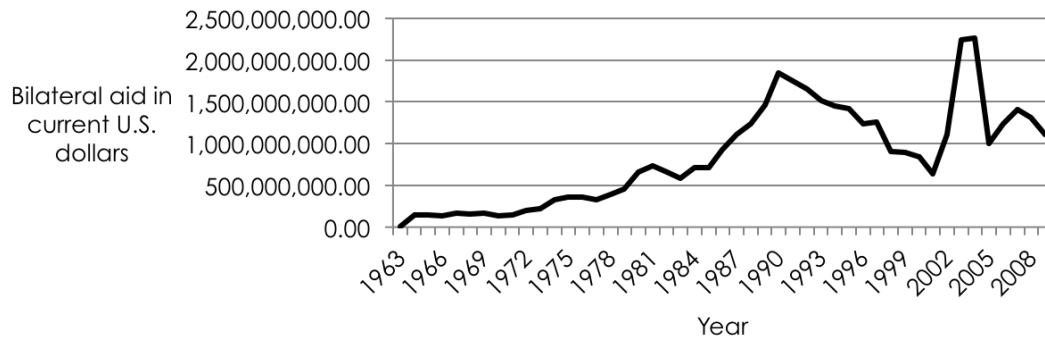
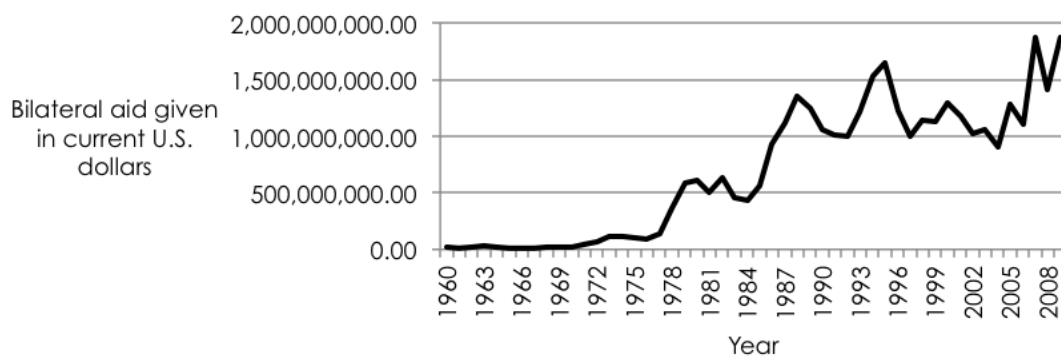


Fig. 4. Timeline of Japan's bilateral aid allocation





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# ECONOMIC ASSIMILATION OF CHINESE IMMIGRANTS IN THE UNITED STATES: IS THERE WAGE CONVERGENCE WITH NATIVES?

Eunis Wu

## I. INTRODUCTION

Asian Americans have a long and profound history in the United States, and are usually referred to as the “model minority”. While the income level of immigrants depends on various factors, existing literature suggests that immigrants who can adapt well and are relatively successful in their new jobs can make a significant contribution to economic growth (Borjas, 2009).

Assimilation and human capital theories explain the income determinants for individuals, especially immigrants, in the labor market. Based on Chiswick's studies (1978) using cross-section data in the 1970s, the age-earnings profiles of immigrant and native men show that upward mobility is an important aspect of the immigrant experience (Borjas, 2009). Despite findings from the age-earnings profiles, however, past research has found that there still seems to be a wage gap between Asian Americans and natives. Studies suggest that Asian immigrants' earnings are about 75% of native-born white Americans' earnings (Min, 2006); mass media reports also show that Asian American men are paid up to 29% less than equally qualified white males (Debusmann, Jr., 2010).

The number of Chinese immigrants in the U.S. has increased significantly over the years. According to the U.S. Census Bureau, there are 3.8 million Asians of Chinese descent in the U.S. in 2009, making it the largest Asian group in the country (2009 American Community Survey, 2009). The Asian population is projected to climb to 40.6 million by 2050, which will make up 9.2 percent of the nation's population (U.S. Census Bureau, 2008). The continuously increasing number of Chinese immigrants in the U.S. raises concerns regarding the living situation of this particular ethnic group. It poses the question of what determines Chinese immigrants' performance in the U.S. labor market, if there is an income gap between Chinese immigrants and natives, and whether assimilation and

upward mobility still apply to immigrants nowadays.

By looking for any income disparity between the immigrants and the natives, this research investigates the impact of assimilation on the level of earnings for Chinese immigrants in the United States. This paper also examines income determinants for Chinese immigrants by applying the assimilation and human capital theories. The research is built upon theoretical models developed from related studies, and focuses on income differences between Chinese immigrants and natives using the latest census data and observations. The study aims at re-examining the existing conclusions reached from past data and making meaningful conclusions that reflect the current living situation of Chinese immigrants in the U.S.

## II. THEORY AND LITERATURE REVIEW

### A. Assimilation

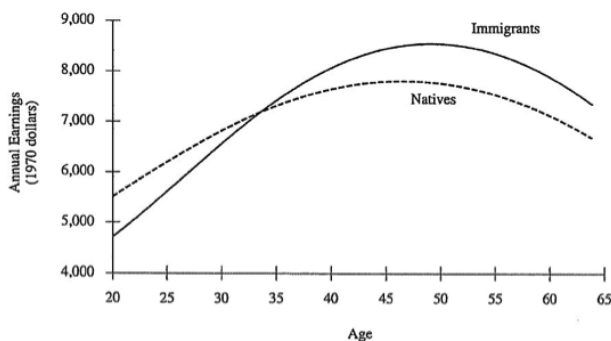
The assimilation theory describes the process that immigrants use to adapt and become acculturated to the host country. It is defined by William Clark (2003) as “a way of understanding the social dynamics of American society that it is the process that occurs spontaneously and often unintended in the course of interaction between majority and minority groups.”

Waters and Jeménez (2005) state that today's immigrants are largely assimilating into the American society along four dimensions: socioeconomic status, spatial concentration, language assimilation, and intermarriage. After migration takes place, immigrants find themselves in a foreign and sometimes hostile environment. A learning process about the host country's cultural, political and economic characteristics begins to take place and the immigrant begins to “assimilate” (Borjas, 1989). In general, immigrants and

their descendants become more similar to natives over time by improving their language skills and acquiring local human capital. They may also become more similar to natives in their legal status by obtaining long-term residency and work permits, or by marrying natives and becoming naturalized citizens (Schaeffer, 2006).

Residential patterns have a significant impact on the immigrants' income. Early studies of Chiswick (1978) use cross-section data that displays a snapshot of the population at a point in time to trace out the age-earnings profiles of immigrants and natives. Figure 1 shows the age-earnings profiles of immigrant and native men in the cross section and allows comparisons of current earnings between newly arrived immigrants and immigrants who migrated years ago (Borjas, 2009).

Figure 1: Age-Earnings Profiles of Immigrant and Native Men in the Cross Section (Borjas, 2009)



Observations of the age-earnings profile suggest that immigrants' earnings are initially lower than the native level, and the immigrant curve is steeper than the native's. Gradually, immigrants reach the same level of income with natives while eventually earning more than natives. A typical immigrant who has been in the U.S. for 30 years earns about 10% more than comparable natives (Borjas, 2009).

Even though Borjas argues that cohort effects might contribute to the appearance of wage convergence when in fact there is none, Chiswick et al. still conclude in later studies that duration in the destination plays an important role concerning the economic adjustment of immigrants in the host country (Beenstock, Chiswick, & Paltiel, 2010). By testing the immigrant assimilation

hypothesis with longitudinal data, Chiswick et al. further develop the theory that long-duration immigrants experience a steeper increase in earnings from 1983 to 1995 (Beenstock, Chiswick, & Paltiel, 2010).

Besides length of stay in the host country, researchers have long emphasized the importance of education on an immigrant's income level. Studies of Asian Americans' income show that education helps immigrants to become acculturated and subsequently to assimilate to some degree (Barringer, Takeuchi, & Xenos, 1990). For example, research shows that sharp differences exist in the time use between immigrants and natives, and that an increasing amount of time spent on activities including education helps immigrants to become assimilated to the host country (Vigdor, 2008).

## B. Human capital

Borjas (2005) defines human capital as a unique set of abilities and acquired skills that each of us brings into the labor market. Human capital theory even more directly asserts the enhancing impact of education on the living situation of minorities (Barringer, Takeuchi, & Xenos, 1990). Human capital theory suggests that success in school and high levels of formal education increase the prospects for better paying, higher status, and more satisfying employment (Barringer, Takeuchi, & Xenos, 1990).

Borjas (2005) suggests in his schooling model that schooling can play a signaling role in the labor market, indicating to employers that the worker carrying the certificate or diploma is a highly productive worker. His model implies that the signaling value of education can help firms to differentiate highly productive workers from less productive workers. In addition to the signaling aspects of education, human capital theory suggests that education helps a worker to actually improve productivity and become more marketable, thus increasing one's earnings in accordance.

Based on the assimilation theory and human capital theory, my research attempts to answer the question of how much influence assimilation has on income level after controlling for human capital factors. Specifically, this research examines how length of stay in the host country helps Chinese immigrants to close the income gap

with natives. Instead of plotting earnings against age, this research looks for relationships between the change in the wage level and the years of experience in the United States. By separating the effect of age from the effect of experience in the host country, the research specifically tests the assimilation theory with the latest cross-sectional data on Chinese immigrants and natives. I hypothesize that:

1. Human capital factors have a significant influence on a Chinese immigrant's income level nowadays.
2. The more assimilated a Chinese immigrant is, the closer the income parity with natives, controlling for other factors that are known to affect income. Specifically, the longer a Chinese immigrant stays in the U.S., the closer the income parity with natives, controlling for other factors that are known to affect income.

### III. DATA

The data in this research paper comes from IPUMS CPS (Current Population Survey) database. IPUMS-CPS is an integrated set of data from 50 years (1962-2011) of the March Current Population Survey (CPS). It is a monthly U.S. household survey conducted jointly by the U.S. Census Bureau and the Bureau of Labor Statistics (IPUMS-CPS, 2011).

All data in this research comes from the latest available CPS administered during March 2011. Samples include U.S. born and Chinese born individuals who are between the age of 25 and 65 and working more than 35 hours per week. The data for natives contains 54,698 observations and the data for Chinese contains 604 observations. The large sample size makes the research and results largely representative of the population.

#### A. Dependent variable

LnWage is used to measure level of income. The variable Wage and Salary Income indicates each respondent's total pre-tax wage and salary income – that is, money received as an employee – for the previous calendar year. The natural log of wage measures how fast income grows given one unit of change for a given variable.

#### B. Independent variables

##### 1. Assimilation

Year of Immigration is used to measure the individual's extent of nativity based on the assimilation theory. This variable reports the year in which a person born outside the United States came to the U.S. to stay.

##### 2. Human capital

Usual Hours Worked Per Week (last year) is used to measure the individual's work experience based on the human capital theory. It reports the number of hours per week that respondents usually worked if they worked during the previous calendar year. Individuals either reported hours working at a job or business at any time during the previous year or acknowledged doing "any temporary, part-time, or seasonal work even for a few days" during the previous year (IPUMS-CPS, 2011).

Education Attainment is used to measure an individual's level of education based on the human capital theory. This variable is recoded into a set of dummy variables:

- HighSchoolDiploma
- SomeCollege
- Bachelors
- Masters
- Professionals
- Doctors

The reference group for the education dummy variables is any individual with high school education (no diploma) or under.

##### 3. Control variables

Age gives each person's age at last birthday and is included in the regression model for natives to separate the impact of age and years of immigration on the level of income. Age proxies life experience and is a very rough proxy for work experience. Sex gives each person's gender and is included as a dummy variable in the empirical model.

Marital Status gives each person's current marital status, including whether the spouse was currently living in the same household. The variable is recoded into a dummy variable, Married, with the reference group of individuals that are not currently married.

NChild gives the number of own children (of any age or marital status) residing with each individual. It includes stepchildren and adopted children as well as biological children.

NChlt5 gives the number of own children age 4 and under residing with each individual. It includes stepchildren and adopted children as well as biological children.

All variables and their detailed definitions are shown in Table 1.

#### IV. EMPIRICAL MODEL

The empirical model of this study contains the following parts:

1. Descriptive statistics; 2. OLS regression analysis; 3. Simulation and comparison of the revised models. First, descriptive statistics is run to compare

variables of Chinese immigrants to natives. Then, Ordinary Least Squares (OLS) regressions are run to examine whether each income determinant has a significant impact on the level of income for Chinese immigrants and natives. Regression models for the natives and the immigrants are as follows:

##### Model 1: "Native" Model

$\text{LnWage} = \alpha_0 + \beta_1 \text{Age} + \beta_2 \text{HighSchoolDiploma} + \beta_3 \text{SomeCollege} + \beta_4 \text{Bachelors} + \beta_5 \text{Masters} + \beta_6 \text{Professionals} + \beta_7 \text{Doctors} + \beta_8 \text{Uhrswork} + \beta_9 \text{Male} + \beta_{10} \text{Married} + \beta_{11} \text{NChild} + \beta_{12} \text{NChlt5}$

Table 1: Variables, Descriptions and Expected Signs

| Variable                    | Description  | Expected Sign |
|-----------------------------|--|---------------|
| <u>Dependent</u>            |  |               |
| LnWage                      | Natural log of wage and salary income  |               |
| <u>Independent</u>          |  |               |
| Age                         | A person's age last birthday   | Positive      |
| Years in US                 | Number of years an imm immigrant has stayed in the U.S.                      | Positive      |
| <u>Education attainment</u> |  | Positive      |
| HighSchoolDiploma           | 0= High School (no diploma) or under<br>1= High school diploma or equivalent |               |
| SomeCollege                 | 0 = no college<br>1 = some college (including associate's degree)            |               |
| Bachelors                   | 0 = No Bachelor's degree<br>1 = Bachelor's degree                            |               |
| Masters                     | 0 = No Master's degree<br>1 = Master's degree                                |               |
| Professionals               | 0 = No Professional School degree<br>1 = Professional School degree          |               |
| Uhrswork                    | Usual hours worked per week (last year)                                      | Positive      |
| <u>Sex</u>                  |  |               |
| Male                        |  | Unknown       |
| Female                      | 0 = Female<br>1 = Male   |               |
| <u>Marital Status</u>       |  |               |
| Married                     | 0 = Not married<br>1 = Married   | Unknown       |
| NChild                      | Number of own children in household  | Unknown       |
| NChlt5                      | Number of own children under age 5 in household                              | Unknown       |

##### Model 2: "Immigrant" Model

$\text{LnWage} = \alpha_0 + \beta_1 \text{YearsinUS} + \beta_2 \text{HighSchoolDiploma} + \beta_3 \text{SomeCollege} + \beta_4 \text{Bachelors} + \beta_5 \text{Masters} + \beta_6 \text{Professionals} + \beta_7 \text{Doctors} + \beta_8 \text{Uhrswork} + \beta_9 \text{Male} + \beta_{10} \text{Married} + \beta_{11} \text{NChild} + \beta_{12} \text{NChlt5}$

In the Immigrant Model, the variable Year-sinUS captures the assimilation theory. To find the equivalent relationship for natives to substitute for the effect of assimilation, the variable Age replaces YearsinUS in the Native Model. To eliminate the effect of human capital, education variables and other demographic variables are controlled throughout the analysis.

Next, the paper examines whether wage convergence takes place between the two groups by simulating a "what-if" scenario of wage and salaries. When the basic models are revised based on the coefficients found in the regression analysis, variable means of the immigrant group are applied in the revised Native Model to calculate the hypothetical income level of natives. The resulting value suggests the income level of natives when they were given Chinese characteristics, which is an important benchmark to compare against actual Chinese income in the Immigrant model.

Finally, the paper looks for any wage convergence by comparing the income results of the immigrant group to the natives'. When the natives were given Chinese characteristics in the Native Model, the calculated resulting value serves as a benchmark against the income level of immigrants. The variable *YearsinUS* is increased gradually, and the correspondent result of the dependent variable *LnWage* shows the immigrant's income at various level of assimilation. Since human capital and other demographic variables are controlled, the results reflect purely the effect of assimilation.

## V. RESULTS

### A. Descriptive statistics

Descriptive results of the mean and standard deviation for natives and Chinese immigrants are shown in Table 2.

A comparison of the means for wage and salary income suggests that Chinese immigrants earn about 14% more than natives on average. The descriptive statistics also shows that Chinese immigrants are more likely to have advanced college degrees and are especially likely to hold masters degrees. The higher income level of immigrants can be largely attributed to the higher education attainment of graduate school degrees, which is consistent with the finding that education is one of the determining factors in income.

### B. Regression analysis

Table 3 shows regression results for the native model and the immigrant model.

Table 2: Descriptive Statistics Results of Natives and Chinese Immigrants

|   | Natives               | Immigrants            |
|---|-----------------------|-----------------------|
| N   | 54698                 | 604                   |
| Dependent Variable:                             |                       |                       |
| Wage and Salary Income                          | 53326.13 (-47725.652) | 61146.55 (-52804.038) |
| LnWage  | 10.6015 (-0.81042)    | 10.7273 (-0.805)      |
| Independent Variables:                          |                       |                       |
| Age   | 43.25 (-10.703)       | 44.42 (-9.682)        |
| YearsinUS                                       | N/A N/A               | 18.1424 (-10.996)     |
| HighSchoolDiploma                               | 0.2763 (0.44719)      | 0.2202 (-0.4147)      |
| SomeCollege                                     | 0.3036 (-0.45981)     | 0.1026 (-0.3037)      |
| Bachelors                                       | 0.2448 (-0.42998)     | 0.2152 (-0.41132)     |
| Masters   | 0.0996 (-0.29952)     | 0.2119 (-0.40901)     |
| Professionals                                   | 0.018 (-0.13298)      | 0.0265 (-0.1607)      |
| Doctors   | 0.0171 (-0.12969)     | 0.149 (-0.35639)      |
| Usual hours worked per week (last yr)           | 43.42 (-7.877)        | 42.78 (-7.878)        |
| Male  | 0.5488 (-0.49761)     | 0.5033 (-0.5004)      |
| Married   | 0.6478 (-0.47767)     | 0.7632 (-0.42544)     |
| Number of own children in household             | 1.05 (-1.164)         | 0.97 (-0.986)         |
| Number of own children under age 5 in household | 0.2 (-0.506)          | 0.16 (-0.429)         |

(Standard deviation in parentheses)

The coefficient for the variable *YearsinUS* is 0.010 and is significant at the 1 percent level. The result suggests that with an increase of one year in the U.S., an immigrant's salary increases by 1%. The coefficient for the variable *Age* is 0.008 and is also significant at the 1 percent level. This means that with an increase of one year of age, a native's salary increases by 0.8%. Thus, changes of the length of stay in the U.S. for the immigrant group have a stronger impact on the income level than changes of years of age for the native group, which gives rise to the possibility that wage gap between the two groups may be eliminated.

Meanwhile, both models have relatively high adjusted R-square values and many coefficients that are statistically significant. All coefficients in the Native Model are significant at the 1 percent level, while most of the coefficients in the Immigrant Model are significant. The regression results are consistent with the expectation that most of the coefficients have positive signs. The high level of significance supports the human capital theory that education plays a huge role in determining income regardless of being native or immigrant. It should be noted that coefficients



for the education variables increase as the level of educational attainment increases in both models, which also supports the hypothesis that higher education attainment has a more significant influence on income growth.

### C. Comparisons of results between the Native Model and the Immigrant Model

Based on the results from regression analysis, the models are restated as follows:

Model 1 – the “Native” Model:  
 $\ln Wage = 8.717 + .008Age + .319HighSchoolDiploma + .486SomeCollege + .486Bachelors + 1.013Masters + 1.338Professionals + 1.256Doctors + .015Uhrswork + .271Male + .156Married + .033NChild - .028NChil5$

Model 2 – the “Immigrant” Model:  
 $\ln Wage = 9.380 + .010YearsinUS + .101HighSchoolDiploma + .428SomeCollege + .783Bachelors + .971Masters + 1.306Professionals + 1.176Doctors + .006Uhrswork + .157Male + .182Married + .077NChild - .081NChil5$

Based on the restated models above, Table 4 shows a comparison of the estimated natural log of wage between natives and Chinese immigrants. As explained in the previous sections, when the basic models are revised based on the coefficients found in the regression analysis, variable means of the immigrant group are applied in the revised Native Model to calculate the hypothetical income level of natives. The results in Table 4 are wages estimated by multiplying the estimated coefficients of each regression times the Chinese immigrants' mean value of each of the independent variables.

From Table 4 on the next page, it can be seen that when given the same character-

Table 3: Regression Results for Natives and Chinese Immigrants

|   | Native Model       |             |         | Immigrants Model   |             |         |
|---|--------------------|-------------|---------|--------------------|-------------|---------|
|   | Coefficients       | t-statistic | Sig.    | Coefficients       | t-statistic | Sig.    |
| Constant  | 8.717<br>(-0.026)  | 338.409     | .000*** | 9.38<br>(-0.182)   | 51.517      | .000*** |
| Age   | 0.008<br>0         | 27.356      | .000*** | N/A                | N/A         | N/A     |
| YearsinUS                                       | N/A                | N/A         | N/A     | 0.01<br>(-0.003)   | 3.997       | .000*** |
| HighSchoolDiploma                               | 0.319<br>(-0.016)  | 19.883      | .000*** | 0.101<br>(-0.114)  | 0.887       | 0.375   |
| SomeCollege                                     | 0.486<br>(-0.016)  | 30.401      | .000*** | 0.428<br>(-0.130)  | 3.286       | .001*** |
| Bachelors                                       | 0.843<br>(-0.016)  | 51.851      | .000*** | 0.783<br>(-0.114)  | 6.846       | .000*** |
| Masters   | 1.013<br>(-0.018)  | 56.569      | .000*** | 0.971<br>(-0.114)  | 8.492       | .000*** |
| Professionals                                   | 1.338<br>(-0.027)  | 49.275      | .000*** | 1.306<br>(-0.191)  | 6.821       | .000*** |
| Doctors   | 1.256<br>(-0.028)  | 45.449      | .000*** | 1.176<br>(-0.120)  | 9.774       | .000*** |
| Usual hours worked per week (last yr)           | 0.015<br>0         | 38.041      | .000*** | 0.006<br>(-0.003)  | 1.622       | 0.105   |
| Male  | 0.271<br>(-0.006)  | 43.442      | .000*** | 0.157<br>(-0.054)  | 2.917       | .004*** |
| Married   | 0.156<br>(-0.007)  | 22.125      | .000*** | 0.182<br>(-0.070)  | 2.601       | .010*** |
| Number of own children in household             | 0.033<br>(-0.003)  | 11.131      | .000*** | 0.077<br>(-0.031)  | 2.47        | .014**  |
| Number of own children under age 5 in household | -0.028<br>(-0.007) | -3.975      | .000*** | -0.081<br>(-0.067) | -1.22       | 0.223   |
| Adjusted R-Square                               | 0.242              |             |         | 0.349              |             |         |
| Observations                                    | 54698              |             |         | 604                |             |         |

Notes:

\*\*\*Significant at the 1 percent level.

\*\*Significant at the 5 percent level.

\*Significant at the 10 percent level.

Standard errors are reported in parentheses.

istics, the natives earn about \$1300 more annually than Chinese immigrants. Since the variable means of Chinese immigrants are applied to each model, the result from the Native model shows the average income level of natives as if they had the same characteristics with Chinese immigrants. Therefore, the results show that when human capital variables are controlled for, the natives have an advantage in income over Chinese immigrants. Since human capital variables are controlled in the simulation, the differences in earnings are attributed mainly to the level of assimilation. The difference could be explained by

various factors such as language, citizenship status, discrimination in the labor market, etc.

Because human capital factors are controlled in the simulation and only the effect of assimilation is considered, the result for natives in Table 4 serves as a benchmark for the Chinese immigrants when wages and salaries for the two groups are compared. Note that values of LnWage in Table 4 for both the natives and the immigrants are higher than the value of LnWage in Table 2 for natives. The results again suggest that natives are at an advantageous position compared to Chinese immigrants when the effect of human capital is controlled and income is determined mostly by the level of assimilation.

Table 5 compares the native benchmark to the value of the natural log of wage for Chinese immigrants when Years in U.S. is adjusted. The native benchmark is quoted from results in Table 4 when natives were given the same Chinese characteristics. The difference between the two columns shows the difference between the absolute value of wage and salaries between the immigrant group and the native group.

Based on the results of Table 5, when they first come to the U.S., immigrants have somewhat lower earnings than the natives with identical human capital endowments. As length of stay in the U.S. increases, immigrant's earnings gradually increase as a result of assimilation. An important finding of the study is that, it takes 21 years for Chinese immigrants to reach the same level of income as natives when the immigrants eventually become assimilated. The decreasing earnings gap shows that wage convergence does apply to Chinese immigrants nowadays. This finding is consistent with Chiswick's conclusions in the age-earnings profile and suggests that longer duration in the U.S. helps immigrants to assimilate more to the host country.

Table 4: Comparison of Natural Log of Wage between the Native Model and the Immigrant Model When Average Chinese Characteristics Are Applied

| Native Model "What-if" |             |          | Immigrant Model   |             |          |
|------------------------|-------------|----------|-------------------|-------------|----------|
| Variable               | Coefficient | Mean     | Variable          | Coefficient | Mean     |
| Constant               | 8.717       |          | Constant          | 9.38        |          |
| Age                    | 0.008       | 44.42    | YearsinUS         | 0.01        | 18.1424  |
| HighSchoolDiploma      | 0.319       | 0.2202   | HighSchoolDiploma | 0.101       | 0.2202   |
| SomeCollege            | 0.486       | 0.1026   | SomeCollege       | 0.428       | 0.1026   |
| Bachelors              | 0.843       | 0.2152   | Bachelors         | 0.783       | 0.2152   |
| Masters                | 1.013       | 0.2119   | Masters           | 0.971       | 0.2119   |
| Professionals          | 1.338       | 0.0265   | Professionals     | 1.306       | 0.0265   |
| Doctors                | 1.256       | 0.149    | Doctors           | 1.176       | 0.149    |
| Uhrswork               | 0.015       | 42.78    | Uhrswork          | 0.006       | 42.78    |
| Male                   | 0.271       | 0.5033   | Male              | 0.157       | 0.5033   |
| Married                | 0.156       | 0.7632   | Married           | 0.182       | 0.7632   |
| NChild                 | 0.033       | 0.97     | NChild            | 0.077       | 0.97     |
| NChlt5                 | -0.028      | 0.16     | NChlt5            | -0.081      | 0.16     |
| LnWage                 |             | 10.7561  | LnWage            |             | 10.7273  |
| Wage and Salary        |             | 46915.34 | Wage and Salary   |             | 45583.45 |

Figure 2 on the next page plots the data in Table 5 to show the findings.

Immigrants have lower level of income compared to natives when they first migrate to the U.S.. As the number of years of stay increases, earnings between the two groups slowly converge and then gradually diverge after 21 years. Eventually the immigrant group becomes completely assimilated and enjoys a higher level of income compared to the natives. A possible explanation for the convergence is that immigrants lack certain skills and are not familiar with the new environment when they first move to the U.S. As time goes by, immigrants obtain necessary knowledge and skills that are useful in raising their productivity and performance in the labor market. As discussed in previous sections, length of stay for Chinese immigrants has a stronger effect on income growth than the change of age for natives. This might also explain the finding that income of Chinese immigrants eventually exceeds the natives' as the immigrants keep acquiring skills and learning knowledge in the host country.

## VI. CONCLUSION

This research examines income determinants for 21st century Chinese immigrants and uses the model to test the impact of assimilation theory on the income level for the immigrants.

Table 5: Immigrant Model Adjusted for Years in U.S. and Compared to Native Benchmark

| YearsinUS | Immigrant     | Native Benchmark | Difference      |
|-----------|---------------|------------------|-----------------|
| 1         | 10.5556       | 10.7561          | (0.2005)        |
| 2         | 10.5656       | 10.7561          | (0.1905)        |
| 3         | 10.5756       | 10.7561          | (0.1805)        |
| 4         | 10.5856       | 10.7561          | (0.1705)        |
| 5         | 10.5956       | 10.7561          | (0.1605)        |
| 6         | 10.6057       | 10.7561          | (0.1504)        |
| 7         | 10.6157       | 10.7561          | (0.1404)        |
| 8         | 10.6257       | 10.7561          | (0.1304)        |
| 9         | 10.6357       | 10.7561          | (0.1204)        |
| 10        | 10.6457       | 10.7561          | (0.1104)        |
| 11        | 10.6558       | 10.7561          | (0.1003)        |
| 12        | 10.6658       | 10.7561          | (0.0903)        |
| 13        | 10.6758       | 10.7561          | (0.0803)        |
| 14        | 10.6858       | 10.7561          | (0.0703)        |
| 15        | 10.6959       | 10.7561          | (0.0602)        |
| 16        | 10.7059       | 10.7561          | (0.0502)        |
| 17        | 10.7159       | 10.7561          | (0.0402)        |
| 18        | 10.7259       | 10.7561          | (0.0302)        |
| 19        | 10.7359       | 10.7561          | (0.0202)        |
| 20        | 10.746        | 10.7561          | (0.0101)        |
| <b>21</b> | <b>10.756</b> | <b>10.7561</b>   | <b>(0.0001)</b> |
| 22        | 10.766        | 10.7561          | 0.0099          |
| 23        | 10.776        | 10.7561          | 0.0199          |
| 24        | 10.786        | 10.7561          | 0.0299          |
| 25        | 10.7961       | 10.7561          | 0.0400          |
| 26        | 10.8061       | 10.7561          | 0.0500          |
| 27        | 10.8161       | 10.7561          | 0.0600          |
| 28        | 10.8261       | 10.7561          | 0.0700          |
| 29        | 10.8362       | 10.7561          | 0.0801          |
| 30        | 10.8462       | 10.7561          | 0.0901          |
| 31        | 10.8562       | 10.7561          | 0.1001          |
| 32        | 10.8662       | 10.7561          | 0.1101          |
| 33        | 10.8762       | 10.7561          | 0.1201          |
| 34        | 10.8863       | 10.7561          | 0.1302          |
| 35        | 10.8963       | 10.7561          | 0.1402          |
| 36        | 10.9063       | 10.7561          | 0.1502          |
| 37        | 10.9163       | 10.7561          | 0.1602          |
| 38        | 10.9263       | 10.7561          | 0.1702          |
| 39        | 10.9364       | 10.7561          | 0.1803          |
| 40        | 10.9464       | 10.7561          | 0.1903          |

My hypothesis that human capital factors have a significant influence on a Chinese immigrant's income level is supported by my results. The most important finding of this study is that there is wage convergence between Chinese immigrants and natives in recent years and it takes more than 20 years for immigrants to become completely assimilated as natives. The results are consistent with Chiswick's findings in the age-earnings profile, and additionally, the two groups' earnings diverge after 20 years of stay in the U.S. Possible explanations could be that immigrants keep acquiring knowledge and skills and are able to apply them effectively over time. They are also able to assimilate themselves in the host society and translate their assimilation into equivalent level of income. Additionally, the results suggest that the current immigration policies are attracting high-skilled immigrants to the U.S. Policies that encourage immigrants to acquire advanced college education need to be carried out in the future; long-term residency would also help immigrants to become more and more assimilated and thus stimulating the overall economy.

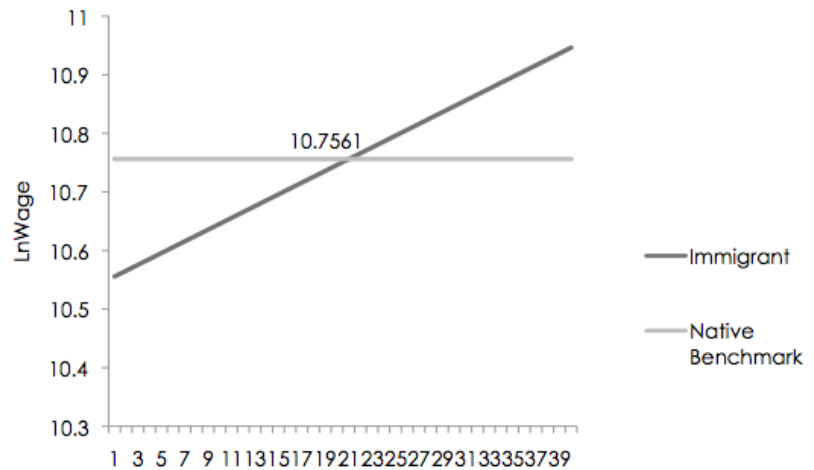
While the hypotheses are supported by the results in this research and the findings are consistent with the assimilation and human capital theories, this study is conducted by analyzing cross-section data and reflects a snapshot of the population's earnings at a fixed point of time. It is not clear whether tracing out the age-earnings profiles by following specific individuals over a period of time would have a significant impact on the results. Future research also needs to be conducted to explore other factors such as intergenerational relationships that could affect assimilation significantly.

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Fig. 2. LnWage vs. Number of Years in U.S. for Immigrants Compared to Natives Benchmark



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