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Editor’s Introduction and Acknowledgements

Tracy C. Miller
Editor of Proceedings

2011 Annual Conference of the Pennsylvania Economic Association

The papers published in this volume were presented at the 2011 Annual Conference of the Pennsylvania Economic Association (PEA) held at Dickinson College from June 2 to 4, 2011. The program lists all presenters, session chairs and discussants. Only the papers and comments submitted according to manuscript guidelines are included in the Proceedings. I thank Beth Henriquez, the administrative assistant for the Calderwood School at Grove City College for her editorial assistance with the Proceedings manuscript.

The 2011 conference was a great success. Participants from across Pennsylvania and several other states, as well as other countries, gathered to share ideas. University faculty, research professionals, graduate students and undergraduate students presented papers and participated in discussions. In addition to the presentations in the concurrent sessions, the conference featured an excellent talk at Friday’s lunch and a lecture arranged by the Federal Reserve Bank of Philadelphia.

After Friday’s lunch, Harry J. Holzer, Professor of Public Policy at Georgetown University, presented a talk discussing Workforce Development Policy, emphasizing how to prepare people for the jobs that will be in demand in the near future. Luke Tilly gave the Friday afternoon Federal Reserve lecture, which included information on the regional economy and the national economic outlook for the months and years ahead.

The success of any conference depends on many individuals. The PEA extends special thanks to Bill Bellinger for his time and energy coordinating all local arrangements. We also thank Dr. Neil Weissman, Dickinson College Provost, for his support, his willingness to host the conference and his participation in it. In addition, we are grateful for the assistance of Dottie Warner, Director of Event Planning, Keith Martin, Director of Dining Services and his staff, and Tammy Evelhoch, Academic Department Coordinator for Economics. The PEA also thanks the Federal Reserve Bank of Philadelphia for the Friday afternoon Lecture and Discussion and for hosting the Friday afternoon reception. Additional thanks go to the entire PEA board for their work making the conference a success. Lastly, thanks to all of the participants who made the conference an interesting, stimulating and friendly place to share ideas.
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2011 CONFERENCE AGENDA

THURSDAY, June 2, 2011

• 4:00 pm - 9:00 pm Registration (Rector Science Center Atrium)
• 5:00 pm - 7:00 pm Board of Director's Dinner/Meeting (Holland Union Building side rooms)
• 7:00 pm - 10:00 pm Reception (Rector Science Center Atrium)

FRIDAY, June 3, 2011

• 8:00 am - 4:30 pm Registration (Rector Science Center Atrium)
• 8:30 am - 10:30am Coffee Break (The Rector Science Center Atrium)
• 9:00 am - 10:15 am Concurrent Sessions
• 10:15 am - 10:30 am Break (The Rector Science Center Atrium)
• 10:30 am - 11:45 pm Concurrent Sessions
• 12 noon - 1:15 pm Luncheon (Stern Great Room)
• 1:15 pm - 2:00 pm Lunch Speaker: Harry J. Holzer, Georgetown University and the Urban Institute (Stern Hall Great Room)
• 2:15 pm - 3:30 pm Concurrent Sessions
• 3:30 pm - 3:45 pm Coffee Break (The Rector Science Center Atrium)
• 3:45 pm - 4:45 pm Fed Lecture (Althouse 106)
• 4:45 pm - 5:45 pm Reception hosted by the Federal Reserve: Rector Science Center Atrium

SATURDAY, June 4, 2011

• 8:00 am - 9:00 am Registration & Coffee (Rector Science Center Atrium)
• 9:00 am - 10:15 am Concurrent Sessions
• 10:30 am -11:00 am General Membership Meeting (Althouse 106)
• 11:15 am Closing
FRIDAY, June 3, 2011

Conference Registration – 8:00 a.m. noon, 2–4:30 p.m.
Rector Hall Atrium

8:30 a.m. – 10:30 a.m. Coffee Break (Rector Science Center Atrium)

FRIDAY, June 3, 2011 9:00 a.m. – 10:15 a.m.

Session F1A: Financial Economics
Location: Rector 1104
Chair: Stephen Mansour, Lehigh University

Crude Oil Prices Severely Effect Pakistan’s Economic Growth

Households Strategic Delinquency Decisions Given Mortgage and Consumer Debt
Hui (Stacie) Wang, Ohio State University

Homeowner’s Dilemma: To Default or Not to Default?
Riaz Hussain, University of Scranton and Steven Mansour, Lehigh University

Discussants:
Gian Kaur, Guru Nanak Dev University
Riaz Hussain, University of Scranton
Thomas Armstrong, Pennsylvania Department of Revenue

Session F1B: Student Session: Economic Development & Education
Location: Rector 115
Chair: Sandra Trejos, Clarion University

Access to Formal Credit and Rural Economic Development: An Examination of Prevailing Assumptions in the Land Rental Market of Rural India
Christian Minich, Indiana University of Pennsylvania and Mitchell DeRubis (Co-Author), Indiana University of Pennsylvania

Risky Behaviors and Academic Performance for High School Students
Huaxia Du, Dickinson College and Jue Wang, Dickinson College

Discussants:
Huaxia Du, Clarion University
Christian Minich, Indiana University of Pennsylvania
Session F1C: Miscellaneous Topics  
Location: Rector 117  
Chair: Michael Hannan, Edinboro University

Methodology for Conducting a Local Impact Study  
William Sanders, Clarion University, Robert Balough, Clarion University and Rod Raehsler, Clarion University

Nineteenth Century London Water Supply: A Process of Improvement  
Nicola Tynan, Dickinson College

Financial Distress Prediction of Malaysia Listed Companies  
Ismail Ait Saadi, Swinburne University

Discussants:  
Michael Hannan, Edinboro University  
John Sinisi, Penn State Schuylkill  
Henry Check, Penn State- Lehigh Valley

Session F1D: International Economics  
Location: Rector 1113  
Chair: Yaya Sissoko, Indiana University of Pennsylvania

Immigration and U.S. Native Workers’ Wages: Differential Responses by Education  
Tanyamat Srungboonmee, University of Wisconsin-Milwaukee

US Manufacturing and Vertical/Horizontal Intra-Industry Trade: Examining the Smooth Adjustment Hypothesis  
Roger White, Franklin & Marshall College

Exchange Rate Pass-Through for Dynamic Strategic Pricing in Thai Automobile Import Markets  
Jui-Chi Huang, Penn State Berks and Tantatape Brahmasrene, Purdue University North Central

Discussants:  
Robert Rogers, Ashland University  
Luis Palacios-Salguero, Point Park University  
Yaya Sissoko, Indiana University of Pennsylvania
Session F1E: Macroeconomics

Location: Althouse 201
Chair: Tracy Miller, Grove City College

When Sectoral Growth Meets Asymmetric Demand: Why Are Some Industries Winning the Global Competition?
Ruohan Wu, Ohio State University

The U.S. Budget Deficit, Inflation and Exchange Rate
Orhan Kara, West Chester University

On the Optionality of Currency
Timothy Kearney, Misericordia University

Discussants:
James Dunn, Edinboro University
Tracy Miller, Grove City College
Ralph Ancil, Geneva College

Session F1F: Economics of Education

Location: Althouse 204
Chair: Thomas Tolin, West Chester University

“Usage of Computer Techniques in Understanding Economics”
Gandhi Veluri, Andhra University

Financial Support and Student Labor Force Participation in Post-Soviet Latvia
Kenneth Smith, Millersville University

A New Look at the Effect of Credit Constraints on College Attendance
Brandon Restrepo, Ohio State University

Discussants:
Paul Woodburne, Clarion University
Thomas Tolin, West Chester University
Jolien Helsel, Youngstown State University
Friday, June 3, 2011  10:30 a.m. – 11:45 a.m.

Session F2A: Miscellaneous Topics
Location: Rector 1104
Chair: Jui-Chi Huang, Penn State University- Berks Campus

Using Averages and Break-even Analysis to Find Optimal Solutions- Part II
Ralph Ancil, Geneva College

Strategic Complexity and Cooperation: An Experimental Study
Matthew Jones, Ohio State University

Assessing India’s Competitive Exposure in U.S. Import Markets
Yaya Sissoko, Indiana University of Pennsylvania and David Yerger, Indiana University of Pennsylvania

Discussants:
David Nugent, Slippery Rock University
Steven Andelin, Penn State University - Schuylkill Campus
Jui-Chi Huang, Penn State University- Berks Campus

Session F2B: Student Session: Labor & Regional Economics
Location: Rector 115
Chair: Simon Condliffe, West Chester University of Pennsylvania

The Impact of Risk-Preference on Health Insurance and Health Costs in The United States
Gregory Fiorentino, West Chester University

Military Recruitment and the Effects of Enlistment Bonuses and College Incentives
Matthew Swisher, Clarion University

A Hedonic Price Model of Residential Housing in Indiana County, Pennsylvania
Elizabeth Judge, Indiana University of Pennsylvania

Discussants:
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Elizabeth Judge, Indiana University of Pennsylvania
Gregory Fiorentino, West Chester University
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Long-Term Effects of Occupational Choice on Unemployment – First Evidence from German Registry Data  
Achim Schmillen, University of Regensburg

Do Major League Players Come Up Big During Their Contract Year?  
Heather O’Neill, Ursinus College

The Underlying Causes of the Disappearing Repair Trades; A Sustainable Consumption Issue  
John McCollough, Penn State-Lehigh Valley

Discussants:  
Jolien Helsel, Youngstown State University  
Lynn Smith, Clarion University  
Kenneth Smith, Millersville University

Session F2D: Economic Education & Teaching  
Location: Rector 1113  
Chair: James Jozefowicz, Indiana University of Pennsylvania

Location, Location, Location: The Importance of Classroom Proximity in Student Peer Evaluation  
Roger White, Franklin & Marshall College

Basic Mathematical Competency and Success in Principles of Macroeconomics  
Paul Woodburne, Clarion University

Reconciling Student Preferences for Tariffs  
David McClough, Ohio Northern University

Discussants:  
Soma Ghosh, Albright College  
David McClough, Ohio Northern University  
Abdul Pathan, PA College of Technology
Session F2E: Public Economics
Location: Althouse 201
Chair: David Culp, Slippery Rock University

Developing Solutions to the Imminent Financial Crisis in PA
James Ravelle, Moravian College

Regulatory Public Policies: The Possibility and Impossibility of Rational Regulation in Government
Coskun Can Aktan, Dokuz Eylul University

Increasing Innovation in Tax Administration Collections: Pennsylvania Department of Revenue
Thomas Armstrong, Pennsylvania Department of Revenue and Daniel Meuser, Pennsylvania Secretary of Revenue

Using Summer and Winter Sessions as Revenue Centers at State Owned Universities: A Case Study
David Culp, Slippery Rock University

Discussants:
Tracy Miller, Grove City College
Thomas Armstrong, Pennsylvania Department of Revenue
David Culp, Slippery Rock University
Michael Hannan, Edinboro University
LUNCHEON AND SPEAKER
12:00 Noon – 2:00 p.m.
Location: Stern Hall Great Room

WORKFORCE DEVELOPMENT POLICY:
How to Move Ahead in the Coming Years

Harry J. Holzer, Ph.D.
Professor of Public Policy at Georgetown University

Dr. Holzer is a Professor of Public Policy at Georgetown University specializing in economics, welfare reform, and low-wage labor markets. Along with Peter B. Edelman, he is a founder and co-director of the Georgetown Center on Poverty, Inequality and Public Policy. In the Clinton Administration, Dr. Holzer served as the Chief Economist for the U.S. Department of Labor and is currently an Institute Fellow at the Urban Institute in Washington, DC, a Senior Affiliate of the National Poverty Center at the University of Michigan, a National Fellow of the Program on Inequality and Social Policy at Harvard University, and a Research Affiliate of the Institute for Research on Poverty at the University of Wisconsin-Madison. He also serves as a Nonresident Senior Fellow with the Brookings Metropolitan Policy Program and is a member of the editorial board at the Journal of Policy Analysis and Management. Dr. Holzer is also a member of the World Economic Forum Global Diversity Council.
Friday, June 3, 2011  2:15 p.m. – 3:30 p.m.

**Session F3A: Financial Economics**  
*Location: Rector 1104*  
Chair: John Walker, Kutztown University

A Study of the Cost Efficiency of Indian Commercial Banks – An Impact of Mergers  
Gian Kaur, Guru Nanak Dev University and Pardeep Kaur, Guru Nanak Dev University

An Analysis of the Link Between A Community Bank’s Profitability and the Absolute and Relative Sizes of its Loan Portfolio  
John Walker, Kutztown University and Henry Check, Penn State University

A Continuous Mortgage Default Model  
Stephen Mansour, Lehigh University, Riaz Hussain, University of Scranton, Vladimir Dobric, Lehigh University and Robert Storer, Lehigh University

**Discussants:**  
John Walker, Kutztown University  
Stephen Mansour, Lehigh University  
Pavani Tallapally, Slippery Rock University

**Session F3B: Student Session: Miscellaneous Topics**  
*Location: Rector 115*  
Chair: Roger White, Franklin and Marshall College

Income Inequality in the U.S. versus Romania  
Joseph Leeson, DeSales University and Michael Lindenfelser, DeSales University

The Impacts of International Migration on the Global Economy  
Amitabh Varma, DeSales University and Tahereh Hojjat, DeSales University

Factors Affecting a Company’s Decision to Export  
Thomas Allen, DeSales University

**Discussants:**  
Amitabh Varma, DeSales University  
Joseph Leeson, DeSales University  
Michael Lindenfelser, DeSales University
Session F3C: Economic Education Panel  
Location: Rector 117  
Chair: Abdul Pathan, Organizer & Moderator, PA College of Technology

Using Social Networks and Internet Based Audience Response Systems in the Classroom  
Sunita Mondal, Slippery Rock University and Roger Solano, Slippery Rock University

Lecture Preparation and Assessment of Student Learning  
Abdul Pathan, PA College of Technology

Does Online Homework System for Statistics Improve Student Learning?  
Margaretha Hsu, Shippenburg University

Strengthening Student Collaboration and Justice in an Online Class.  
Sandra Trejos, Clarion University

Session F3D: Microeconomics  
Location: Rector 1113  
Chair: Robert D’Intino, Rowan University

Bankruptcy and Steel Plant Shutdowns  
Robert Rogers, Ashland University

Endogenous Timing and Strategic Choices: The Cournot-Bertrand Model  
Kosin Isariyawongse, Edinboro University

Agency Theory and the Effects of Executive Compensation on Stockholders’ Wealth  
David Nugent, Slippery Rock University

Discussants:  
Natalie Reaves, Rowan University  
Stephanie Brewer, Indiana University of Pennsylvania  
Robert Rogers, Ashland University
Session F3E: Miscellaneous Topics
Location: Althouse 201
Chair: William Sanders, Clarion University

Electricity Theft in the US
Keva Steadman, Binghamton University

An Economic Analysis of New Legal Forms to Support American Social Enterprise
Robet D’Intino, Rowan University and John Sinisi, Penn State - Schuylkill

Endogenous Dollarization and Optimal Exchange Rate Policy: The Role of Nontradable Goods
Luis Palacios-Salguero, Point Park University

Discussants:
Robert D’Intino, Rowan University
Thomas Tolin, West Chester University
William Sanders, Clarion University

Session F3F: Agricultural and Natural Resource Economics
Location: Althouse 204
Chair: Steven Andelin, Penn State University- Schuylkill

Role of Teledensity in the Telecom Sector and its Impact on Pakistan’s Economic Growth
Adiya Kiani, The Federal Urdu University of Arts, Science & Technology

The Impacts of Ethanol Production on Global Food Inflation: Food Vs. Fuel
Tahereh Hojjat, DeSales University and Bhagyavati, Desales University

Co-Movements of Business Cycles in the Maghreb: Does Trade Matter?
Belhadj Aram, University of Orleans

Impact of Climate Change on Agricultural Production in Asian Countries: Evidence from Panel Study
Jaehyuk Lee, Auburn University

Discussants:
Kenneth Smith, Millersville University
Steve Andelin, Penn State University
James Dunn, Edinboro University
John McCollough, Penn State University – Lehigh Valley
Session F3G: Student Poster Session  Location: Rector Science Center Atrium

Does Securitization Result in Too Many Students Getting Loans?
Amber Link, Clarion University

Friday, June 3, 2011  3:30 p.m. – 3:45 p.m.

Coffee Break – The Rector Science Center Atrium

FRIDAY, June 3, 2011  3:45 p.m. – 4:45 p.m.

Presentation on the Regional Economy by Luke Tilly, Regional Economic
Advisor, Federal Reserve Bank of Philadelphia

Althouse 106

FRIDAY, June 4, 2010  4:45 p.m. – 5:45 p.m.

Reception
hosted by the Federal Reserve Bank of Philadelphia

Rector Science Center Atrium

SATURDAY, June 4, 2011  8:00 a.m. – 9:00 a.m.

Conference Registration & Coffee
(Rector Science Center Atrium)
Saturday, June 4, 2011   9:00 a.m. – 10:15 a.m.

**Session S1A: Special Topics**  
**Location: Rector 1104**  
Chair: *Orhan Kara*, West Chester University

Friending Facebook, Timely Tweets: Using Web 2.0 in Economics Education  
*John Hineman*, Point Park University, and *John Norris*, Slippery Rock University

Incentives and Outcomes in Even Matches in Men’s Professional Tennis  
*Tomi Ovaska* and *Albert Sumell*, Youngstown State University

The Partnership of EDGAR Online and XBRL – Should Compustat Care?  
*Pavani Tallapally*, Slippery Rock University, *Michael Luehlfing*, Louisiana Tech University and  
*Madhu Motha*, Butler Community College.

**Discussants:**  
James Jozefowicz, Indiana University of Pennsylvania  
Orhan Kara, West Chester University  
David Nugent, Slippery Rock University

**Session S1B: Urban, Rural & Regional Economics**  
**Location: Rector 115**  
Chair: *Lynn Smith*, Clarion University

The Effect of Automobile Production on the Growth of Non-Farm Proprietor Densities in Alabama’s Counties  
*Sooriyakumar Krishnapillai*, Auburn University

Retail and Population Density in Smaller U.S. Cities  
*William Bellinger* and *Jue Wang*, Dickinson College

The Economic Impact of Reading Downtown Streetcar Project  
*Tufan Tiglioglu* and *Takele Tassew Mojire*, Alvernia University

**Discussants:**  
*William Sanders*, Clarion University  
*Lynn Smith*, Clarion University  
*Michael Hannan*, Edinboro University
Session S1C: Student Session: Economic Development
Location: Rector 117
Chair: Sandra Trejos, Clarion University

Military Trade and Economic Development in Brazil
Braden Picardi, Clarion University

Standard of Living in the United Arab Emirates
James Eckels, Clarion University

Discussants:
James Eckels, Clarion University
Braden Picardi, Clarion University

SATURDAY, June 4, 2011  10:30 a.m. – 11:00 a.m.

GENERAL MEMBERSHIP BUSINESS MEETING

Althouse 106

This Annual Business Meeting of the General Membership of the Pennsylvania Economic Association is open to the entire membership of the PEA, including all registrants at the conference.

SATURDAY, June 4, 2011  11:15 a.m. - Closing

There is no formal closing session, but conference participants are welcome, and encouraged, after the last set of paper sessions, to stay and chat as long as you wish and thank you for helping to make this year’s conference a success.
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<td>Wang, Hui</td>
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<td>White, Roger</td>
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<td>Woodburne, Paul</td>
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<td>Zahoor, Raja Asif</td>
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ABSTRACT
During the recent economic recession, many households find themselves struggling in financial distress. They slip deeper into debt, have higher chance of default on their debt obligations, and consequently bear enormous burdens and stress in managing their daily finance. This paper use a new data set to reveal the overall debt stress levels from 2006 to 2010, which spans the collapse of the subprime mortgage market and ensuing economic downturn. The empirical analysis finds evidence that consumer debt and consumer loan delinquency could have a greater impact on individual’s stress and anxiety levels, compared to mortgage debt and mortgage default.

I. INTRODUCTION
Following the collapse of the subprime mortgage market and the banking crisis, the general downturn in U.S. economy brought about financial difficulties for many households. At the onset of the recession in December 2007, 30 percent of US households reported holding both mortgage and other types of consumer debt, many of whom during the financial downturn experienced unemployment, mounting debt, underwater mortgages, delinquencies and even foreclosure. These financial distresses may have been a chronic strain on an individual’s financial well-being, and can ultimately affect their preferences and future economic decisions.

However, due to the lack of data, little is known about how much stress debt portfolios and the economic conditions can bring about to the homeowners and which types of delinquency will make consumers more stressed out? This paper uses a new national household data set covering the period from 2006 through 2010 to examine factors that affect stress levels related to two major types of debt, mortgage and consumer debt, and particularly it will investigate the relationship between debt stress and consumer delinquency behavior.

Using this new data set known as the Consumer Finance Monthly, an aggregate level Debt Stress Index and individual level Debt Stress Index are constructed. Contrary to the traditional believe that mortgage debt and mortgage default should be more stressful for homeowners compared to consumer loans, this paper finds evidence that consumer debt and consumer loan delinquency could have a greater impact on the individual’s overall stress level. This paper is organized as follows. In section II discusses the related literatures. Section III introduces the survey data. Section IV presents the models for aggregate level and individual level debt stress index. In section V, the empirical findings are presented. Summary and conclusions are given in section V.

II. LITERATURE REVIEW
There has been limited research studying relationship between debt stress and consumer behavior and its economic impact due to the lack of data. Using the survey data from Ohioan, Dretea (2000) shows that anxiety increase with both the ratio of credit card debt to income and being in default, and worrying about one’s overall debt explains some of the age effect. In addition, the author finds younger borrowers have higher levels of credit card debt and debt stress.

Dunn and Mirzaie (2010) use data from the Consumer Finance Monthly (CFM) and find the debt stress index follows the movement of economic conditions. They constructed the debt stress index using four survey questions. The debt stress index reached historic low point in May 2007, just before the collapse of the subprime mortgage market, and then jumped upward brought by the subprime collapse. Since then, the index climbed up steadily as the economy slide into recession until the summer of 2009, as the summit of the stress index.

Olsen and Dunn (2010) examined the data on household balance sheets using the Consumer Finance Monthly and compared the CFM with the Survey of Consumer Finance. They find data from the CFM tract the data from the SCF fairly closely, allowing for normal growth trends and known sample differences. I will use the same survey data for this study.

The National Housing Survey conducted by Fannie Mae in November 2010 found more than half of mortgage delinquent borrowers are very stressed about their debt; however stress
among general public continues to moderate. Most recently on CNN.com, a brief analysis of 10 European countries using government data on suicide rates suggests that the ongoing economic downturn have a larger impact on suicide rates than expected.

Nonetheless there has been no study on the relationship between debt stress level and delinquency behavior when consumers hold different types of debt.

III. DATA

The data used in this paper comes from a national monthly household level survey known as the Consumer Finance Monthly (CFM). The CFM collects current and complete data on household financial situations including credit usage, missed payment, incomes, asset and debt compositions, and related consumer behavior—many of which are not available from other national surveys. Critically to this study, CFM contains very unique data on consumer financial and psychological stress from all consumer debt sources including mortgages, credit cards, car loans, student loans, payday loans etc.

The CFM survey asks the respondents nine questions on debt stress and anxiety levels, in which four will be used in this study in consideration of sample size. These four questions cover debt stress levels and anxiety from their overall debt, problems that their debt situations will cause in the future, and anxiety levels of defaulting in the future. The five possible response categories to each survey question are coded from one to five with one being the lowest stress category. Detailed survey questions are listed in the Appendix.

When constructing the Aggregated Debt Stress Index, the full sample from 2006 to 2010 collected in the CFM, i.e. a total of 16095 observations, are used to generate the full picture of financial stress levels for all households. For individual level analysis of debt stress, the sample is restricted to homeowners who are carrying both mortgage and consumer debt, resulting in a sample size of 5827. In addition, the data are complemented with unemployment data from BLS and House Price Index data from The Federal Housing Finance Agency (FHFA).

IV. MODELING DEBT STRESS

The Aggregate Debt Stress Index

The Aggregate Debt Stress Index and an individual level Debt Stress Index are constructed following Dunn and Mirzaie (2010). The Debt stress Index (DSI) at the individual level is computed based on the four debt stress related questions:

\[
DSI_i = \frac{1}{4} (X_{i,1} + X_{i,2} + X_{i,3} + X_{i,4})
\]

Where \(X_{ij}\) denotes the debt stress level for individual \(i\) by survey question \(j\). In order to examine the overall trend of debt stress level over the economic downturn, the full sample from the CFM from 2006 to 2010 are used and the Aggregate Debt Stress Index (ADSI) is constructed using a rolling three-period technique with weights to enhance the statistical reliability. The initial quarter of available data, 2006 Quarter 1, is set as the base period, which has a raw score of 2.177 in terms of average individual debt stress level. The ADSI is computed using weights with the following formula:

\[
ADSI_t = \frac{100}{2.177} (0.5 \cdot \frac{1}{n_{t-1}} \sum_{i=1}^{n_t} DSI_i + 0.25 \cdot \frac{1}{n_{t-2}} \sum_{i=1}^{n_{t-1}} DSI_i + 0.25 \cdot \frac{1}{n_{t-3}} \sum_{i=1}^{n_{t-2}} DSI_i)
\]

The ADSI from 2006 to 2010 are presented in Table 1 and plotted in Figure 1 with national unemployment rate and House Price Index quarterly change. From 2006 to 2007 Quarter 2, the overall levels of consumer debt stress are relatively flat with ADSI blew 100 points. Since the third quarter of 2007, consistent with the onset of the subprime mortgage and banking crisis, debt stress index shows a substantial increase steadily each quarter until 2009 Quarter 2, when it hits the highest level of 110.6. After that, the ADSI drops gradually and arrives approximately at the base level in the fourth quarter of 2010.

Modeling Individual Debt Stress

Table 2 shows that when subgrouped by delinquency history, more 65% of those who have the experience of more-than-60-day mortgage delinquency have a Debt Stress Index (DSI) greater than 3, which means they feel either quite a bit of stress or a great deal of stress. While only less than 18% of the mortgage non-defaulters stated the same amount of stress. Among the mortgage defaulters, about 34% admit they feel a great deal of stress, compared to only about 5% of the non-defaulters at the same stress level. Borrowers who have missed at least one minimum payment in the past six months on consumer loans also tend to state that they are more stressful than those who are current on their payments. About 64% of the borrowers who have been late on consumer loans by more than three times say they either have quite a bit deal of stress or a great deal of stress—a percentage that is four times as high as those who have never been late in the past six months.

The formal analysis is carried out using Logit model for analyzing the effect of debt burdens and delinquency on debt stress levels given that both mortgage and consumer debt are present for the homeowners. Debt Stress Index at the
proceedings of the Pennsylvania Economic Association

There are five types of explanatory variables in the regression, all of which are listed in Table 3, from five different perspectives: (1) dummy variables for delinquency history (D<sub>i</sub>)—including a dummy for mortgage delinquency, a dummy indicating the consumer has defaulted on consumer loans for equal or less than three times, and a dummy indicating the consumer has been late for more than three times on consumer loans; (2) variables measuring borrower’s financial wellbeing (X<sub>i</sub>)—log liquid asset, log income, log mortgage balance, log total consumer debt, and employment status; (3) variables measuring state level shocks like state level unemployment rate and change in house price index over time (Z<sub>t-1</sub>); (4) age, education and other demographic variables (Y<sub>i</sub>); (5) expectations, specifically the expectation of future unemployment rate (Exp<sub>t</sub>).

V. RESULTS

Table 4 presents the regression results for both Logit and OLS models. Most of the regression results are consistent no matter using Logit or OLS regression. The three delinquency variables are all significant and have positive effects, suggesting that missing consumer loan payments have at least the same impact on individual’s stress level as being delinquent on mortgage payments. On average, if a borrower has missed a minimum payment on consumer loans by more than three times in the past six months, his/her stress level will increase from 2.26 to 4.02 according to the OLS result. This means on average, a homeowner will jump from not very much stress to quite a bit of stress or even to a great deal of stress, while controlling for all other variables. This finding seems to be contradicting the commonsense that mortgage, the biggest household debt, should put more stress on consumers, compared to credit card debt, car loans or other consumer debt, so that consumers should be more struggling and stressed out when being late on mortgage payment. However, a closer examination of borrower’s debt payment priorities, the role of liquidity, and lender’s debt collecting process provides evidence to support the above finding.

Consumers today depend more and more on the liquidity of credit cards by borrowing and revolving balance from month to month to maintain their day-to-day living. In another word, credit card is a close cash substitute and an incomplete insurance against negative income shocks. Delinquencies, especially serious delinquencies on consumer loans mainly credit card debt, lead borrowers to a pressing and stressful situation. When consumers are late on credit card payment for more than 60 days, as in the cases of our samples, they will be classified by lenders as “90 days late”, and lenders will report the delinquency history to credit bureaus. The consequence is not only those borrowers will lose the convenience of liquidity provided by credit cards or any other types of consumer loans, but also their credit scores will become exponentially worse as they move from 90 to 120 days late. Eventually the accounts of the credit card defaulters will be charged-off if they are more than 120 days late regulated by the FDIC law. The defaulters’ information will be sold to a third-party collection agency, which usually uses all kinds of means to collect debt from letters in mail to harassing phone calls. This is a very frustrating situation for defaulters who are particularly urgent in need of cash.

When homeowners are behind on their mortgage payment for 60 to 90 days, lenders will start a foreclosure process. However, the foreclosure process can take from several months to years depending on the state foreclosure laws. For example, in the “judicial process” states lenders have to go through a long, legal process to obtain the deed which can take up to 270 days. Foreclosure nationwide took 478 days in 2010. The National Housing Survey (2010) documented that the mortgage defaulters expected a longer length of time prior to foreclosure. Moreover, according to the Survey, 53% of the general public prioritize their bill payments based on importance to them, and only 12% prioritize their bills by the biggest debt, which is usually the mortgage payment for people who have both mortgage and consumer debt. The above evidence all suggests that for consumers who have both consumer loans and mortgage debt, they may feel the same or even more financially and mentally stressed out if they have missed a payment in the former than in the latter.

The results for financial variables are all significant. Having more liquid asset and income reduce stress levels, while more mortgage balance and consumer loans contribute to higher stress levels. On average, the total consumer debt increases the borrower’s stress level by four times as the same amount of mortgage debt does, suggested by the estimates of the coefficient from the OLS regression. Moreover, the degree of stress and anxiety tend to follow positively with the state level unemployment rate; however, the Debt Stress Index is not affected by changes in the state level house price index.

The age-stress profile is found to be concave, with the stress level peaking out around 54 years old. Consumers who have at least some college education tend to be more capable of controlling their stress level compared to high school graduates and less-than-high-schools. Consistent with Dunn and Mirzaie (2010), a gender difference on stress level is identified in this study with women showing a greater degree of debt stress and anxieties than their male counterparts. As the number of children in the household increase, it is more likely for an individual to report higher stress levels, and married household tend to have lower stress levels. The expectation of the future unemployment rate also explains...
part of the difference in the debt stress. If consumers expect higher unemployment rate in the next year, they are more likely to report higher stress level.

VI. CONCLUSIONS

The recent economic recession with the severe downturn in the housing market, mounting debt burdens and sharply rising delinquency rate, put tremendous financial and mental stress on many households. This paper has used a new national-level household data set, the Consumer Finance Monthly, covering the period from 2006 through 2010 to empirically examine the trend of total debt stress over this critical period, and investigate into the factors explaining the individual level debt stress. Using this new data set with debt stress variables and its very detailed financial information, both the Aggregate Debt Stress Index (ADSI) and individual level Debt Stress Index are constructed.

The ADSI shows how the general stress level of the overall population moves over this critical period. It accurately predicted the onset of the economic crisis with the jump in the ADSI in the third quarter of 2007 and eventually tapered off with the easing of the economy condition after the second quarter of 2009.

When it comes to explaining individual debt stress levels, the finding of this paper challenges the traditional view. It is usually believed that mortgage debt and mortgage default should be make homeowners more stressed out compared to consumer loans and consumer loan delinquency. However, this paper finds evidence that consumer debt and consumer loan delinquency could have a greater impact on an individual’s overall stress level, which may be related to the role of liquidity from consumer loans and the debt collecting process.

Table 1. Aggregate Debt Stress Index

<table>
<thead>
<tr>
<th>Year, Quarter</th>
<th>Aggregate Debt Stress Index (ADSI)</th>
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<tbody>
<tr>
<td>2006q1</td>
<td>100.0</td>
</tr>
<tr>
<td>2006q2</td>
<td>98.2</td>
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<tr>
<td>2006q3</td>
<td>98.9</td>
</tr>
<tr>
<td>2006q4</td>
<td>99.4</td>
</tr>
<tr>
<td>2007q1</td>
<td>99.0</td>
</tr>
<tr>
<td>2007q2</td>
<td>99.7</td>
</tr>
<tr>
<td>2007q3</td>
<td>102.9</td>
</tr>
<tr>
<td>2007q4</td>
<td>104.8</td>
</tr>
<tr>
<td>2008q1</td>
<td>104.5</td>
</tr>
<tr>
<td>2008q2</td>
<td>106.2</td>
</tr>
<tr>
<td>2008q3</td>
<td>107.4</td>
</tr>
<tr>
<td>2008q4</td>
<td>106.7</td>
</tr>
<tr>
<td>2009q1</td>
<td>108.5</td>
</tr>
<tr>
<td>2009q2</td>
<td>110.6</td>
</tr>
<tr>
<td>2009q3</td>
<td>106.9</td>
</tr>
<tr>
<td>2009q4</td>
<td>101.3</td>
</tr>
<tr>
<td>2010q1</td>
<td>98.9</td>
</tr>
<tr>
<td>2010q2</td>
<td>98.3</td>
</tr>
<tr>
<td>2010q3</td>
<td>98.2</td>
</tr>
<tr>
<td>2010q4</td>
<td>98.5</td>
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Note: Total sample size: 16095
Table 2: Debt Stress Index and Delinquency History

<table>
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<tr>
<th></th>
<th>DSI&gt;3</th>
<th>4&lt;DSI&lt;=5</th>
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<tr>
<td>No Mortgage Delinquency</td>
<td>17.76%</td>
<td>4.83%</td>
</tr>
<tr>
<td>Mortgage 60-day Delinquency</td>
<td>65.38%</td>
<td>33.85%</td>
</tr>
<tr>
<td>No Consumer Loan Delinquency</td>
<td>14.78%</td>
<td>3.60%</td>
</tr>
<tr>
<td>Consumer loan Delinquency &lt;=3 times</td>
<td>36.21%</td>
<td>12.76%</td>
</tr>
<tr>
<td>Consumer loan Delinquency &gt;3 times</td>
<td>64.04%</td>
<td>20.78%</td>
</tr>
</tbody>
</table>

Figure 1. Aggregate Debt Stress Index, Unemployment Rate and HPI Change from 2006 Q1 to 2010 Q4
Table 3. Definition of Variables

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Definition</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortgage Delinquency</td>
<td>1 if ever missed a mortgage payment for more than 60 days in the past 12 months; 0, otherwise</td>
<td>0.026</td>
</tr>
<tr>
<td>Consumer Loan Delinquency &lt;=3 times</td>
<td>1 if missed minimum payments for more than 60 days on consumer loans by less than or equal to three times in the past six months; 0, otherwise</td>
<td>0.11</td>
</tr>
<tr>
<td>Consumer Loan Delinquency &gt;3 times</td>
<td>1 if missed minimum payments on consumer loans by more than three times in the past six months; 0, otherwise</td>
<td>0.035</td>
</tr>
<tr>
<td>Log Financial Assets</td>
<td>Log total household Financial assets</td>
<td>11.4</td>
</tr>
<tr>
<td>Log Income</td>
<td>Log total annual household income</td>
<td>10.3</td>
</tr>
<tr>
<td>Log Mortgage Balance</td>
<td>Log mortgage balance</td>
<td>11.5</td>
</tr>
<tr>
<td>Log Consumer Debt</td>
<td>Log total amount of consumer debt</td>
<td>5.9</td>
</tr>
<tr>
<td>State Unemploy. Rate</td>
<td>State-level unemployment rate</td>
<td>6.3</td>
</tr>
<tr>
<td>HPI Change</td>
<td>Quarterly change in state level house price index</td>
<td>-0.20</td>
</tr>
<tr>
<td>Age</td>
<td>Age of the respondent</td>
<td>50.8</td>
</tr>
<tr>
<td>Age 2</td>
<td>Age square</td>
<td>2735</td>
</tr>
<tr>
<td>Gender</td>
<td>1 if female; 0 if male</td>
<td>0.54</td>
</tr>
<tr>
<td>Marital Status</td>
<td>1 if married; 0 otherwise</td>
<td>0.77</td>
</tr>
<tr>
<td>Ethnic/Racial</td>
<td>1 if white; 0, nonwhite</td>
<td>0.85</td>
</tr>
<tr>
<td>No. of Children</td>
<td>Number of children in the household</td>
<td>0.87</td>
</tr>
<tr>
<td>College</td>
<td>1 if at least some college education; 0 if no college</td>
<td>0.53</td>
</tr>
<tr>
<td>&lt; HS Degree</td>
<td>1 if less than high school; high school grads omitted group</td>
<td>0.032</td>
</tr>
<tr>
<td>Expectation</td>
<td>Expectation of unemployment rate one year later; 1 if expect worse</td>
<td>0.36</td>
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</table>
Table 4. Regression Result

Dependent Variable: Debt Stress Index

<table>
<thead>
<tr>
<th>Variables</th>
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<th></th>
<th>OLS</th>
<th></th>
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<td></td>
<td>Estimate</td>
<td>Std. Error</td>
<td>Estimate</td>
<td>Std. Error</td>
</tr>
<tr>
<td>Mortgage Delinquency</td>
<td>0.48**</td>
<td>0.21</td>
<td>0.28**</td>
<td>0.097</td>
</tr>
<tr>
<td>Consumer loans Delinquency &lt;=3 times</td>
<td>0.85**</td>
<td>0.11</td>
<td>0.48**</td>
<td>0.064</td>
</tr>
<tr>
<td>Consumer loans Delinquency &gt;3 times</td>
<td>1.4**</td>
<td>0.17</td>
<td>0.76**</td>
<td>0.11</td>
</tr>
<tr>
<td>Log Financial Asset</td>
<td>-0.19**</td>
<td>0.020</td>
<td>-0.11**</td>
<td>0.011</td>
</tr>
<tr>
<td>log Income</td>
<td>-0.16**</td>
<td>0.041</td>
<td>-0.071**</td>
<td>0.024</td>
</tr>
<tr>
<td>log Mortgage Balance</td>
<td>0.070**</td>
<td>0.014</td>
<td>0.025**</td>
<td>0.008</td>
</tr>
<tr>
<td>Log Consumer Debt</td>
<td>0.22**</td>
<td>0.027</td>
<td>0.12**</td>
<td>0.016</td>
</tr>
<tr>
<td>State Unemployment Rate</td>
<td>0.079**</td>
<td>0.020</td>
<td>0.073**</td>
<td>0.005</td>
</tr>
<tr>
<td>HPIC</td>
<td>-0.25</td>
<td>0.35</td>
<td>-0.25</td>
<td>0.21</td>
</tr>
<tr>
<td>Age</td>
<td>0.11**</td>
<td>0.020</td>
<td>0.048**</td>
<td>0.007</td>
</tr>
<tr>
<td>Age^2</td>
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Notes: The samples are the households which have both mortgage and consumer debt.
**: significant at 5%. *: significant at 10%.

APPENDIX

The Debt Stress Index is based upon four survey questions which are presented below. The five possible response categories are coded from one to five with one being the lowest stress category, as well as the category. Note that all the individuals in our sample have both mortgage debt and consumer debt.

The wording of the survey questions is presented below.

1. Overall, how often do you worry about the total amount you (and your spouse/partner) owe in overall debt? Would you say you worry (a) all of the time; (b) most of the time; (c) some of the time; (d) hardly ever; or (e) not at all?

2. How much stress does the total debt you (and your spouse/partner) are carrying cause to you? It is (a) a great deal of stress; (b) quite a bit; (c) some stress; (d) not very much; or (e) no stress at all?

3. Now, thinking ahead over the next five years, how much of a problem, if any, will the total debt you (and your spouse/partner) have taken on be for you? Will it be (a) an extreme problem; (b) a large problem; (c) medium problem; (d) small problem; or (e) no problem at all?

4. How concerned are you that you (and your spouse/partner) will never be able to pay off these debts? Are you (a) very much concerned; (b) quite concerned; (c) somewhat concerned; (d) not very concerned; or (e) not at all concerned
REFERENCES


METHODOLOGY FOR CONDUCTING A LOCAL IMPACT STUDY: THE CASE OF THE CLOSING OF THE CLAIRON O-I GLASS PLANT

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Clarion University of Pennsylvania

ABSTRACT
The purpose of this paper is to document the methodology that was used for a local impact study, and which can serve as a guide for others. The case in the original impact study was that of the closing of the Owens-Illinois (O-I) glass plant in Clarion, PA. In the study, a well-known regional input-output model was used in conjunction with survey results for a forecast that was more reliable than either method alone could provide. This paper illustrates how the model and survey were combined to improve the forecast.

BACKGROUND
Clarion County is located in the heart of Northwest Pennsylvania. It is predominantly rural, with extensive forest and parklands. The entire county has only about 40 thousand inhabitants, with a labor force of less than half of that. Clarion Borough, the county seat, has about 6,000 residents, as do the University and the surrounding township. The balance of the county population can be found in a few other towns or scattered about the county.

Owens-Illinois Corporation was the largest private employer in the county at the time of the announced closing, scheduled for July, 2010, and the third largest overall behind Clarion University and the Clarion Hospital. The loss of 420 of the highest paying jobs in the county was feared to have a devastating effect on the local economy, especially due to its local linkages. A previous downsizing of the plant to less than half of its original complement in the 1990s, the loss of two plants in the 1990s and the loss of another major employer in the 2000s raised the level of concern for the balance of the local economy. For that reason, the Clarion County Economic Development Corporation contacted the Clarion University Bureau of Business and Economic Research to estimate the impact of the planned closing in Balough, Raehsler and Sanders (2010). The full study can be viewed online at the CCEDC website in Clarion County Economic Development Corporation (2010).

INPUT-OUTPUT ANALYSIS
Input-output model and software comes from IMPLAN (2010). For those unfamiliar, IMPLAN software is based upon an input-output matrix, which can be disaggregated to individual counties, or to defined regions. Regional impacts may be seen by adding or deleting industries or parts of industries. As noted in the report itself, one primary advantage in utilizing this software program is that it provides employment and spending multipliers.

When using IMPLAN, the target industry of the region is assumed to have the same characteristics as that of the national industry. Likewise, the labor force is assumed to have characteristics of the national labor force of that industry. Using this model, we would have projected that the initial 420 jobs lost directly would result in a total (including indirect and induced losses) of about 800 lost jobs. That would represent a substantial percentage of the adult workforce – enough to raise the unemployment rate of over 10% by more than an additional 4%. This is consistent with a similar study from the Pennsylvania State Workforce Education and Development Initiative. Indeed, it would be overwhelming during tough economic times. Forecasts for local taxes, housing markets and services were equally dire using the unrefined model.

WORKFORCE SURVEY
Our novel approach was born of the fact that we knew about the local market conditions, and how they were different from those of the national industry. One hint came from the downsizing a decade earlier. Hiring had halted altogether for a while, which meant that a higher percentage workers were nearing retirement than might otherwise be expected. It also meant that the balance of the workers were relatively young, and might be able to relocate or find employment in other industries. We suspected that the cuts in the labor force might be more transitory than first thought.

In order to follow up on our suspicions, a survey of employees was done. One third of the employees responded. We confirmed that half ranged from 50 to 59 years old, 78 percent fell in the range between 40 and 59 years of age, and over 5% were over 60 years of age. As a result, 57.1% of respondents had at least 20 years of tenure, while 33.6% had less than 5 years at the plant. It was also confirmed that the average earnings of individuals ($52,500) was above the average household income in Clarion County ($42,000) and a substantial part of their own family incomes ($65,500).
RESULTS

A number of O-I employees expected to retire, some using the early retirement option. Less than 60% of the employees at O-I expected to become unemployed. Of those, a number had plans to become self-employed or move to get jobs. The remainder had strong ties to the area, and planned to seek jobs locally. Many owned their homes, and over 90% said that there would be no change in their housing situation.

As a result, the first-round (420), indirect and induced unemployment adds up to an IMPLAN forecast of 661 jobs lost, rather than 800. Implications for local income and tax revenues were also suitably muted. Income was forecasted to fall $20-24 million, and tax revenues about $250,000. These represent a challenge to the local economy, but not the overwhelming one originally predicted.

REFERENCES


WHEN SECTORAL GROWTH MEETS EXPORTS: WHY ARE SOME INDUSTRIES WINNING THE GLOBAL COMPETITION?

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ABSTRACT
This paper uses US sector-level manufacturing industry data and looks into how sector’s learning-by-exporting (LBE) effect can be affected by innovation effort. Empirical evidence tells us that positive correlation between exports and productivity exists only among those sectors which pay the highest amount in R&D. Further tests show that it is only in the same group that sectoral exports can significantly raise both productivity level and growth rate. Through estimation of sectoral innovation input growth, it is also found that a faster innovation growth can enlarge this influence.

I. INTRODUCTION
There are always winners and losers under globalization. Some industries, e.g. computer and kindred manufacturers, had soared during the last couple of decades in 20th century, while other industries vanished during the same period. In other words, under the circumstance that trade prospered greatly between different regions in the world, different industries share very little in their growth path, however. To be specific, being featured by different export or import status, each sector will thereby have its own development pace. Therefore, how can a sector's trade status influence its growth?

This paper is motivated by the empirical evidence that exports do have correlation with sectoral productivity growth, but it is significantly positive only when sectoral R&D funds are high enough. Therefore, innovation appears to be an intriguing and important channel for the so-called learning-by-exporting (LBE) theory to come into existence. If every sector needs to pay for innovation to increase its productivity, the innovation effort plays an importance role and varies the impact of export on productivity growth. If the innovation effort is low, then export importance only casts ambiguous influence on productivity and its growth in a neglectable way. However, if the effort is high enough, export importance will be able to speed up sectoral development significantly.

As for the empirical tests of the influence of exports on productivity, in order to eliminate the probable endogeneity in the OLS regression, I use instrumental variables and implement 2SLS estimation. Furthermore, I look into how fostered innovation growth affects productivity growth. The methodology includes two steps. The first one is to estimate the SIC4 R&D values based on the SIC2 data. Assume that R&D values at both SIC levels are affected by the same estimators at corresponding levels to the same extent. In this way, I use the estimators that have information on both SIC levels as a bridge, which helps me find the SIC4 innovation effort under each SIC2 category. Next, using the estimated R&D growth values as the fixed effects on the regression, how the fostered innovation growth makes difference to productivity growth can thus be revealed.

This paper is organized as the following. Section II establishes the empirical motivation of this paper. Section III implements empirical tests to look into the causality relationship between exports and productivity; to be specific, whether exports influence sectoral productivity growth and how this process is influenced by innovation. Section IV estimates innovation growth rate for each sector and the effect it has on LBE, while section V concludes the paper.

1.1 Literature review
Looking into the relationship between exports and productivity, we can find a tremendous amount of work demonstrating the positive relationship between them. Traditionally speaking, high productivity is well known as the reason why advanced firms or industries benefit more from international trade; only more profitable and competent firms can afford to export, which is more costly than merely operating domestically. It is well known as a "self-selection effect" (Bernard et. Al., 2004; Lopez, 2004), which has been proven by a large amount of theoretical and empirical evidence. However, this paper considers another dimension of the causality: better exporting behavior can stimulate sectoral growth more under an open economy. There are already theories considering the causality through this view. For example, learning by exporting (Marin, 1992; Ben-David, 1993) explains how firms grow faster because of their exports; the international trade which the firms participate in would speed their own development. There are ex-post benefits for exporting firms, which have access to advanced knowledge and skills not available domestically, and such learning can enhance firms' innovation and efficiency. So far all empirical tests based on different samples have shown

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both positive and negative feedback to this theory, indicating that the theory itself is very case-sensitive. In Clerides et al. (1998), the authors use plant-level data from Mexico, Columbia and Morocco yet find no evidence that firms’ cost will be affected by previous exporting behaviors. To improve the theory more needs to be considered. In Baldwin et. Al. (2008), a combined conclusion is established; they find that openness increases industry productivity in a level sense, but it has ambiguous effect on its growth rate. Freer trade slows down industry growth by raising the expected fixed cost of innovation but not affecting expected benefits. In this paper, I am also going to look into how this ambiguous effect of exports on productivity is caused, but through the channel of R&D funds.

II. MOTIVATION

Let’s briefly look into the US data and find the relationship between industry’s exports and its productivity first. I use 5-factor TFP (TFP5) to estimate productivity level. The data comes from CES Manufacturing Industry Database (Bartelsman et. al., 2000). The effect of export on growth rate is very likely to be determined by the variation of innovation input, and a separation is used here so as to distinguish between different cases by various innovation levels. In considering how costly it would be to make progress for a firm in one industry, I use summary dataset for R&D - performing companies in selected manufacturing and detailed nonmanufacturing industries: 1993 - 94. Among all these 433 manufacturing industries, according to their R&D funds invested by companies, they are divided into three groups: industries those of which only spent less than $ 500 million, those spent more than $ 500 million but less than $ 2000 million, as well as those spent more than $ 8000 million. Hereafter they are mentioned as group 1, group 2 and group 3 respectively for short. The details are shown in Table 1.

Among all these cases, as for the productivity level, if there is no division according to sectoral R&D payment, exports will have a significantly positive correlation with productivity. If we look into each group which pays differently for innovation, we can see that group 1 and group 2 both show negative yet insignificant correlation between exports and productivity. Among sectors that pay R&D funds low enough, export value can slow down sectoral productivity growth rate, in a neglectable way though. In other words, if R&D investment is not high enough, exports can slow down sectoral growth rate. Intuitively, if the firms fail to put enough effort on improving their technologies, they can hardly learn from their exporting activities. It is in group 3 where the highest innovations are made can sectoral exports have positive correlation with productivity. Only the coefficients of export value of the third group, or for those most advanced industries which need to pay highest cost to innovate, are statistically significant.

We have similar findings on productivity growth rate. Among all the groups the correlation between exports and productivity growth is positive and significant; but when we divide them into different groups based on sectoral R&D input, group 3 is the unique group where significant and positive correlation shows up. Group 1 shows a positive elasticity while group 2 negative; both of them are insignificant though. Only if sectors work hard enough on innovation can their efforts be repaid; sectoral growth rate will therefore positively correlated with exports. Hence, when the innovation input is low, export has ambiguous yet neglectable correlation with sectoral productivity growth rate; when innovation effort is high enough exports appear to be positively correlated to sectoral growth significantly.

III. EMPIRICAL TEST

3.1 Productivity level

In order to inspect the influence of exports on productivity, the regression equation is

\[ TFP5_i = \beta E_i + T_i \theta + \epsilon_i \]  

where $E_i$ denotes the export value of each industry $i$. It uses U.S. Imports and Exports by 4-digit SIC Industry (Feenstra, 1994). Besides the dollar value of each US manufacturing industry’s total export, $T_i$ denotes a vector of industry characteristics; there are following explanatory variables -- $Cap$: real capital per employment; $Pien$: deflator for cost of electric & fuels; $Piinv$: deflator for total capital expenditure; $Prodw$: production worker wages; $Vship$: total value of shipments; $Vadd$: total value added. Besides, the TFP data comes from CES Manufacturing Industry Database. $\epsilon_i$ is the estimation error term.

Hereby I use the same dataset which has been used previously and U.S. Imports and Exports by 4-digit SIC Industry (Feenstra, 1994). However, since there is mutual influence between export and productivity, and this paper focuses on one dimension -- how export can increase sectoral productivity -- there is an endogeneity problem in our previous estimation. In order to remove the possible endogeneity in export value, the method of 2SLS is applied here instead of OLS. Using both sectoral tariff and deflated material costs as solid instrumental variables, now we can run the regression and know the effects of exports on productivity.

In Table 2, different rows report $\beta$ from estimations using different sets of independent variables. From the above to the below, row by row in this table I add explanatory variables into the regression one after one. In this way, we may check the robustness and consistence of $\beta$’s significance. If it is significant with only one or two of other explanatory variables, but loses its significance after more variables being
added in, we can tell that the exports do not have noticeable correlation with productivity.

If all the groups are included in the pooled sample and there is no division by R&D efforts, sectoral export values will constantly have positive effect on productivity. What’s more, together with other relevant industry characteristics, export value has an increasingly positive influence with sectoral productivity. There are two reasons for this result: on the one hand, exporters absorb new knowledge and skills from exporting behavior and become more competent; on the other hand, only firms or sectors with higher productivity qualify for trading with the overseas. Export values’ positive impact on productivity is directly shown here.

However, as for group 1 and group 2, most of the elasticities turn out to be negative. Also, none of them is significant. Only in group 3 where the greatest innovation effort was made can export value has significant and positive influence on productivity. This proves that only when a sector is paying enough effort on their R&D activities can their exports enhance productivity. Otherwise, even if it has a remarkable export advantage, its production technology can still be very low.

### 3.2 Productivity growth rate

In order to consider whether export importance can enhance sectoral productivity growth through the channel of innovation, 2SLS method is again applied here. Evaluate

\[ DITFP_{i} = E_{i} + T_{i} + \theta + \varepsilon_{i} \]  

(2)

Still using both tariff and deflator for total cost of materials as IVs, we can achieve the results in Table 3.

From the results in Table 3, we can find that among all these three groups, only the coefficients of export importance of the third group, or those most advanced industries which need to pay highest cost to innovate, remains positive and statistically significant. As for group 1 and group 2, none of the influences are significant. Compared with Table 1 where OLS instead of 2SLS was used, we can have more interesting findings. First of all, if there is no consideration of innovation effort, no significance appear anymore. Between sectoral export importance and growth rate there is no correlation worth noticing. Second, in group 3 with the highest payment of R&D, the positive influence of exports on growth rate has increased while the significance has decreased. It happens because there is mutual positive feedback between exports and growth; faster sectoral growth enlarges exports, and larger exports also speed up growth rate. After the endogeneity problem is removed by 2SLS, the unilateral influence of exports on growth rate will be weakened. However, as we can tell from Table 3, this influence is still significant even though the significance is lower. More important exports can cause faster sectoral growth when innovation is expensive enough. Third, as for group 1 and group 2, the influences are not consistently positive or negative anymore; they are quite ambiguous yet still with no significance appearing. Exports cannot affect sectoral growth in every other way, if the innovation effort is low.

### IV. EFFECT OF SECTORAL R&D GROWTH

After confirming the conclusion that only when innovation investment is high enough can exports improve sectoral productivity and its growth, the next thing we need to consider, is whether an increase of innovation growth can enlarge the impact on both productivity level and growth rate exerted by exports. However, based on the current database I only have R&D information by SIC2, but all the productivity and growth rate are recorded on SIC4 level. Therefore, I will manage to estimate R&D by SIC4 by using some variable which have information on both SIC levels as the “bridge” estimators, and include the results in the following regression.

#### 4.1 Estimation of sectoral R&D growth

Let R&DS indicate the innovation input at SIC2 level, while R&Ds indicate SIC4. Therefore S denotes the SIC2 sector, while s the SIC4. I have 9 variables on both SIC2 and SIC4 level: total real capital stock (Cap), real capital equipment (Equip), real capital structures (Plant), total capital expenditure (Invest), cost of electric and fuels (Energy), total cost of materials (Matcost), production worker hours (Prodh), production worker wages (Prodw), and firm-level domestic net sales (Firm). Hereafter I name these variables "both-way" variables.

Assume R&D at both SIC levels are affected by the same variables in the same way. In other words, when we establish the relationship between R&D and all these variables at SIC2 level:

\[ R&D_S = \prod_{n=1}^{6} M_{nS}^s \]  

(3)

\[ R&D_s = \prod_{n=1}^{6} M_{ns}^S \]  

(4)

where \( M_{nS}^s \in \{Cap, Equip, Plant, Invest, Energy, Matcost, Prodh, Prodw, Firm\} \), including all the both-way variables at SIC2 level. Out of the same logic \( M_{ns}^S \) corresponds to all the corresponding SIC4 both-way variables.

Now establish the relationship between all the SIC2 and SIC4 variables. Let \( R&D_s = R&D_S \ast a_s \), and \( M_n = M_{nS} \ast a_m \). Therefore we have

\[ a_s = \prod_n a_m^n \]  

(5)
By running the regression at SIC2 level, we can have all the necessary elasticity \( \lambda_i \); using both SIC2 and SIC4 data (namely \( M_n \) and \( M_m \)) we will also know what \( a_m \)s are. Based on these results \( R&D_i \) can be estimated for each SIC4 sector.

First of all let us estimate all the relevant coefficients in (3) through

\[
\log R&D_S = \sum_{a=1}^{9} \lambda_a \log M_{aS} \tag{6}
\]

The estimation results are in Table 4. After using all the estimated \( \lambda_a \)s and calculating the \( a_m \) for each SIC4 sector, now we can estimate \( R&D_i \) for them too, and therefore \( \log R&D_s \) as the sectoral innovation growth rates.

4.2 Learning by exporting effect

Next let us consider whether innovation growth has significant effect on LBE. To do this I look into the fixed effect of innovation growth; I divide all the \( R&D \) growth rates into different groups based on their values and use them as dummy variables, and then check their influence on industries' learning by exporting process.

As in table 5 and table 6, after calculating the \( R&D \) growth rate for each sector, I rank them into several groups from the lowest value to the highest. I name them \( log R&D1_{i} \), \( log R&D2_{i} \) and so on. \( log R&D1_{i} = 1 \) if \( log R&D_{i} \in (-5, -2) \), = 0 otherwise; \( log R&D2_{i} = 1 \) if \( log R&D_{i} \in (-2, -1) \), = 0 otherwise; \( log R&D3_{i} = 1 \) if \( log R&D_{i} \in (-1, 0) \), = 0 otherwise; \( log R&D4_{i} = 1 \) if \( log R&D_{i} \in (0, 1) \), = 0 otherwise; \( log R&D5_{i} = 1 \) if \( log R&D_{i} \in (1, 2) \), = 0 otherwise; \( log R&D6_{i} = 1 \) if \( log R&D_{i} > 2 \), = 0 otherwise. By adding these dummy variables into 2SLS estimations based on (1) and (2), I can further look into how innovation growth influences sectors' LBE process, and whether higher growth rate is magnifying or shrinking the sectoral productivity.

In both Table 5 and Table 6 there are 4 panels, each of which corresponds to regressions based on different sample pools, namely all groups without divisions of \( R&D \) funds, group 1 that pays the lowest for innovation, group 2 that pays medium, and group 3 that pays the highest amount of companies-performed \( R&D \). In every panel, each column stands for different regressions including specific set of explanatory variables, while each row reports the elasticity of sectoral exports and estimated \( R&D \) growth dummies.

From Table 5 we can have these findings. First, compared with the previous regressions (Table 2), in Table 5 the elasticities of export values all have the same signs, and are still significant only in Panel A and Panel D. When we control the \( R&D \) funds, even after the \( R&D \) growth rate fixed effect is added into our consideration, the exports' significantly positive effect on sectoral productivity level exists only when \( R&D \) funds are high enough. And for all the three groups, their exports elasticity all change to some extent, meaning \( \log R&D \) fixed effect do affect the LBE regressions significantly. After the exports value is controlled, if a sector has different fostered innovation growth, its productivity is also going to vary.

Second, it is noticeable that only in Panel D with group 3 the elasticities of \( log R&D \) fixed effects stay being positive and increase drastically. Therefore after controlling the export values, the faster a sector's \( R&D \) grows, the higher its productivity will be. Given the highest \( R&D \) funds being paid, exports will be able to enhance sectoral productivity level greatly, and faster \( R&D \) growth rate will also push the productivity even higher so as to exaggerate industries' LBE effects under the high-initial-R&D circumstance.

Next, look into other groups. Speaking of \( R&D \) growth fixed effect, in Group 1 it will slow down the sectoral productivity level significantly as the elasticities all decrease remarkably when \( \log R&D \) rank increases. When exports value is controlled the faster the sector grows, its productivity will fall greatly if the initial \( R&D \) funds are low enough. In group 2 the \( \log R&D \) fixed effect is very ambiguous, in the sense of both signs and values. It is very difficult to tell whether LBE is going to be affect by fostered innovation growth or not. However, it is certain that only Panel A, where all the groups are in the pooled sample, and Panel B where lowest amount of \( R&D \) funds are being paid have significant \( \log R&D \) elasticities.

In Table 6 the results are similar. It is only in group 3 that pays the highest initial \( R&D \) funds we can find positive \( \log R&D \) fixed effect, and it is also increasing drastically when the \( \log R&D \) rank rises. Under the high-initial-R&D circumstance, exports will enhance sectoral productivity growth significantly, and higher \( R&D \) growth rate will accelerate this process and increase the growth more.

Furthermore, now both group 1 and group 2 have vague and insignificant \( \log R&D \) effects. Only in group 3 the elasticities of exports and the dummy variables turn out to be significant. In group 1 and group 2, the effects of exports are still ambiguous yet insignificant in all the different regressions; so are the elasticities of \( R&D \) growth dummies. Thus, only when the sectors pay for innovation high enough can their exports improve productivity growth significantly, and this LBE process will be enlarged by faster innovation growth.

V. CONCLUSION

This paper looks into how a sector's innovation effort influences its productivity. The results show that only among those sectors which put high enough effort on innovation can
exports promote productivity growth significantly, or the so-called "learning-by-exporting" phenomenon exists. Also, it is in the same group that exports can have persistently positive influence on future productivity growth as well. Besides initial R&D investment, the innovation growth rate changes the size of learning-by-exporting. The faster the innovation grows, the larger the effect of sectoral exports exert on productivity.

Of course problems still exist. Only when R&D effort is high enough can sectoral exports improve productivity significantly, and acquired innovation growth can enlarge this process. However an importance question still remains: how high is high enough? Is there an innovation effort threshold so that only beyond this threshold can learning-by-exporting happen? How will this threshold be correlated to other sectoral characteristics, for example, export status, trade cost, or growth rate? Second of all, this paper only proves higher R&D growth rates can enlarge sectoral productivity when export value is controlled, in this sense the effect of LBE is strengthened. However, we can further find a measurement for the LBE process; that is, the improvement of a sector, or a plant’s productivity when the export behavior comes into our consideration. Based on this we can have a more accurate and detailed results of how innovation influences the learning-by-exporting process. In a word, more work needs to be done to solve for the theory beneath the learning-by-exporting phenomenon.
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Notes: Table 1 reports the coefficients of exports in simple OLS regressions of TFP5 level and its growth rate against exports as in (1) and (2). \( E_i \) is measured in $10^{11}$.

*** Significant at or less than 1%.

** Significant at or less than 5%.

* Significant at or less than 10%.
### Table 2: Effect of Export Values ($\beta$) on Productivity Level by R&D Funds

<table>
<thead>
<tr>
<th>Regressors</th>
<th>All Groups</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export Value</td>
<td>3.60***</td>
<td>-5.96</td>
<td>-6.21</td>
<td>4.61***</td>
</tr>
<tr>
<td>Export Value, $T_1$</td>
<td>4.00***</td>
<td>-6.93</td>
<td>-9.29</td>
<td>4.56***</td>
</tr>
<tr>
<td>Export Value, $T_2$</td>
<td>4.18***</td>
<td>-7.93</td>
<td>6.76</td>
<td>4.75***</td>
</tr>
<tr>
<td>Export Value, $T_3$</td>
<td>4.44***</td>
<td>-3.99</td>
<td>-2.61</td>
<td>4.66***</td>
</tr>
<tr>
<td>Export Value, $T_4$</td>
<td>7.84***</td>
<td>6.53</td>
<td>58.3</td>
<td>8.11***</td>
</tr>
<tr>
<td>Export Value, $T_5$</td>
<td>10.2***</td>
<td>15.0</td>
<td>39.7</td>
<td>7.99***</td>
</tr>
<tr>
<td>Export Value, $T_6$</td>
<td>10.7***</td>
<td>137</td>
<td>157</td>
<td>139</td>
</tr>
<tr>
<td>N. Obs.</td>
<td>433</td>
<td>137</td>
<td>157</td>
<td>139</td>
</tr>
</tbody>
</table>

Notes: This table reports the 2SLS regression coefficients $\beta$ using different sets of explanatory variables for each group of manufacturing industries, as in (1). $T_1 = \{\text{Cap}\}$, $T_2 = \{T_1, \text{Pien}\}$, $T_3 = \{T_2, \text{Piinv}\}$, $T_4 = \{T_3, \text{Prodw}\}$, $T_5 = \{T_4, \text{Vship}\}$, $T_6 = \{T_5, \text{Vadd}\}$. $E_i$ is measured in $10^{11}$. Group 1 has 137 sectors, group 2 has 157 sectors, and group 3 has 139 sectors.

*** Significant at or less than 1%.
** Significant at or less than 5%.
* Significant at or less than 10%.

### Table 3: Effect of Export Values ($\beta$) on Productivity Growth Rate by R&D Funds

<table>
<thead>
<tr>
<th>Regressors</th>
<th>All Groups</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export Value</td>
<td>0.52</td>
<td>-4.94</td>
<td>-1.30</td>
<td>0.70*</td>
</tr>
<tr>
<td>Export Value, $T_1$</td>
<td>0.82</td>
<td>-2.64</td>
<td>0.40</td>
<td>0.64*</td>
</tr>
<tr>
<td>Export Value, $T_2$</td>
<td>0.76</td>
<td>-2.64</td>
<td>0.13</td>
<td>1.06**</td>
</tr>
<tr>
<td>Export Value, $T_3$</td>
<td>0.81</td>
<td>-0.89</td>
<td>0.22</td>
<td>1.13**</td>
</tr>
<tr>
<td>Export Value, $T_4$</td>
<td>1.92</td>
<td>0.62</td>
<td>1.08</td>
<td>1.58**</td>
</tr>
<tr>
<td>Export Value, $T_5$</td>
<td>2.26</td>
<td>5.16</td>
<td>8.51</td>
<td>1.92**</td>
</tr>
<tr>
<td>Export Value, $T_6$</td>
<td>2.54</td>
<td>10.05</td>
<td>2.85</td>
<td>1.86**</td>
</tr>
<tr>
<td>N. Obs.</td>
<td>433</td>
<td>137</td>
<td>157</td>
<td>139</td>
</tr>
</tbody>
</table>

Notes: This table reports the 2SLS regression coefficients $\beta$ using different sets of explanatory variables for each group of manufacturing industries, as in (2). $T_1 = \{\text{Cap}\}$, $T_2 = \{T_1, \text{Pien}\}$, $T_3 = \{T_2, \text{Piinv}\}$, $T_4 = \{T_3, \text{Prodw}\}$, $T_5 = \{T_4, \text{Vship}\}$, $T_6 = \{T_5, \text{Vadd}\}$. $E_i$ is measured in $10^{11}$. Group 1 has 137 sectors, group 2 has 157 sectors, and group 3 has 139 sectors.

*** Significant at or less than 1%.
** Significant at or less than 5%.
* Significant at or less than 10%.
Table 4: $\lambda_n$ Regression Results o R&D at SIC2 Level

<table>
<thead>
<tr>
<th>Regressors</th>
<th>mean</th>
<th>std. error</th>
<th>Regressors</th>
<th>mean</th>
<th>std. error</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\log(\text{Energy})$</td>
<td>-0.07</td>
<td>0.44</td>
<td>$\log(\text{Prodh})$</td>
<td>-0.64</td>
<td>2.14</td>
</tr>
<tr>
<td>$\log(\text{Equip})$</td>
<td>-3.64*</td>
<td>1.68</td>
<td>$\log(\text{Prodw})$</td>
<td>1.97</td>
<td>2.84</td>
</tr>
<tr>
<td>$\log(\text{Invest})$</td>
<td>3.92*</td>
<td>1.80</td>
<td>$\log(\text{Firm})$</td>
<td>2.26***</td>
<td>0.43</td>
</tr>
<tr>
<td>$\log(\text{Matcost})$</td>
<td>-2.20***</td>
<td>0.71</td>
<td>$\log(\text{Cap})$</td>
<td>0.77</td>
<td>0.62</td>
</tr>
<tr>
<td>$\log(\text{Plant})$</td>
<td>-0.79</td>
<td>2.39</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$R^2$ 0.932  N. Obs. 20

Notes: Table 4 reports all the $\lambda_n$ as in (6) based on the information of all SIC2 sectors.
*** Significant at or less than 1%.
** Significant at or less than 5%.
* Significant at or less than 10%.

Table 5: Learning by Exporting Regression (Productivity Level) with R&D Growth Dummy

Panel A: All Groups

<table>
<thead>
<tr>
<th>Regressors</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$E_i$</td>
<td>3.62***</td>
<td>4.01***</td>
<td>4.18***</td>
<td>4.44***</td>
<td>7.86***</td>
<td>10.2***</td>
<td>10.5***</td>
</tr>
<tr>
<td>$\log R&amp;D1$</td>
<td>-0.033*</td>
<td>-0.025</td>
<td>-0.024</td>
<td>-0.024</td>
<td>-0.025</td>
<td>-0.025</td>
<td>-0.033**</td>
</tr>
<tr>
<td>$\log R&amp;D2$</td>
<td>-0.256*</td>
<td>-0.261**</td>
<td>-0.263**</td>
<td>-0.265**</td>
<td>-0.267**</td>
<td>-0.319**</td>
<td></td>
</tr>
<tr>
<td>$\log R&amp;D3$</td>
<td>-0.509</td>
<td>-0.508</td>
<td>-0.515</td>
<td>-0.514</td>
<td>-0.513</td>
<td>-0.516</td>
<td>-0.676*</td>
</tr>
<tr>
<td>$\log R&amp;D4$</td>
<td>-3.770*</td>
<td>-3.730*</td>
<td>-3.793*</td>
<td>-3.781*</td>
<td>-3.757*</td>
<td>-3.775*</td>
<td>-4.726**</td>
</tr>
<tr>
<td>$\log R&amp;D5$</td>
<td>-6.915</td>
<td>-6.822*</td>
<td>-6.956*</td>
<td>-6.913*</td>
<td>-6.995*</td>
<td>-7.004*</td>
<td>-8.566**</td>
</tr>
<tr>
<td>$\log R&amp;D6$</td>
<td>-6.397</td>
<td>-6.270*</td>
<td>-6.470*</td>
<td>-6.415*</td>
<td>-6.413*</td>
<td>-6.479*</td>
<td>-7.810**</td>
</tr>
</tbody>
</table>

Panel B: Group 1

<table>
<thead>
<tr>
<th>Regressors</th>
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</thead>
<tbody>
<tr>
<td>$E_i$</td>
<td>-6.88</td>
<td>-5.30</td>
<td>-5.36</td>
<td>-5.54</td>
<td>-2.33</td>
<td>7.94</td>
<td>16.1</td>
</tr>
<tr>
<td>$\log R&amp;D1$</td>
<td>-0.111***</td>
<td>-0.042**</td>
<td>-0.042**</td>
<td>-0.042**</td>
<td>-0.036*</td>
<td>-0.036*</td>
<td>-0.036*</td>
</tr>
<tr>
<td>$\log R&amp;D2$</td>
<td>-0.910***</td>
<td>-0.361**</td>
<td>-0.359**</td>
<td>-0.361**</td>
<td>-0.348**</td>
<td>-0.301**</td>
<td>-0.312*</td>
</tr>
<tr>
<td>$\log R&amp;D3$</td>
<td>-2.519***</td>
<td>-0.749</td>
<td>-0.751</td>
<td>-0.751</td>
<td>-0.729</td>
<td>-0.619</td>
<td>-0.656</td>
</tr>
<tr>
<td>$\log R&amp;D4$</td>
<td>-14.296***</td>
<td>-4.518*</td>
<td>-4.542*</td>
<td>-4.606*</td>
<td>-4.304</td>
<td>-3.583</td>
<td>-3.820</td>
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Panel C: Group 2

<table>
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<th>(6)</th>
<th>(7)</th>
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<tbody>
<tr>
<td>$\log R&amp;D1$</td>
<td>0.014</td>
<td>0.013</td>
<td>0.013</td>
<td>0.013</td>
<td>0.014</td>
<td>0.014</td>
<td>0.016</td>
</tr>
<tr>
<td>$\log R&amp;D2$</td>
<td>0.124</td>
<td>0.108</td>
<td>0.104</td>
<td>0.122</td>
<td>0.135</td>
<td>0.120</td>
<td>0.143</td>
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<tr>
<td>$\log R&amp;D3$</td>
<td>-0.089</td>
<td>-0.109</td>
<td>-0.121</td>
<td>-0.079</td>
<td>-0.042</td>
<td>-0.044</td>
<td>0.037</td>
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</table>
### Panel D: Group 3

<table>
<thead>
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<th>Regressors</th>
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<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log R&amp;D1</td>
<td>0.015</td>
<td>0.004</td>
<td>0.011</td>
<td>0.010</td>
<td>0.010</td>
<td>0.013</td>
<td>0.013</td>
</tr>
<tr>
<td>log R&amp;D2</td>
<td>0.170</td>
<td>0.186</td>
<td>0.214</td>
<td>0.190</td>
<td>0.182</td>
<td>0.199</td>
<td>0.195</td>
</tr>
<tr>
<td>log R&amp;D3</td>
<td>0.249</td>
<td>0.260</td>
<td>0.309</td>
<td>0.242</td>
<td>0.228</td>
<td>0.256</td>
<td>0.195</td>
</tr>
<tr>
<td>log R&amp;D4</td>
<td>2.406</td>
<td>2.649</td>
<td>2.996</td>
<td>2.712</td>
<td>2.601</td>
<td>2.845</td>
<td>2.866</td>
</tr>
<tr>
<td>log R&amp;D5</td>
<td>4.664</td>
<td>4.805</td>
<td>5.443</td>
<td>4.863</td>
<td>4.642</td>
<td>5.177</td>
<td>4.590</td>
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<tr>
<td>log R&amp;D6</td>
<td>8.047</td>
<td>8.078</td>
<td>8.654</td>
<td>8.115</td>
<td>7.859</td>
<td>8.211</td>
<td>5.857</td>
</tr>
</tbody>
</table>

Notes: Table 5 reports all the LBE coefficients ($\beta$) based on (1) with R&D growth rates as fixed effects. Different columns denote different regressions with specific sets of explanatory variables.

*** Significant at or less than 1%.
** Significant at or less than 5%.
* Significant at or less than 10%.
### Panel C: Group 2

<table>
<thead>
<tr>
<th>Regressors</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$E_i$</td>
<td>-0.234</td>
<td>1.370</td>
<td>1.370</td>
<td>1.240</td>
<td>1.260</td>
<td>-2.460</td>
<td>-4.620</td>
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<tr>
<td>$\log R&amp;D1$</td>
<td>-0.001</td>
<td>0.000</td>
<td>-0.003</td>
<td>-0.003</td>
<td>-0.003</td>
<td>-0.002</td>
<td>-0.003</td>
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<tr>
<td>$\log R&amp;D2$</td>
<td>0.003</td>
<td>0.012</td>
<td>-0.013</td>
<td>-0.014</td>
<td>-0.009</td>
<td>-0.007</td>
<td>-0.008</td>
</tr>
<tr>
<td>$\log R&amp;D3$</td>
<td>-0.061</td>
<td>-0.047</td>
<td>-0.112</td>
<td>-0.114</td>
<td>-0.101</td>
<td>-0.094</td>
<td>-0.096</td>
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<tr>
<td>$\log R&amp;D4$</td>
<td>0.230</td>
<td>0.307</td>
<td>-0.082</td>
<td>-0.090</td>
<td>-0.022</td>
<td>0.033</td>
<td>0.031</td>
</tr>
<tr>
<td>$\log R&amp;D5$</td>
<td>-0.180</td>
<td>-0.158</td>
<td>-0.897</td>
<td>-0.913</td>
<td>-0.778</td>
<td>-0.681</td>
<td>-0.704</td>
</tr>
<tr>
<td>$\log R&amp;D6$</td>
<td>0.112</td>
<td>0.447</td>
<td>-0.143</td>
<td>-0.166</td>
<td>-0.120</td>
<td>-0.033</td>
<td>-0.037</td>
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### Panel D: Group 3

<table>
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<tr>
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<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$E_i$</td>
<td>0.613**</td>
<td>0.561*</td>
<td>0.710*</td>
<td>0.725*</td>
<td>0.975*</td>
<td>1.210</td>
<td>1.130</td>
</tr>
<tr>
<td>$\log R&amp;D1$</td>
<td>0.126***</td>
<td>0.130***</td>
<td>0.127***</td>
<td>0.127***</td>
<td>0.127***</td>
<td>0.127***</td>
<td>0.127***</td>
</tr>
<tr>
<td>$\log R&amp;D2$</td>
<td>1.011***</td>
<td>1.010***</td>
<td>1.000***</td>
<td>0.994***</td>
<td>0.994***</td>
<td>0.997***</td>
<td>0.996***</td>
</tr>
<tr>
<td>$\log R&amp;D3$</td>
<td>2.855***</td>
<td>2.859***</td>
<td>2.843***</td>
<td>2.825***</td>
<td>2.829***</td>
<td>2.835***</td>
<td>2.825***</td>
</tr>
<tr>
<td>$\log R&amp;D6$</td>
<td>28.164***</td>
<td>28.280***</td>
<td>28.088***</td>
<td>27.955***</td>
<td>27.608***</td>
<td>27.693***</td>
<td>27.272***</td>
</tr>
</tbody>
</table>

Notes: Table 6 reports all the LBE coefficients ($\beta$) based on (2) with R&D growth rates as fixed effects. Different columns denote different regressions with specific sets of explanatory variables.

*** Significant at or less than 1%.

** Significant at or less than 5%.

* Significant at or less than 10%.

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### ENDNOTES

1. \( \text{TFP5} \) is based on a five-factor production function: capital (\( K \)), production worker hours (\( N \)), non-production worker hours (\( L \)), non-energy materials (\( M \)) and energy (\( E \)). \( \text{TFP5}=Q-\sum_n \alpha_n Y_n \), \( n \in \{ K, N, L, M, E \} \). \( Q \) is real output, \( \alpha_n \) is the share in revenue of factor \( n \), \( Y_n \) is the real input of \( n \).

2. Data come from National Science Foundation statistics. The dataset sorts all the industries by SIC-2, while Feenstra's data by SIC-4. Therefore in empirical tests all the industries belonging to the same SIC-2 category are treated to be paying the same R&D cost.

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### REFERENCES


THE U.S. BUDGET DEFICIT, INFLATION AND EXCHANGE RATE

Orhan Kara
Department of Economics and Finance
West Chester University
West Chester, PA 19383

ABSTRACT
This study further contributes to the literature by applying ARDL and error correction models to the U.S. data between 1973 and 2010 to find the relationship and the effect of the U.S. budget deficit and inflation on the exchange rate. The conclusions reveal that there is a significant relationship between inflation and exchange rate. Inflation causes the dollar to depreciate in both short and long run. However, that there is no significant and direct relationship between budget deficit and exchange rate. Furthermore, increases in interest rate and income lead to appreciation of the currency while a decrease in them produces depreciation in the currency in nominal and real exchange rates. Finally, the effect of inflation on the exchange rate is similar regardless of producer price index or consumer price index is used.

INTRODUCTION
The Great Recession (December 2007-June 2009) led to a steep increase in the U.S. budget deficit, which received a renewed attention from both scholars and politicians. Increased government spending with aggressive monetary policies raised concerns over inflation. However, the Fed is currently hesitant to implement policies given that the unemployment rate is still high and that inflation rate is relatively low. When the price level starts increasing, the Fed may take actions, which will result in an increase in interest rate. As a result, the value of dollar will be affected. Although the relationship between budget deficits, inflation, and exchange rate is the subject of many studies, both empirically and theoretically, they produced conflicting evidence and no agreed upon conclusion has been reached.

Several scholars investigated the relationship between budget deficits and inflation, especially after Friedman’s (1968) claim of budget deficits as the main cause of inflation. The general approach to determine the effect of budget deficits on inflation is how the budget deficit is financed (Saleh and Harvie, 2005) although the agreement is that budget deficits tend to lead inflation regardless of how it is financed. For example, Sargent and Wallace (1981) argued that monetary authorities need to monetize the deficit at one point which leads to inflation. Similarly, Dwyer (1984) and Miller (1983) claimed that budget deficits are inflationary, whether they are monetized or not, through an increase in the wealth due to a rise in the value of bonds and through a crowding out effect as innovation of payment system that makes government bonds more substitutable for money (Saleh and Harvie, 2005). Empirical evidence also supported those claims (Ahking and Miller, 1985; Hondroyiannis and Papapetrou 1994; Sowa 1994; Metin 1998; Neyapti, 2003). Moreover, empirical evidence also supported the relationship between budget deficit and interest rates (Feldstein, 1982; Dwyer, 1982; Kormendi, 1983; Evans, 1985; Cebula, 1988; Melvin, Schlangerhauf, and Talu, 1989; Knot and deHan, 1999; Cebula, 2003; Saleh and Harvie, 2005; Chen, 2007; and Butt, Rehman, and Azeeem, 2010).

However, when we look at the relationship between budget deficit and exchange rates, and inflation and exchange rates, studies often produced conflicting results (Evans, 1985; Deravi, Gregorowicz, and Heghi, 1995; Arize and Malindretos 1997; Kim, 1998; Darrat, Chopin, and Dickens, 2001; Kara and Nelson, 2003; El-Sakka and Ghali, 2005; Cheng, Taylor, and Weng, 2006; Maria-Doloris, 2009; Butt, Rehman and Azeeem, 2010). For example, Evans (1985) asserted that large budget deficit did not lead to an increase in the value of the dollar while Melvin, Schlangerhauf, and Talu (1989) concluded that a rise in the budget deficit led to arise in the value of dollar and that a decrease in the budget deficit caused a decrease in the value of dollar. With a vector autoregressive model, Deravi et al. (1995) found that changes in exchange rate led to changes in price levels, specifically exchange rate depreciation leading to inflation by using a data set spanning from 1975 to 1995. Darrat et al. (2001), using cointegration and error correction method, reached similar conclusions over a period of 1973 to 1997 U.S. data. On the other hand, Kim (1998) found a negative relationship between exchange rate and inflation by employing data from U.S. ranging from 1973 to 1995 with a cointegration method.

Studies that analyzed the relationship by extending data to other countries also produced conflicting conclusions. Arize and Malindretos (1997) investigated the effects of exchange rate variability on inflation over forty one countries by using cross section data and found evidence supporting the hypothesis that exchange rate variability affects inflation. Likewise, El-Sakka and Ghali (2005) concluded that depreciation in Egypt’s currency caused inflation in Egypt. In eleven new European Union member countries and a candidate country data, Dolores (2009) also found a positive relation between exchange rate and inflations as Vasicek did (2010). Moreover, Butt et al. (2010) reached the conclusion.
that the relationships between exchange rate and inflation exists in Pakistan case although the direction is opposite of what other studies found: inflation causes the changes in exchange rates. On the other hand, after examining data from the U.K. from 1958 to 2002, Kara and Nelson (2003) found a little and weak evidence of the relationship between inflation and exchange rate. Finally, Cheng et al. (2006) concluded that there was no causal relationship between exchange rates and inflation measured by Consumer Price Index, for the U.K., Germany, Canada, and Japan.

DATA AND METHODOLOGY

In order to investigate the main objective of this study, i.e., the relationship between exchange rates, inflation, and budget deficit, we need to formulate the functional of the relationship. According to studies investigating the determinants of the exchange rates, researchers agreed that the following factors are the main determinants of the exchange rate: Inflation, interest rates, income, and government (Butt et al., 2010). Furthermore, we also look at both nominal and real exchange rates. Therefore, the following functions are established:

\[ EXC = f(PPI, Y, R, DEF), \]  

(1)

where EXC is exchange rate, PPI is producer price index, Y is real gross domestic product, and DEF is government budget deficit. Exchange rate is defined as the number of units of foreign currency per unit of domestic currency, which means that a decrease in EXC is a depreciation of the domestic currency.

In order to estimate the relationship between exchange rate, inflation rate, and deficit, we adopted the following model based on the above form:

\[ LEXC_t = a + bL\text{PPI}_t + cLY_t + dR_t + e \text{DEF}_t + e_t \]  

(2)

where the variables are the same as defined above and L before the variables refers to natural logarithm of the variables. \( e_t \) is the error term. In equation (2), we expect an estimate of \( b \) to be negative indicating that an increase in prices will cause depreciation of the currency. Estimated sign of \( c \) is expected to be positive indicating an appreciation of the currency. However, if an increase in income leads to relatively more imports, the sign could be negative as the demand for foreign currency increases, which leads to depreciation of the domestic currency. \( D \) is expected to be positive as a rise in interest rate relative to other countries’ rates will lead to a higher return for the investors in domestic country. Finally, the expected sign of \( \text{DEF} \) can be positive or negative based on the previous research as was explained in the previous section.

Equation (2) outlines the long-run relationship among the variables of the function. However, we would like to examine the effect of those variables towards to the long run transition, we need to introduce the short-run dynamics into equation (2). In order to do so, we follow Pesaran et al. (1996, 1999, & 2009) and express the equation in an Autoregressive Distributed Lag (ARDL) format.

Since both producer (wholesale) price index (PPI) and consumer price index (CPI) were used for inflation variable in previous studies, we also estimated the equation (3) for PPI and CPI (Chen, 2007). In addition, we also estimated the equation for both real effective exchange rate and nominal effective exchange rates by following previous studies such as Chen (2007).

In this study, we use ARDL approach developed by Pesaran et al. (1996 & 2009) because of relative ease in estimations. The ARDL approach is executed in two stages (Pesaran et al., 1996 & 2009).

First, two null hypotheses (stating the non-existence of cointegration) are constructed to determine the cointegration among variables in each equation.

\[ H_0: \delta_1=\delta_2=\delta_3=\delta_4=0 \quad H_1: \delta_1\neq0, \delta_2\neq0, \delta_3\neq0, \delta_4\neq0 \]  

(3)

The above hypotheses are tested according to the test statistics obtained. After, a decision is made, we move to the second stage of the ARDL method and estimate equations (2). In this stage, we estimate four models based on the following criteria: the R-bar square criterion, Akaike information criterion (AIC), Schwarz Bayesian criterion (SBC), and Hannan-Quinn criterion (HQC). From the estimated four models, we select one model and report the results. In addition, our selection is based on examining diagnostic statistics (statistical fit). The ARDL model assume that there is one cointegration relationship in the model and can be applied irrespective of whether the repressors are I(0) or I(1). As suggested by Pesaran et al. (1996), this avoids the pretesting problems associated with standard cointegration analysis. For instance, if we were carrying out a cointegrating VAR analysis, we needed to follow number of steps, namely determining that the jointly determined variables of the model are I(1), ergogeneity, decision of the order of VAR, identifying the nature of deterministic variables, resolving the identification problem, and testing the over identifying restriction on the long run relations (if any). In addition, the ARDL approach outperforms other estimation methods in small samples (Pesaran and Shin, 1999). Furthermore, Pesaran and Shin (1999) showed that if we have endogenous variables in our model, estimating variables and carrying out the statistical inference are the same after altering the order of ARDL. Because of the relative ease of this approach, we used ARDL model.
The data for this study covers the period from 1973 to 2010. All data were collected on a quarterly basis, ranging from the first quarter of 1973 to the last quarter of 2010 (1973Q1-2010Q4). Part of data used in this study was extracted from the “IMF Financial Statistics, online”. The International Monetary Fund, (IMF), collects data on countries for economic variables on an annual, quarterly, and monthly basis. For the purpose of this study, the following data are obtained and expressed in index form:

- Nominal Effective Exchange Rates (NEER): 1973Q1-2010Q4
- Real Effective Exchange Rates (REER): 1975Q1-2010Q4

The remaining data came from the Federal Reserve Bank of Saint Louis for the same period. Specifically, the following data were obtained:

- Interest rates (federal funds rate): 1973Q1-2010Q4
- Income (real gross domestic product, seasonally adjusted): 1973Q1-2010Q4
- Prices (producer price index and consumer price index): 1973Q1-2010Q4
- Budget deficit: 1973Q1-2010Q4

RESULTS

We estimated the error-correction model outlined by equation (2) using quarterly data over 1973Q1-2010Q4 period for the United States. As indicated above, we first tested for the joint significance of \( \delta_1-\delta_4 \) in equation (2). Since we have quarterly data, we imposed four lags. As the testing can be conducted based on: a) no intercept, no trend variable, b) intercept and no trend variable, c) intercept and trend variable, we performed three F tests. In most cases the F-statistic was significant. For the cases of b) intercept and no trend variable, and c) intercept and trend variable, the F-values fell between upper and lower bound critical values, indicating an inconclusive results. However, for the case of a) no intercept, no trend variable, the F values were bigger than upper bound critical value, which indicated the existence of cointegration and our estimates are based on no intercept and no trend equations.

According to Table 1 that all calculated F-statistic is greater than the upper bound critical value, indicating that all lagged level variables in our equation are jointly significant, therefore they are cointegrated. Since all variables in both models were found to be cointegrated, we proceeded to the second stage of estimation and estimated equation (2) by imposing four maximum lags on each first differenced variable due to the quarterly data. As a result, four group of estimates are obtained for: 1) nominal effective exchange rate and producer prices, income, interest rate, and deficit; 2) nominal effective exchange rate and consumer prices, income, interest rate, and deficit; 3) real effective exchange rate and producer prices, income, interest rate, and deficit; and 4) real effective exchange rate and consumer prices, income, interest rate, and deficit. Except for the consumer price variable on real exchange rate, which R-bar gave the best result, the other estimates were obtained based on Akaike information criteria.

Table 2 reports the long run estimates along with ARDL estimates. Long run estimates confirm our expected signs. All of the variables are statistically significant, except for deficit variable. The biggest effect on exchange rate comes from income, followed by the prices. Although it is highly significant, the effect of interest rate is relatively small. Government deficit seems to have slight effect on the exchange rate and insignificant. ARDL estimates indicate that all the lagged variables are also statistically significant with the exception of deficit variable. As indicated with changing signs in the lags, the variables adjust over time to long run values. Diagnostic tests show the robustness of the estimates. Under the variables column in the table, the number in parenthesis indicates the lags, which is the same in the other tables in the study.

Table 3 shows the error correction estimates. Except for the deficit variable, the other estimated values are all statistically significant. Again, under the variables column in the table, the symbol \( \Delta \) in front of the variables refers to the differencing. For example, \( \Delta LNEER \) means one period difference. The number after the variable refers to the further differencing in the variables. For instance, \( \Delta LNEER \) indicates one period difference of dLNEER, and so on, which is the same in the remaining tables (tables 4 through 9).

\[ Ecm(-1) \text{ is the error correction coefficient, which tells how fast the economy returns to the equilibrium (long run values-coefficients) once it is shocked.} \]

\[ \text{After a shock, (change in prices, for example), an adjustment process is evident, then the economy returns to its long-run equilibrium values. This speed of adjustment process is given by the error correction term. The expected sign of the error correction coefficient is negative for the following reasons. When the short-run values overshoot the long-run equilibrium values, then the adjustment is downward, as expected or vice versa (Greene, 2008).} \]

\[ \text{Another important feature of the error correction coefficient is the magnitude. Since the expected value of it is between zero and one, and negative, the larger the value in absolute value, the faster the economy gets into its equilibrium values. Likewise, smaller values of error correction coefficient indicate a slower adjustment process for the long-run equilibrium. By replacing producer price index with consumer price index, we also run the same model. However the results were very similar to the producer price index as can be seen from tables 4 and 5.} \]

\[ \text{Magnitudes and significance levels including lag lengths were almost identical. The error correction coefficient was also close to the producer price case.} \]
Our analysis so far used nominal effective exchange rate as the dependent variable. However, the effect and the relationship to the inflation and budget deficit could produce different results and some studies used real effective exchange rate when looking at the determinants of exchange rates. Instead of nominal effective exchange rate as the dependent variable, we used real effective exchange rate to investigate the relationship between exchange rate, inflation, and budget deficit.

Table 6 presents the long run and ARDL estimates for the real effective exchange rate with independent variables including producer prices, income, interest rate, and budget deficit. Other than the budget deficit variable, the remaining variables are all statistically significant. The estimated coefficient for the inflation (producer price index) has a negative sign indicating that inflation leads to depreciation of dollar.

Compared to the nominal effective exchange rate, the effect of inflation on real effective exchange rate is smaller as the magnitude of the coefficient is less in absolute value. Likewise, the estimated coefficient for the income is also smaller indicating a smaller effect on the real exchange rate. However, interest rate has a greater impact on the real effective exchange rate relative to its effect on the nominal effective exchange rate. In terms of the estimated value, the effect of interest rates on the real exchange rates is twice as much as that on the nominal exchange rates. Finally, budget deficit has a much smaller and insignificant effect on the real exchange rate.

Error correction estimates for the real exchange rate are given in table 7. Since the error correction estimates are the short run estimates, it is clear from the table that inflation, income, and deficit have much smaller effect in the short run. As we expect, inflation causes a depreciation of the dollar, while increases in income and interest rate result in appreciation of the dollar. Budget deficit variable is not statistically significant and has a much smaller estimated value. Error correction coefficient has a value of -0.0334 indicating a slower adjustment process to the long run values.

Similar to the analysis in nominal exchange rate above, consumer price index is also used to investigate to find the effect of inflation and budget deficit on real exchange rate and the results are illustrated in tables 8 and 9. As the tables illustrate, the effect of consumer prices is greater on the real exchange rate, estimated value increased from -0.117 to -0.5507, about five fold increase. Having the expected negative sign, however, the significance level decreased, although it is statistically significant at 88 percent. Income coefficient is also turned to be bigger while the coefficient for the interest rate is smaller in the long run. Again, the government budget deficit is not statistically significant and small.

Short run estimated coefficients and adjustment process are given in table 9. The adjustment process, according to the estimated error coefficient, is faster. However, based on the number of lags, there is longer correction period to the long run values, especially for the prices. Otherwise, the results are similar to that of producer price case.

**CONCLUSIONS**

Previous research often produced mixed result with respect to the relationship between exchange rate, inflation, and budget deficit. This study investigated the relationship by applying ARDL model on quarterly data from 1973 to 2010 by providing four sets of estimates for nominal and real exchange rates. The findings of this study can be summarized as follows. First, there is a significant relationship between inflation and exchange rate. In particular, inflation leads to depreciation of dollar in both short and long run. Unlike the findings by Kara & Nelson (2003) and Cheng et al. (2006) who found very weak or no evidence between exchange rate and inflation, our conclusion supports the findings by Butt et al. (2010), Vasicek (2010), Dolores (2009), and Arize & Malindretos (1997) who found a relationship between inflation and exchange rate.

Second conclusion of this study is that there is no significant and direct relationship between budget deficits and exchange rate as claimed by Evans (1985). This finding is contrary to the conclusion reached by Melvin et al. (1989). Third, increases in interest rate and income lead to appreciation of the currency while a decrease in them produces depreciation in the currency. Fourth, the above conclusions are valid for both nominal and real exchange rates. Finally, according to the estimated coefficients, irrespective to whether producer price index or consumer price index is used for the inflation, the effect of inflation on the exchange rate is similar.
**TABLE 1. F-TEST RESULTS FOR COINTEGRATION**

<table>
<thead>
<tr>
<th></th>
<th>Producer price Index Used</th>
<th>Consumer price Index used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Effective Exchange Rate</td>
<td>4.1463</td>
<td>4.2508</td>
</tr>
<tr>
<td>Real Effective Exchange Rate</td>
<td>3.9119</td>
<td>4.5976</td>
</tr>
</tbody>
</table>

*Critical values for F-Test (No intercept, No Trend): Lower Bound=2.157 & Upper Bound= 3.3340*

**TABLE 2. LONG-RUN COEFFICIENT ESTIMATES FOR NOMINAL EFFECTIVE EXCHANGE RATE**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log of PPI</td>
<td>-0.3778</td>
<td>0.2085</td>
<td>-1.8124</td>
<td>.072</td>
</tr>
<tr>
<td>Log of Income</td>
<td>0.6597</td>
<td>0.0996</td>
<td>6.6248</td>
<td>.000</td>
</tr>
<tr>
<td>Interest Rate</td>
<td>0.0662</td>
<td>0.0145</td>
<td>4.5536</td>
<td>.000</td>
</tr>
<tr>
<td>Government Budget</td>
<td>0.0008</td>
<td>0.0013</td>
<td>0.5918</td>
<td>.555</td>
</tr>
</tbody>
</table>

**ARDL Estimates for Nominal Effective Exchange Rate**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNEER(-1)</td>
<td>1.2630</td>
<td>0.0835</td>
<td>15.1213</td>
<td>.000</td>
</tr>
<tr>
<td>LNEER(-2)</td>
<td>-0.5173</td>
<td>0.1306</td>
<td>-3.9613</td>
<td>.000</td>
</tr>
<tr>
<td>LNEER(-3)</td>
<td>0.3176</td>
<td>0.1300</td>
<td>2.4430</td>
<td>.016</td>
</tr>
<tr>
<td>LNEER(-4)</td>
<td>-0.1341</td>
<td>0.0795</td>
<td>-1.6857</td>
<td>.094</td>
</tr>
<tr>
<td>LWP</td>
<td>-0.4300</td>
<td>0.1341</td>
<td>-3.2058</td>
<td>.002</td>
</tr>
<tr>
<td>LWP(-1)</td>
<td>0.4033</td>
<td>0.1271</td>
<td>3.1734</td>
<td>.002</td>
</tr>
<tr>
<td>L</td>
<td>0.0466</td>
<td>0.0163</td>
<td>2.8560</td>
<td>.005</td>
</tr>
<tr>
<td>R</td>
<td>0.0095</td>
<td>0.0030</td>
<td>3.1555</td>
<td>.002</td>
</tr>
<tr>
<td>R(-1)</td>
<td>-0.0129</td>
<td>0.0049</td>
<td>-2.6335</td>
<td>.009</td>
</tr>
<tr>
<td>R(-2)</td>
<td>0.0135</td>
<td>0.0049</td>
<td>2.7748</td>
<td>.006</td>
</tr>
<tr>
<td>R(-3)</td>
<td>-0.0140</td>
<td>0.0047</td>
<td>-2.9569</td>
<td>.004</td>
</tr>
<tr>
<td>R(-4)</td>
<td>0.0085</td>
<td>0.0030</td>
<td>2.8438</td>
<td>.005</td>
</tr>
<tr>
<td>DEF</td>
<td>0.0000006</td>
<td>0.000009</td>
<td>0.5979</td>
<td>.551</td>
</tr>
</tbody>
</table>

- R-Bar-Squared: 0.9519
- F-Stat.: 243.6434
- Equation Log-likelihood: 341.5829
- Akaike Info. Criterion: 328.5829
- Schwarz Bayesian Criterion: 309.1010
- DW-statistic: 1.9932
### TABLE 3. ERROR CORRECTION ESTIMATES FOR NOMINAL EFFECTIVE EXCHANGE RATE

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio [P-value]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔLNEER1</td>
<td>0.3337</td>
<td>0.0813</td>
<td>4.1056 [.000]</td>
</tr>
<tr>
<td>ΔLNEER2</td>
<td>-0.1836</td>
<td>0.0822</td>
<td>2.2343 [.027]</td>
</tr>
<tr>
<td>ΔLNEER3</td>
<td>0.1341</td>
<td>0.0795</td>
<td>1.6857 [.094]</td>
</tr>
<tr>
<td>ΔLWP</td>
<td>-0.4300</td>
<td>0.1341</td>
<td>3.2058 [.002]</td>
</tr>
<tr>
<td>ΔLY</td>
<td>0.0466</td>
<td>0.0163</td>
<td>2.8560 [.005]</td>
</tr>
<tr>
<td>ΔR</td>
<td>0.0095</td>
<td>0.0030</td>
<td>3.1555 [.002]</td>
</tr>
<tr>
<td>ΔR1</td>
<td>-0.0080</td>
<td>0.0032</td>
<td>2.5385 [.012]</td>
</tr>
<tr>
<td>ΔR2</td>
<td>0.0055</td>
<td>0.0030</td>
<td>1.8253 [.070]</td>
</tr>
<tr>
<td>ΔR3</td>
<td>-0.0085</td>
<td>0.0030</td>
<td>2.8438 [.005]</td>
</tr>
<tr>
<td>ΔDEF</td>
<td>0.000006</td>
<td>0.000009</td>
<td>.5978 [.551]</td>
</tr>
<tr>
<td>ecm(-1)</td>
<td>-0.070684</td>
<td>0.019887</td>
<td>-3.5543 [.001]</td>
</tr>
</tbody>
</table>

| R-Bar-Squared | 0.2505 |
| F-Stat.       | 6.1132 |
| Equation Log-likelihood | 341.5829 |
| Akaike Info. Criterion | 328.5829 |
| Schwarz Bayesian Criterion | 309.1010 |
| DW-statistic  | 1.9932 |

### TABLE 4. LONG-RUN COEFFICIENT ESTIMATES FOR NOMINAL EFFECTIVE EXCHANGE RATE

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio [P-value]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log of CPI</td>
<td>-0.3517</td>
<td>0.1527</td>
<td>-2.3035 [.023]</td>
</tr>
<tr>
<td>Log of Income</td>
<td>0.6547</td>
<td>0.0758</td>
<td>8.6369 [.000]</td>
</tr>
<tr>
<td>Interest Rate</td>
<td>0.0651</td>
<td>0.0167</td>
<td>3.8973 [.000]</td>
</tr>
<tr>
<td>Government Budget</td>
<td>0.0001</td>
<td>0.0001</td>
<td>1.1852 [.238]</td>
</tr>
</tbody>
</table>

**ARDL Estimates for Nominal Effective Exchange Rate**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio [P-value]</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNE(-1)</td>
<td>1.2959</td>
<td>0.0831</td>
<td>15.5969 [.000]</td>
</tr>
<tr>
<td>LNE(-2)</td>
<td>-0.5459</td>
<td>0.1320</td>
<td>-4.1365 [.000]</td>
</tr>
<tr>
<td>LNE(-3)</td>
<td>0.3238</td>
<td>0.1320</td>
<td>2.4536 [.015]</td>
</tr>
<tr>
<td>LNE(-4)</td>
<td>-0.1470</td>
<td>0.0809</td>
<td>-1.8186 [.071]</td>
</tr>
<tr>
<td>LCP</td>
<td>-0.9615</td>
<td>0.3950</td>
<td>-2.4340 [.016]</td>
</tr>
<tr>
<td>LCP(-1)</td>
<td>0.9357</td>
<td>0.3866</td>
<td>2.4203 [.017]</td>
</tr>
<tr>
<td>LY</td>
<td>0.0480</td>
<td>0.0151</td>
<td>3.1759 [.002]</td>
</tr>
<tr>
<td>R</td>
<td>0.0083</td>
<td>0.0030</td>
<td>2.7120 [.008]</td>
</tr>
<tr>
<td>R(-1)</td>
<td>-0.0103</td>
<td>0.0050</td>
<td>-2.0554 [.042]</td>
</tr>
<tr>
<td>R(-2)</td>
<td>0.0114</td>
<td>0.0050</td>
<td>2.2952 [.023]</td>
</tr>
<tr>
<td>R(-3)</td>
<td>-0.0130</td>
<td>0.0048</td>
<td>-2.6963 [.008]</td>
</tr>
<tr>
<td>R(-4)</td>
<td>0.0084</td>
<td>0.0030</td>
<td>2.7600 [.007]</td>
</tr>
<tr>
<td>DEF</td>
<td>0.000010</td>
<td>0.000009</td>
<td>1.1643 [.246]</td>
</tr>
</tbody>
</table>

| R-Bar-Squared | 0.9505 |
| F-Stat.       | 236.3579 |
| Equation Log-likelihood | 339.4370 |
| Akaike Info. Criterion | 326.4370 |
| Schwarz Bayesian Criterion | 306.9551 |
| DW-statistic  | 2.0591 |
### Table 5. Error Correction Estimates for Nominal Effective Exchange Rate

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio [P-value]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔLNE1</td>
<td>0.3691</td>
<td>0.0812</td>
<td>4.5446 [.000]</td>
</tr>
<tr>
<td>ΔLNE2</td>
<td>-0.1768</td>
<td>0.0834</td>
<td>-2.1200 [.036]</td>
</tr>
<tr>
<td>ΔLNE3</td>
<td>0.1470</td>
<td>0.0809</td>
<td>1.8186 [.071]</td>
</tr>
<tr>
<td>ΔLCP</td>
<td>-0.9615</td>
<td>0.3950</td>
<td>-2.4340 [.016]</td>
</tr>
<tr>
<td>ΔLY</td>
<td>0.0480</td>
<td>0.0151</td>
<td>3.1759 [.002]</td>
</tr>
<tr>
<td>ΔR</td>
<td>0.0083</td>
<td>0.0030</td>
<td>2.7120 [.008]</td>
</tr>
<tr>
<td>ΔR1</td>
<td>-0.0068</td>
<td>0.0032</td>
<td>-2.1021 [.037]</td>
</tr>
<tr>
<td>ΔR2</td>
<td>0.0046</td>
<td>0.0030</td>
<td>1.5243 [.130]</td>
</tr>
<tr>
<td>ΔR3</td>
<td>-0.0084</td>
<td>0.0030</td>
<td>-2.7600 [.007]</td>
</tr>
<tr>
<td>ΔDEF</td>
<td>0.000010</td>
<td>0.000009</td>
<td>1.1643 [.246]</td>
</tr>
<tr>
<td>ecm(-1)</td>
<td>-0.073254</td>
<td>0.020258</td>
<td>-3.6161 [.000]</td>
</tr>
</tbody>
</table>

R-Bar-Squared: 0.2285
F-Stat.: 5.5526
Equation Log-likelihood: 339.4370
Akaike Info. Criterion: 326.4370
Schwarz Bayesian Criterion: 306.9551
DW-statistic: 2.0591

### Table 6. Long-Run Coefficient Estimates for Real Effective Exchange Rate

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio [P-value]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log of PPI</td>
<td>-0.1170</td>
<td>0.0613</td>
<td>-1.9089 [.058]</td>
</tr>
<tr>
<td>Log of</td>
<td>0.4623</td>
<td>0.0237</td>
<td>19.5225 [.000]</td>
</tr>
<tr>
<td>Interest Rate</td>
<td>0.1101</td>
<td>0.0310</td>
<td>3.5521 [.001]</td>
</tr>
<tr>
<td>Government</td>
<td>0.0001</td>
<td>0.0003</td>
<td>.37860 [.706]</td>
</tr>
</tbody>
</table>

**ARDL Estimates for Real Effective Exchange Rate**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio [P-value]</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRE(-1)</td>
<td>1.1986</td>
<td>0.0843</td>
<td>14.2230 [.000]</td>
</tr>
<tr>
<td>LRE(-2)</td>
<td>-0.2320</td>
<td>0.0819</td>
<td>-2.8327 [.005]</td>
</tr>
<tr>
<td>LPW</td>
<td>-0.0061</td>
<td>0.0015</td>
<td>-3.9538 [.000]</td>
</tr>
<tr>
<td>LPW(-1)</td>
<td>0.0022</td>
<td>0.0016</td>
<td>1.4004 [.164]</td>
</tr>
<tr>
<td>LY</td>
<td>0.0154</td>
<td>0.0058</td>
<td>2.6810 [.008]</td>
</tr>
<tr>
<td>R</td>
<td>0.0091</td>
<td>0.0032</td>
<td>2.8702 [.005]</td>
</tr>
<tr>
<td>R(-1)</td>
<td>-0.0055</td>
<td>0.0032</td>
<td>-1.6940 [.093]</td>
</tr>
<tr>
<td>DEF</td>
<td>0.000004</td>
<td>0.000010</td>
<td>0.3769 [.707]</td>
</tr>
</tbody>
</table>

R-Bar-Squared: 0.9731
F-Stat.: 721.6056
Equation Log-likelihood: 302.3113
Akaike Info. Criterion: 294.3113
Schwarz Bayesian Criterion: 282.5447
Criterion: 1.9900
### TABLE 7. ERROR CORRECTION ESTIMATES FOR REAL EFFECTIVE EXCHANGE RATE

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio [P-value]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔLRE1</td>
<td>0.2320</td>
<td>0.0819</td>
<td>2.8327 [.005]</td>
</tr>
<tr>
<td>ΔLPW</td>
<td>-0.0061</td>
<td>0.0015</td>
<td>-3.9538 [.000]</td>
</tr>
<tr>
<td>ΔLY</td>
<td>0.0154</td>
<td>0.0058</td>
<td>2.8702 [.005]</td>
</tr>
<tr>
<td>ΔR</td>
<td>0.0091</td>
<td>0.0032</td>
<td>2.8702 [.005]</td>
</tr>
<tr>
<td>ΔDEF</td>
<td>0.000004</td>
<td>0.000010</td>
<td>0.37692 [.707]</td>
</tr>
<tr>
<td>ecm(-1)</td>
<td>-0.0334</td>
<td>0.0117</td>
<td>-2.8466 [.005]</td>
</tr>
</tbody>
</table>

| R-Bar-Squared | 0.2106                  |
| F-Stat.       | 8.8176                   |
| Equation Log-likelihood | 302.3113        |
| Akaike Info. Criterion     | 294.3113            |
| Schwarz Bayesian Criterion | 282.5447        |
| DW-statistic           | 1.9900                 |

### TABLE 8. LONG-RUN COEFFICIENT ESTIMATES FOR REAL EFFECTIVE EXCHANGE RATE

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio [P-value]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log of CPI</td>
<td>-0.5507</td>
<td>0.3518</td>
<td>-1.5656 [.120]</td>
</tr>
<tr>
<td>Log of</td>
<td>0.7433</td>
<td>0.1762</td>
<td>4.2177 [.000]</td>
</tr>
<tr>
<td>Interest Rate</td>
<td>0.0837</td>
<td>0.0253</td>
<td>3.3121 [.001]</td>
</tr>
<tr>
<td>Government</td>
<td>0.0003</td>
<td>0.0002</td>
<td>1.0769 [.284]</td>
</tr>
</tbody>
</table>

**ARDL Estimates for Real Effective Exchange Rate**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio [P-value]</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRE(-1)</td>
<td>1.2135</td>
<td>0.0891</td>
<td>13.6204 [.000]</td>
</tr>
<tr>
<td>LRE(-2)</td>
<td>-0.2728</td>
<td>0.0872</td>
<td>-3.1291 [.002]</td>
</tr>
<tr>
<td>LCP</td>
<td>-1.1518</td>
<td>0.5765</td>
<td>-1.9980 [.048]</td>
</tr>
<tr>
<td>LCP(-1)</td>
<td>1.7010</td>
<td>0.9959</td>
<td>1.7079 [.090]</td>
</tr>
<tr>
<td>LCP(-2)</td>
<td>-1.6796</td>
<td>1.0362</td>
<td>-1.6209 [.108]</td>
</tr>
<tr>
<td>LCP(-3)</td>
<td>1.9480</td>
<td>0.9345</td>
<td>2.0847 [.039]</td>
</tr>
<tr>
<td>LCP(-4)</td>
<td>-0.8502</td>
<td>0.5059</td>
<td>-1.6806 [.095]</td>
</tr>
<tr>
<td>LY</td>
<td>0.0441</td>
<td>0.0263</td>
<td>1.6765 [.096]</td>
</tr>
<tr>
<td>R</td>
<td>0.0098</td>
<td>0.0037</td>
<td>2.6639 [.009]</td>
</tr>
<tr>
<td>R(-1)</td>
<td>-0.0091</td>
<td>0.0057</td>
<td>-1.6115 [.110]</td>
</tr>
<tr>
<td>R(-2)</td>
<td>0.0043</td>
<td>0.0039</td>
<td>1.0918 [.277]</td>
</tr>
<tr>
<td>DEF</td>
<td>0.00003</td>
<td>0.00005</td>
<td>0.6717 [.503]</td>
</tr>
<tr>
<td>DEF(-1)</td>
<td>0.00001</td>
<td>0.00007</td>
<td>0.1577 [.875]</td>
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<tr>
<td>DEF(-2)</td>
<td>-0.00010</td>
<td>0.00007</td>
<td>-1.4575 [.147]</td>
</tr>
<tr>
<td>DEF(-3)</td>
<td>-0.00002</td>
<td>0.00007</td>
<td>-0.2452 [.807]</td>
</tr>
<tr>
<td>DEF(-4)</td>
<td>0.00009</td>
<td>0.00005</td>
<td>1.8039 [.074]</td>
</tr>
</tbody>
</table>

| R-Bar-Squared | 0.9719                  |
| F-Stat.       | 313.3524                 |
| Equation Log-likelihood | 301.6640        |
| Akaike Info. Criterion     | 285.6640            |
| Schwarz Bayesian Criterion | 262.1308        |
| DW-statistic           | 2.0655                 |
### TABLE 9. ERROR CORRECTION ESTIMATES FOR REAL EFFECTIVE EXCHANGE RATE

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio [P-value]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔLRE1</td>
<td>0.2728</td>
<td>0.0872</td>
<td>3.1291 [.002]</td>
</tr>
<tr>
<td>ΔLCP</td>
<td>-1.1518</td>
<td>0.5765</td>
<td>-1.9980 [.048]</td>
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<tr>
<td>ΔLCP1</td>
<td>0.5818</td>
<td>0.5981</td>
<td>.97282 [.332]</td>
</tr>
<tr>
<td>ΔLCP2</td>
<td>-1.0978</td>
<td>0.6072</td>
<td>-1.8080 [.073]</td>
</tr>
<tr>
<td>ΔLCP3</td>
<td>0.8502</td>
<td>0.5059</td>
<td>1.6806 [.095]</td>
</tr>
<tr>
<td>ΔLY</td>
<td>0.0441</td>
<td>0.0263</td>
<td>1.6765 [.096]</td>
</tr>
<tr>
<td>ΔR</td>
<td>0.0098</td>
<td>0.0037</td>
<td>2.6639 [.009]</td>
</tr>
<tr>
<td>ΔR1</td>
<td>-0.0043</td>
<td>0.0039</td>
<td>-1.0918 [.277]</td>
</tr>
<tr>
<td>ΔDEF</td>
<td>0.000032</td>
<td>0.000048</td>
<td>.67167 [.503]</td>
</tr>
<tr>
<td>ΔDEF1</td>
<td>0.000027</td>
<td>0.000046</td>
<td>.58921 [.557]</td>
</tr>
<tr>
<td>ΔDEF2</td>
<td>-0.000072</td>
<td>0.000048</td>
<td>-1.4962 [.137]</td>
</tr>
<tr>
<td>ΔDEF3</td>
<td>-0.000088</td>
<td>0.000049</td>
<td>-1.8039 [.074]</td>
</tr>
<tr>
<td>ecm(-1)</td>
<td>-0.059357</td>
<td>0.024448</td>
<td>-2.4279 [.017]</td>
</tr>
</tbody>
</table>

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Bar-Squared</td>
<td>0.1519</td>
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<td></td>
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<tr>
<td>F-Stat.</td>
<td>3.3245</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equation Log-likelihood</td>
<td>301.6640</td>
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</tr>
<tr>
<td>Akaike Info. Criterion</td>
<td>285.6640</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schwarz Bayesian Criterion</td>
<td>262.1308</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DW-statistic</td>
<td>2.0655</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REFERENCES**


ON THE OPTIONALITY OF CURRENCY

Timothy F. Kearney
Department of Business
Misericordia University
300 Lake Street
Dallas, PA 18612

ABSTRACT
A dollar generally defined simply as currency, printed by the monetary authority and valued at par. The “par” valuation is believed to be maintained by fiat. This paper will show that the nominal value of a fiat “dollar” is in fact defined due to its characteristics as a government debt issue. That is, the value of a fiat currency can be defined precisely: it is a zero coupon perpetual note, issued by a government agent, who’s price is fixed at “par” by embedded call and put options. These options can be modeled, and the values of the options are robust.

INTRODUCTION
Nearly forty years from the end of the Bretton Woods “gold exchange standard” monetary system that had precisely fixed the dollar to gold, there remains considerable controversy over why paper currency has a value. With a gold- or commodity-monetary standard, a ‘dollar’ is defined by a precise relationship to that commodity. However, a fiat currency is defined as a currency which does not have intrinsic value in that its face value is worth less than the value of the media that it is printed or stamped on. In addition, currency does not pay interest. Economic theory continues to wrestle with how to treat currency, which is dominated by other, interest bearing assets in the utility function yet continues to be demanded.

It is believed that in a world of fiat monies, the value of a “dollar” is changed from something objective ($35/oz.) to something entirely subjective. A dollar generally defined simply as currency, printed by the monetary authority and valued at par. The “par” valuation is believed to be maintained by fiat. The belief is that fiat money’s is valued based on the amount of goods it is expected to command and, more ephemeral, the belief that someone will accept this asset in the future.

This paper will show that this sort of ephemeral valuation is not necessary: The nominal value of a fiat “dollar” is in fact defined due to its characteristics as a government debt issue. That is, the value of a fiat currency can be defined precisely: it is a zero coupon perpetual note, issued by a government agent, who’s price is fixed at “par” by embedded call and put options. These options can be modeled, and the values of the options are robust. That is, the value of a dollar does not depend on ad hoc arguments, but can be drawn from financial principles.

My proposal, then, is to develop a valuation for currency based on puts/calls that keep the value of fiat currency at par at all times. This property of zero price volatility means that currency can be valued as an asset not for return, but for its risk reducing properties. This would be a novel application of options to monetary theory.

LITERATURE REVIEW
Anna J. Schwartz (1993) characterized fiat money “money that national monetary authorities have the power to issue without legal constraints”. This is an explanation of what happens when money is unhooked from gold or another objective standard, but not an explanation of how the numeraire currency is defined. In his influential textbook, Mankiw (2003) notes that “the use of money in exchange is a social convention: everyone values fiat money because they expect everyone else to value it”. This is the conventional view.

This conventional view is still evolving. As noted by Sargent (1987), there remain “difficulties in creating a model in which an inconvertible government currency has value…In equilibrium, an inconvertible currency is valueless.”. Arguments advanced to support valuation of a fiat currency are somewhat ad hoc. There are the well-developed series of models known as ‘cash in advance’, that there is a precautionary motive to demand money in order to make some purchases that are assumed to require cash accumulated earlier (e.g. Wen, 2010). Another is that the inconvertible currency is put directly into the actors’ utility function by costless emission by the monetary authority, (e. g. Wang and Basu, 2006).

Former Federal Reserve Governor Laurence Meyer (2001) describes how fiat monies come to be valued:

“With the collapse of the gold standard, countries moved to fiat money systems. Fiat money is inconvertible, meaning that it is not convertible into nor backed by any commodity. It serves as legal tender by decree, or fiat, of the government. Its value is based on trust--specifically that others will accept it in payment for goods and services and that its value will
remain relatively stable. This trust is based in part on laws that make the fiat money "legal tender" in the payment of taxes and in the United States the payment of private debts”

In other words, he describes that fiat money is trusted because its value ‘will remain relatively stable” and that the trust is based on the mandate that fiat money will be accepted “in the payment of taxes”, i.e., can be “put” to the government at face value, or par. It is my intention to show a) that currency has an explicit value based on financial principles and that b) the reason for its value being ‘relatively stable” is the result of the embedded American put/call options. This zero price volatility aspect can explain why currency remains in demand, even though it is dominated by interest bearing instruments in return. This conundrum was described by Thornton (2000):

“Until now, money implicitly has been a tangible real commodity, i.e., a commodity money, or a claim to such. In modern monetary economies, however, money is typically paper currency with no intrinsic value. A question that has troubled monetary economists is why do people hold an asset that is valueless except in exchange? The answer suggested here is that money is the only asset that provides exchange services that other assets cannot provide”

This research intends to show that currency has a value beyond its medium of exchange function, and in fact has a value as an asset. However, its value is not derived from its zero return –which would indeed leave it vulnerable to being dominated by other instruments - but from its ability to reduce the risk in a portfolio due to zero price variance/zero covariance with other assets.

To my knowledge, there have been two attempts to value currency using options. Beck and Stockman (2005) see currency as an option to purchase goods. That is, their theory is able to handle an inconvertible currency when evaluating a cash-in-advance model of money demand. Another approach was put forth by Haug and Stevenson (2009) and treats money as including embedded American put options on the base-metal of coins. They note these embedded options as ‘almost undescribed in the literature” They understand coins as a ‘long perpetual put plus a piece of base metal” whose face value transfers that put to paper currency. While this approach ties financial theory with monetary analysis, I do not believe that this is the sole understanding of options in currency.

**CURRENCY AS GOVERNMENT DEBT**

It is well known that governments issue two types of debt, interest bearing bonds and low denomination, non-interest bearing liabilities known as currency. Each of these types of public sector issues is held as assets by the public. Currency has no maturity and pays no interest. It is a beautiful instrument for a government to issue, since it is a zero-coupon, perpetual (a consol).

It is well known that the price of a perpetual is \( P = \frac{r}{i} \), where

\[
\begin{align*}
p &= \text{price} \\
 i &= \text{market interest rate} \\
 r &= \text{coupon rate}
\end{align*}
\]

In the case of a zero coupon instrument, the price of a Federal Reserve note should be zero, since \( r = 0 \). In reality, Federal Reserve notes are priced at par, or their face value. This would seem to violate the pricing principles of perpetual bonds. The common explanation is that these bonds are kept at par by fiat.

**PRICING THE CONSOL**

It is possible without reliance on ad hoc arguments that the appropriate authority decrees that the value is par. Rather, the price of this issue is held at par through embedded puts and calls.

- In the case of Federal Reserve notes, the put is clearly written on the note, that the bill is “legal tender for all debts, public and private”. A fiat currency is valued due to the ability to pay taxes with it, even in a circumstance of hyper inflation where holders do not want the things.

- The call feature of a Federal Reserve note is less clear. Custom shows that the notes have been called and exchanged at par. This has been most recently shown during the redesign of U.S. currency. Analytically, an exchangeable bond is the same as a callable bond.

This is of course an unusual put/call feature, since it is meant to keep the price at par in perpetuity for both the issuer and the holder. It is meant as a price support. We would not expect for either side to pay for their protection, but would expect to see the embedded options take on value if the price were to deviate from par.

Admittedly, this is a difficult concept; isn’t a dollar the same thing as a one dollar bill. But the numeraire is not actually explained. That is why a dollar has a certain value in a gold standard, and a different value in a fiat standard. Here we are actually explaining how a dollar is determined.

I develop the argument that the price is kept at par thanks to embedded put and call options, that these options can be modeled, and the values of the options are robust. The ‘put’ comes from being able to put currency at face value to the in
order to discharge tax payments. While there is not an explicit ‘call’ feature, currency is ‘exchangeable’. This can be seen by the series of exchanges as the look of currency has been changed. Analytically, an exchangeable debt instrument is the same as a callable debt instrument. Thus, the price of this government debt instrument is kept at par by these options.

Moving further from why the price of currency ‘remains relatively stable’, I will develop the argument that a fiat currency thus has real economic value: a fixed nominal price that has a) zero variance and b) has zero co-variance with other assets. I believe that these properties can be used to show why currency is not completely dominated by interest bearing instruments as an asset. That is, I will endeavor to explain why an asset that does not pay an interest rate is nonetheless still demanded.

To evaluate the options, we used Bloomberg software (2004). First, we valued currency as a zero coupon perpetual bond with embedded put/call options. We valued the options as American options, which can be exercised at any point in time.

We considered a $100 bill, and assumed an 18 month holding period for the note (this is approximately equal to the expected life of U.S. paper currency). The analysis remains valid for other time-horizons. We set the strike price for the put and call at par; in this instance $100.

We used the “price based model” option, which utilizes the Cox-Ross-Rubenstein binomial tree approach. The tree is comprised of nodules based on a price moving up or down. The trees utilize the risk free rate, the initial price of the underlying, a measure of volatility and, of course, time. In the Bloomberg software, the model uses the price of the bond and its underlying volatility as the “stochastic variables”. That is, the bonds utilize the volatility of a normal consol.

If it happens that the price of the perpetual falls below par, the holder has an incentive to put the note to the government to satisfy tax obligations. If it happens that the price of the perpetual rises above par, the issuer has an incentive to call it to exchange for a new note at par. We show that these options display the proper response to a rise or fall in the value of the underlying security. This certainty of zero volatility is clearly useful for the sorts of transactions these small denomination notes are used for.

In a freely functioning market, the ability to put and call these debt instruments at par is what keeps their price at par. This is a more satisfying outcome than relying on a fiat to ensure that money is a reasonable measure of value. We see if these simple options actually can be modeled.

Upon issuance, the note is priced at par with a strike price of par, or $100. The value of the option at par is zero. This can be seen in Table I. The delta, the change in the price versus the change in the underlying, is the same in absolute value for both options, +0.5 for the call and -0.5 for the put options. The gamma (rate of change of the delta) and the vega (change in option price per 1% change in volatility) are equal. That means that the note is protected equally in either direction. (See Table I.)

Now take the case where the notes price rises above par, to say 100.20. This creates and incentive for the issuer to call the bonds at par, rather have it put to them at the market price. In this instance, the value of the call option rises to $0.20 per $100 to the issuer. The delta on the call option rises to 1.0, as the call is in the money. The value of the put is still zero, and its delta falls. The vega of the call falls, while the vega of the put remains unchanged; the underlying volatility is affecting the constant price option at the same rate. (See Table II.)

Now consider the value of the put option when the price falls below par, to 99.80. In this instance, the put holder gains value from the ability to put the bonds at par, while the call holder still has no use for its option. Here, as predicted by the option evaluation at issue, the in the money put has a value of $0.20 per $100. The option responds in mirror fashion to the call example: the delta on the put goes to -1.0, as it is in the money. The value of the put is still zero, and its delta falls. The vega of the put falls, while the vega of the call remains unchanged; the underlying volatility is affecting the constant price option at the same rate. (See Table III.)

Moving further from why the price of currency ‘remains relatively stable’, I develop the argument that a fiat currency thus has real economic value: a fixed nominal price that has a) zero variance and b) has zero co-variance with other assets. I believe that these properties can be used to show why currency is not completely dominated by interest bearing instruments as an asset. That is, I will endeavor to explain why an asset that does not pay an interest rate is nonetheless still demanded.
### TABLE I

<table>
<thead>
<tr>
<th>Option</th>
<th>Strike Price</th>
<th>Conv.</th>
<th>5/29/49</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVE AMERICAN CALL</td>
<td>1.000</td>
<td>2.714</td>
<td>0.000</td>
</tr>
<tr>
<td>AVE AMERICAN PUT</td>
<td>-0.492</td>
<td>-0.154</td>
<td>0.000</td>
</tr>
</tbody>
</table>

**Model:** P

- Black-Derman-Toy
- Lognormal
- Normal Mean rev
- Price based

**Delta:**
- 0.306
- 0.000
- 0.000

**Gamma:**
- 0.000
- 0.000
- 0.000

**Vega:**
- 0.000
- 0.000
- 0.000

**Time Value:**
- 0.000
- 0.000
- 0.000

Expiration:
- Fund: 100,000
- Repo: 1.18

### TABLE II

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**Model:** P

- Black-Derman-Toy
- Lognormal
- Normal Mean rev
- Price based

**Delta:**
- 0.306
- 0.000
- 0.000

**Gamma:**
- 0.000
- 0.000
- 0.000

**Vega:**
- 0.000
- 0.000
- 0.000

**Time Value:**
- 0.000
- 0.000
- 0.000

Expiration:
- Fund: 100,000
- Repo: 1.18
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**Model properties**

1. Black-Derman-Toy
2. Lognormal
3. Normal mean reversion
4. Price-based

**Model**

- B: Black-Derman-Toy
- L: Lognormal
- N: Normal mean reversion
- P: Price-based

**Expiration**

Fund px 100,000

**Revol. PV**

Australia 612 2767 8290
Brazil 1951 2048 4450
Europe 46 22 7303 1503
Germany 46 05 904116
Hong Kong 622 2797 8600
Japan 62 9201 9550
Singapore 65 6212 1000
U.S. 1 222 323 2000

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0903-10-01-10-7-9-4-10-5-4-7-4-1
REFERENCES


ASSESSING INDIA’S COMPETITIVE EXPOSURE IN U.S. IMPORT MARKETS

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ABSTRACT
This paper examines the evolution of India’s competitive exposure to other nations on its sales into U.S. import goods markets over the 1996 to 2006 time frame. We show that the methodology employed, the Market Overlap Measure statistic, is superior for this type of competitive exposure analysis to statistics based on similarities in export profiles across nations. These similarity profile measures have been used in prior research on India’s competitive trade exposures by the IMF. Hence, this study provides a deeper understanding of how recent patterns of shifting U.S. import market shares may be impacting India’s competitive exposure in U.S. import markets than is obtained from prior research. The findings will quantify the extent to which India’s market exposures to higher income nations is rising, or falling, and provide some evidence on the extent to which India’s sales into U.S. import goods markets are becoming more sophisticated and higher value added.

INTRODUCTION
This paper contributes to the research literature on understanding India’s export competitiveness by utilizing a relatively new methodology for assessing a nation’s competitive exposure to other nations and regions. We analyze the patterns of U.S. imports from India which raises our understanding of India’s evolving exposure to competition in the U.S. import market from China, Canada, Mexico, EU nations, Latin American nations, and other nations of the world. We conduct a comprehensive analysis of shifting U.S. import market shares, at the six-digit Harmonized Trade Schedule (HTS) level, across all nations from which the United States imported between 1996 and 2006 using annual data. For each year, there are more than 200 nations represented in the data file along with more than 5400 different six-digit HTS product groups. This study is the most detailed analysis ever done, to the knowledge of the authors, examining India’s sales into the United States which quantifies the degree of exposure India has to other nations also selling into U.S. import markets.

The analysis utilizes a recently developed analytic method for quantifying a nation’s competitive exposure to other nations or regions in some specified market (the U.S. import market in this study), the Market Overlap Measure (MOM) introduced by Sawchuk and Yerger (2006a,b; 2007). They demonstrate the superiority of MOM for assessing competitive exposure over ad-hoc comparisons across product sectors, comparisons based on revealed comparative advantage, and similarity indices such as that of Finger and Kreinen (1979). The methodology and findings will be of interest to those researching India’s trade competitiveness, and more broadly, to those interested in using this paper’s research design as a template for investigating other nations’ competitive exposures in important global destination markets such as the United States or the European Union.

The MOM framework is used to investigate several questions of interest to researchers analyzing India’s export performance. What are the key nations/regions that compete with India in U.S. import markets? Has the relative importance of particular nations/regions been changing over time? Which product groups are most responsible for the competitive exposure facing India? Do the most significant product groups driving India’s competitive exposure to different nations vary significantly across those nations? Is India’s changing competitive exposure in U.S. import markets consistent with a movement towards the production of more sophisticated and higher value added products?

LITERATURE REVIEW
One aspect of the trade literature involving India-U.S. trade relations has been the interplay between India, China, and the U.S. in each other’s markets. Greene (2006) investigated U.S.-China competition in the Indian market and documented China’s rapid growth in Indian market since 1999. Greene identifies the most intense competition between the U.S. and China arising in high-value-added
technology markets such as the machinery, electrical machinery, computers, and telecommunications equipment sectors. In this paper, we can assess the importance of these same markets as sources of competition between China and India in the U.S. market.

Cerra et al. (2005) examine the consequences for India from China’s entry into the WTO in part by examining India-China competition in the U.S. market. Using a Herfindahl Index measure of the concentration of exports with regards to product group diversification, they show that India’s exports have been much more concentrated than for China as India’s Herfindahl measure is approximately 7-8 times China’s value over their 1992-2001 sample. They also estimate an Index of Trade Competition, based upon export similarity profiles, between India and China on sales in U.S. markets and find minimal change in this index over the sample period. As noted in the methodology section of this paper, however, there are serious weaknesses in using similarity-of-export-profile measures as the basis of inferring changes in competitive exposure between two nations. In this paper, we much more directly assess India’s changing competitive exposure to China in U.S. markets.

Since India’s export competitiveness inevitably will be impacted by the overall cost competitiveness of India’s economy, the findings in this paper can be compared against other research related to India’s cost competitiveness. Ark et al (2008) directly compare the cost competitiveness of manufacturing in India and China at both the national and sub national levels over the 1990-2004 period.1 In the latter years of their sample period, they find that while China’s labor productivity level was slightly higher than India’s productivity in many industries, China’s higher compensation level compared to India left China slightly disadvantaged relative to India in terms of unit labor costs. Less reassuring for India, however, has been the trend on its unit labor costs relative to China. China’s labor productivity growth substantially outpaced its compensation growth, leading to declines of 20 to 80 percent in its unit labor costs across manufacturing sectors over the sample period. In contrast, India’s labor productivity growth lagged its compensation growth resulting in increases of 10 to 100 percent in its unit labor costs across manufacturing sectors. In this paper, we can compare the shifts over time in product groups most responsible for India’s exposure to China in U.S. markets to see if it is consistent with the findings of Ark et al (2008).

Another area of policy research related to India’s cost competitiveness has focused on constraints on the growth of Indian manufacturing, which one would expect to impact the growth patterns of India’s exports to the U.S. market and its competitive exposure on sales in U.S. markets. Gupta et al (2008) examine data on Indian registered manufacturing from 1973-2003.2 Their results run counter to expectations that low skilled labor intensive manufacturing sectors would have better performing growth than other manufacturing sectors following industrial delicensing given India’s abundance of low skilled labor. Instead, they find that in the post-delicensing period that industries with above median labor intensity grew 19 percent less than the below median intensity industries. They also found that industries with above median infrastructure-intensive grew 10 percent less than below median industries; and, industries with above median financial dependence grew 19 percent less than below median industries. In this paper, we can compare those sectors most responsible for India’s exposure to key nations and regions on sales in U.S. markets against Gupta et al’s (2008) list of labor intensive and infrastructure intensive industries whose growth has lagged relative to other manufacturing sectors.

In addition to the focus on India’s competitive exposure, this paper adds to the literature on methods used to assess a nation’s competitive exposure. One common approach for assessing the degree of market exposure between two nations has been to do somewhat ad-hoc comparisons across nations of the relative importance in total exports of various industry sectors.3 These ad-hoc industry comparisons, however, cannot assess the relative importance of the market share changes in one product group versus another product group. Nor do they provide any type of summative statistic capturing the effects across all product groups of the market interactions between two nations.

Analysts in recent years have been using indices designed to assess the degree of similarity in export profiles between two nations as a summative measure of the degree of market competition or market interaction between two nations in a specified market area. One frequently used similarity measure has been the export similarity measure of Finger and Kreinin (1979). The measure is defined as follows:

$$F-K = \left(\sum_{i=1}^{n} \min[a_i; b_i]\right) \times 100 \quad (1)$$

where $a_i$ (b$_i$) is the share of nation A’s (B’s) total sales or exports to the designated market of analysis accounted for by industry sector i. Hence, $0 \leq F-K \leq 100$ and increases in F-K are associated with increases in the similarity of the two nations’ export profiles.4

In recent literature, authors are using the F-K index, or SPEC, to indicate the degree of competitiveness between two nations in sales to the defined market area. Rises in the similarity index between two nations is taken as evidence of growing competition between the two nations or, if the similarity index between nations A and B is larger than between nations A and C, then nation B is said to be a greater source of competition for nation A than is nation C. For example, the degree of competition between India and China in world markets has been analyzed using an export
similarity index that “indicates the extent to which two countries compete in world markets based on the similarity of the composition of their trade.” (Cerra et al., 2005, p.8).

WEAKNESSES OF EXPORT SIMILARITY PROFILES AS MEASURES OF COMPETITIVE EXPOSURE

Although the F-K export similarity index and the related similarity indices are quite useful for comparing profiles across nations, these indices suffer a potentially damaging shortcoming if used to analyze one nation’s exposure to another nation in its sales to a specified market. Namely, these indices make no adjustment for the absolute size of the nations being compared. A simple example highlights the problem. Consider the hypothetical data contained in Example Table 1A where three nations (A, B, and C) sell goods across three industry sectors (X, Y, and Z) to some designated market. The computed F-K export similarity index value, using Equation (1), between nations A and B is F-K_{AB} = 100, and between nations A and C is F-K_{AC} = 76. So, by the rationales used in the papers cited, one should conclude that nation A experiences approximately one-third greater competition from nation B than it does from nation C [i.e., (100-76)/76]. Such a conclusion clearly would be misleading, because it ignores the reality of nation C’s much larger market share than nation B in every industry sector for which nation A has sales.

USING MOM TO MEASURE COMPETITIVE EXPOSURE

The Market Overlap Measure, MOM, captures both the breadth of market interactions across all industry sectors between two nations as well as the depth of market interactions in sectors important to nation A. Nation B’s measured market overlap with A can be large relative to nation A’s market overlap with other nations if nation B is present in many of the industry sectors in which nation A sells; or, if nation B has a relatively large market share in industry sectors that are important to nation A. A complete derivation of the MOM, along with an explanation of its several useful properties, can be found in Yerger and Sawchuk (2006a). Here, we show its construction and highlight some of its more useful properties.

Start by specifying some market area having multiple detailed industry sectors within the market area, and multiple nations supplying goods to that market area (U.S. import market in this paper). Next, designate one of the supplying nations for MOM analysis and label it ‘A’. If there are j = 1, …, n nations producing goods for sale in the specified market area, and there are i = 1, …, m different industry sectors, then the MOM measure between nation A and any other nation j will be:

\[ \text{MOM}_{Aj} = \left( \sum_{i=1}^{m} s_{iA} \cdot m_{sij} \right) \cdot 100 \]  \hspace{1cm} (2)

Where \( s_{iA} \) is the percent share of nation A’s sales in the market area accounted for by industry sector i so \( \sum_{i=1}^{m} s_{iA} = 1.0 \); \( m_{sij} \) is the percentage market share of industry sector i in the market area held by nation j so, \( \sum_{j=1}^{n} m_{sij} = 1.0 \).

For the case where j=A, MOM_{AA} = \left( \sum_{i=1}^{m} s_{iA} \cdot m_{siA} \right) \cdot 100. MOM_{AA} is simply the weighted average market share for nation A across all i industry sectors in the specified market area. The weights on each industry sector i reflect the importance of sector i to nation A’s sales in the market area as measured by i’s percentage share of nation A’s total sales in the market area. Next, consider the case for j ≠ A and label the other nation B so MOM_{AB} = \left( \sum_{i=1}^{m} s_{iA} \cdot m_{siB} \right) \cdot 100. MOM_{AB} measures the degree of nation B’s market overlap across all i industry sectors with A in the specified market area. MOM_{AB} is a weighted average measure of nation B’s market share across all i sectors in which nation A sells in the specified market area. As with MOM_{AA}, however, the weights on each industry sector i reflect the importance of sector i to nation A’s sales in the market area. By summing \( s_{iA} \cdot m_{siB} \) across all i sectors, MOM_{AB} captures both the breadth of market interactions across all industry sectors between nations A and B as well as the depth of market interactions in sectors most important to nation A. We illustrate the MOM computations by solving the MOM values for nation A in the earlier example data as shown in Example Table 1B.

Computing MOM indices from the demonstration data, Example Table 1B, finds MOM_{AA} = 40.9, MOM_{AB} = 1.6, and MOM_{AC} = 57.5. These MOM values clearly highlight that nation A has much greater market overlap exposure with nation C than B due to nation C’s much larger absolute size, even though nations A and B have more similar profiles than do nations A and C. Nations A, B, and C have a 40.9%, 1.6%, and 57.5% average market shares in the industry sectors for which nation A has sales when each sector is weighted by the sector’s share of nation A’s total sales (constant 1/3 across sectors in this example). Based on the MOM values, one concludes nation A’s exposure to nation C is nearly 36 times larger (57.5/1.6) than its exposure to nation B. Plus the MOM analysis can provide a much more accurate description of nation A’s relative market exposure to nations B and C than that afforded by the F-K measure, for which it was earlier shown could lead to the conclusion that nation A experienced about a third more market exposure to nation B than to nation C despite nation C’s much larger market presence.

Moreover, the additive nature of the MOM computations leads to several useful properties that aid in analyzing the degree of market overlap between nations. First, for any Aj nation pairing the value of MOM_{Aj} will be bounded by:
0 ≤ MOM_{Aj} < 100  \quad (3)

A zero value for MOM_{Aj} will occur if in every sector i for which nation A has sales, nation j has zero sales. The upper bound for MOM_{Aj} can approach 100 when nation A’s sales are extremely small in every sector i for which it has sales, and nation j has all the market share in these i sectors, except for nation A’s extremely small sales. Also, meaningful comparisons across nations are possible with the MOM since:

\[ \sum_{j=1}^{n} MOM_{Aj} = 100 \quad (4) \]

Consequently, one can directly compare the MOM_{Aj} value for two different j nations and accurately infer that if MOM_{Aj1} > MOM_{Aj2}, then nation A has a larger cumulative market overlap across all industry sectors with nation j1 than with nation j2 (as seen by MOM_{AB} and MOM_{AC} in Table 1B). If one wishes to more deeply understand the sectors most responsible for the MOM value estimated between two nations, any estimated MOM_{Aj} can be decomposed into its contributions by industry sector as follows:

\[ \text{sector i’s contribution to MOM}_{Aj} = \left[ 6_{iA} \cdot ms_{ij} \right] / \left( \sum_{j=1}^{n} 6_{iA} \cdot ms_{ij} \right) \cdot 100 \quad (5) \]

Again from Example Table 1B, we calculate that nation A’s market overlap with Nation C comes: 38.1% from sector X (0.219/0.575); 18.8% from sector Y (0.108/0.575); 43.1% from sector Z (0.248/0.575).

**MOM ANALYSIS OF INDIA’S COMPETITIVE EXPOSURE**

Annual MOM values for 1996-2006 between each India and every one of the 200+ nations selling into the U.S. import market were computed based on the dividing of the U.S. import market into more than 5400 mutually exclusive six-digit HTS product groups. Conceptually, it is an extension of demonstration Table 1B into more than 5400 product sectors columns and more than 200 nation rows with the analysis repeated for each year. Table 1 contains the computed MOM values, as shown in Equation (2) and Table 1B, from 1996-2006 for each nation representing one percent or more of India’s 2006 competitive exposure in U.S. import markets. In addition, the EU nations’ MOM values are summed into EU-27 which gives India’s cumulative competitive exposure to EU nations.

By far the most substantial change in the pattern of India’s competitive exposure over this period is the near doubling of India’s exposure to China as the China MOM rises from 9.74 to 17.44 by 2006, indicating that China’s weighted average market share in U.S. import markets important to India was 17.44% by 2006. India’s cumulative exposure to the EU nations declines slightly from 1996-2006, by the end of the period China has surpassed the cumulative EU nations and become the largest source of competitive exposure faced by India in U.S. import markets. India’s competitive exposure to Israel is the third most important after China and EU-27, although there is a clear downward trend over the period in this exposure. The NAFTA (North American Free Trade Agreement) nations of Canada and Mexico both show rising MOM values over the period, indicating that India’s exposure to these nations is increasing.

Summing the MOM values for EU-27, China, India, Israel, Canada, and Mexico reveals the extent to which India’s competitive exposure in U.S. import markets comes from this subset of nations. For 2006, this summed MOM value is 68.34 indicating that in U.S. import markets important to India the average market share held by these nations was 68.34%. In order to better understand the key product groups driving India’s competitive exposure to these nations, the 1996 and 2006 MOM values are broken down into their contribution by product group for EU-27, China, Israel, Canada, and Mexico as shown in Equation 5 and related discussion.

Table 2a contains the contributions by product group to the 1996 MOM values for listed nations. The product group contributions to MOM values were estimated using the HTS 6-digit level data as shown by Equation 5. The 6-digit data was then summed into its 2-digit groups for ease of presentation and for each nation in Table 2a every 2-digit group accounting for one percent or more of the MOM value is shown. For example, the EU MOM value in 1996 of 17.11 from Table 1 indicates that the weighted average market share for EU nations in import product group markets important to India was 17.11%; and, from Table 2a we see that 43.0% of this weighted average market share was accounted for by 6-digit product groups within HTS 71, Precious Metal Clad Metals, Articles Thereof. The decompositions in Table 2a reveal the wide range of product groups driving India’s competitive exposure to the different nations. Continuing with HTS 71, note it accounts for almost all of India’s exposure to Israel, but less than 5% of India’s exposure to China, Canada, and Mexico. Examining the top five product groups for EU, China, Canada, and Mexico, there are 16 different product groups represented and those appearing more than once are:

- HTS 62 (3 Times)- Apparel and Clothing, Not Knitted
- HTS 61 (2 Times)- Apparel and Clothing, Knitted
- HTS 63 (2 Times)- Textile Articles; Rags
- HTS 64 (2 Times)- Footwear
- HTS 71 (2 Times)- Precious Metal Clad Metals
- HTS 84 (2 Times)- Nuclear Machinery & Mechanical Appliances
Certainly the first four product groups on the above list are consistent with the view that India’s 1996 competitive advantage in U.S. import markets was primarily in low skill labor intensive product groups. For the latter two product groups, one cannot be certain of the skill intensity due to the aggregating across HTS 6-digit product groups of widely varying skill intensity product groups HTS 84 and 85. To correct for this problem, the leading 6-digit HTS product groups will be analyzed later in the paper. First, however, the changes from 1996 to 2006 will be compared by replicating Table 2a for 2006 MOM values, shown in Table 2b, and comparing the patterns.

As seen in Table 2b, the HTS 71 product groups decline substantially in importance as causes of India’s competitive exposure to the EU and Israel, while increasing modestly in importance as drivers of India’s exposure to China, Canada, and Mexico. Before examining the Table 2b nations in more detail, an overview of shifts in key product groups is obtained by reviewing the 13 different product groups represented in the top five for EU, China, Israel, Canada, and Mexico. Those product groups appearing more than once are:

- HTS 71 (4 times)- Precious Metal Clad Metals
- HTS 62 (3 times)- Apparel and Clothing, Not Knitted
- HTS 84 (3 times)- Nuclear Machinery & Mechanical Appliances
- HTS 85 (3 times)- Electrical Machinery & Equipment
- HTS 63 (2 times)- Textile Articles; Rags
- HTS 72 (2 times)- Iron and Steel
- HTS 87 (2 times)- Vehicles and Parts, Other Than Railway

Compared to the top five listings for 1996, there is evidence of increasing importance of more skill intensive product groups in explaining India’s competitive exposure as seen by the increased frequency of HTS 84 and HTS 85 in the top five, along with the emergence of HTS 72 and HTS 87.

Focusing upon the EU contributions by product group, the declining importance of HTS 71 is replaced by the rising share of India’s competitive exposure accounted for by HTS 29 (Organic Chemicals), HTS 84, HTS 85, and HTS 30 (Pharmaceutical Products) product groups. Other product groups declining in importance include HTS 62, HTS 64, and HTS 42 (Articles of Leather). Thus, while the MOM values from Table 1 indicate that there has been minimal change in India’s competitive exposure to EU on sales in U.S. import markets, the results in Tables 2a and 2b reveal that there has been a clear shifting of the competitive exposure dynamic away from lower skill intensity products towards higher skill intensity products.

The shifts in product group contributions for China is less clear cut than for the EU, but the evidence still does support the view that India’s competitive exposure in U.S. import markets is shifting towards higher value added products. From 1996 to 2006, the contribution from key clothing and textile product groups HTS 62, 63, 64, and 57 declined by 10.0% from 44.3% to 34.3% while the contribution from more skill intensive higher value added sectors HTS 73 (Articles Iron and Steel), 85, and 94 (Furniture) rose 9.4% from 8.9% to 18.3%.

For Canada, the most significant shift in product groups driving India’s exposure to Canada is the rise in importance of HTS 72 (iron and steel) while motor vehicles and parts (HTS 87), and machinery-related (HTS 84, 85) product groups retained their importance as contributors to India’s Canadian exposure. The shifts in key product groups driving India’s exposure to Mexico provides further support for the view that India has been moving into higher skilled product groups in the U.S. import markets. The contribution of clothing related product groups (HTS 61, 62) to India’s competitive exposure to Mexico fell by 14.5% from 29.0% in 1996 to 14.7% in 2006. This decline was replaced by a gain in contribution of 16.5% from HTS 85 and a gain of 6.5% from HTS 84.

Overall, the results presented in Tables 2a and 2b show that the sources of India’s competitive exposure in U.S. import markets varies significantly across nations, and that there have been some notable shifts in the product groups most responsible for India’s competitive exposure. The data is quite consistent with the contention that India is successfully moving away from relatively low skilled product groups and into higher skilled and higher value added product groups in its sales in U.S. import markets. As a further verification of this hypothesis, the leading HTS 6-digit product groups contributions to the 1996 and 2006 MOM values are shown Appendix Table B for EU, China, Canada, India, Israel, and Mexico. (Note: For space constraints, the authors are reporting only Tables 3a and 3b). Space constraints preclude a detailed discussion of all of these results. Instead, a few of the key changes will be highlighted and the interested reader can examine in more details the outcomes for any of the nations of interest.

The biggest shift in the detailed data on the drivers of India’s competitive exposure to the EU is the declining relative importance of India’s nonindustrial diamonds product group (HTS 710239) , partially offset by the emergence of electric generating sets (HTS 850231) and measured dose medicaments (HTS 300490). So, here is seen the rising importance of both India’s electrical machinery and pharmaceutical industries. The growing importance of the pharmaceutical industry also is seen in its rising contribution
to the MOM values for Canada (HTS 300410, 300490, and 300420) and Israel (HTS 300420, 300490, and 300390). Another sector with rising importance as a driver of India’s competitive exposure in U.S. import markets is the iron and steel industry as seen by its rising contribution to India’s exposure to Canada (HTS 721049). Further evidence of India’s production shifts towards higher value-added products is seen in the rising importance of television production (HTS 852812), motor vehicle parts (HTS 870899), plastics (HTS 390760), and electrical motors (HTS 850140) as contributors towards India’s competitive exposure with Mexico in U.S. import markets.

CONCLUSION

This paper’s analysis of India’s competitive position in U.S. import markets is much more complete than prior work such as that done by Cerra et al (2005) who only estimated India’s competitive exposure to China in U.S. import markets. By using a superior analytic measure, and by estimating the measure for all nations selling in U.S. import markets, this paper documents the sharp rise in China’s importance as a competitor to India in U.S. import markets and China’s dominant position as a source of competitive exposure for India compared to any other single nation selling in U.S. import markets. The analysis summarized in Table 1 shows that the other primary nations accounting for India’s competitive exposure in U.S. import markets are Israel, Canada, and Mexico; but, by 2006 India’s exposure to Israel is less than half its exposure to China and its exposure to either Canada or Mexico is less than a third its exposure to China.

The near doubling in importance of China as a competitor in U.S. import markets important to India is consistent with the findings by Ark et al (2008) of a declining trend line for the ratio of China’s unit labor costs to India’s unit labor costs over much of this study’s sample period. Shifts in the importance of the product groups driving India’s competitive exposure to China, Israel, Canada, and Mexico also support the findings of Gupta et al (2008). They find that despite India’s relative abundance of low skill labor, since industrial delicensing India’s more labor intensive industries have grown less than Indian industries with below median labor intensity. Similarly, this paper finds a declining relative importance for commodity products, such as diamonds, and labor intensive products, such as clothing and footwear and textiles, as the sources of India’s competitive exposure to other nations in U.S. import markets. The shifts in product groups driving India’s competitive exposure in U.S. import markets is consistent with India’s production advantage moving into higher skilled and higher value added products in the mechanical appliances, electrical machinery, iron and steel, motor vehicle, and pharmaceutical product groups. This paper’s findings suggest that continued growth in U.S. import markets for India will come not from utilizing its abundant low skilled labor supply, but by continuing to upgrade both the skill set of its workforce and the capital intensity of its production.

TABLES

**EXAMPLE TABLE 1A**

Demonstrating Construction of MOM Values

<table>
<thead>
<tr>
<th>Dollar Sales by Sector</th>
<th>Sector X</th>
<th>Sector Y</th>
<th>Sector Z</th>
<th>Sum</th>
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**EXAMPLE TABLE 1B**

Demonstrating Construction of MOM Values for Nation A

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<tr>
<th>Sector</th>
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<th>( s_iA \times m_{si} )</th>
<th>( s_iA \times m_{si} )</th>
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<td>A</td>
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<td>(100/300)*(100/154)</td>
<td>(100/300)*(100/404)</td>
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<tr>
<td>Sector Y</td>
<td>B</td>
<td>(100/300)*(4/304)</td>
<td>(100/300)*(4/154)</td>
<td>(100/300)*(4/404)</td>
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<tr>
<td>Sector Z</td>
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<td>(100/300)*(200/304)</td>
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Table 1: MOM Values for India - US Import Markets 6 Digit HTS

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<td>29</td>
<td>2.0%</td>
<td>40</td>
<td>2.1%</td>
<td>50</td>
<td>1.0%</td>
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<tr>
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<td>1.5%</td>
<td>76</td>
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<td>0.9%</td>
<td>15</td>
<td>0.9%</td>
<td>94</td>
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<tr>
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<td>1.4%</td>
<td>39</td>
<td>1.4%</td>
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<td>30</td>
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## APPENDIX TABLE B

### Table 3(a): EU - 1996 %MOM Contributions for HTS 6 Digit

<table>
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<tr>
<th>HTS</th>
<th>Sij for India</th>
<th>SijMSij EU 27</th>
<th>%MOM Contribution</th>
<th>HTS 2 Digit</th>
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<td>0.001531144</td>
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</table>

### Table 3(b): EU - 2006 %MOM Contributions for HTS 6 Digit

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<th>SijMSij EU 27</th>
<th>%MOM Contribution</th>
<th>HTS 2 Digit</th>
</tr>
</thead>
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<tr>
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<tr>
<td>840999</td>
<td>0.005121923</td>
<td>0.001498349</td>
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<tr>
<td>870899</td>
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<td>0.00145562</td>
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<tr>
<td>630231</td>
<td>0.012483012</td>
<td>0.001388675</td>
<td>0.8%</td>
<td>63</td>
</tr>
</tbody>
</table>
ENDNOTES


4 Krugman (1991) defines a similar measure \( SPEC = \sum_{i=1}^{n} |a_i - b_i| \) with variables as defined for the F-K export similarity index. See Kim (1999), and Clark and WinCoop (2001) for applications using SPEC.

5 This section follows closely from the presentation in Sissoko and Yerger (2009)

6 See Sawchuk and Yerger (2006a,b) for complete derivation of all results in this section, Table 1B contains computation example.

7 See Appendix Table A for descriptions of each HTS 2-digit product group

REFERENCES


Basic Mathematical Competency and Success in Principles of Macroeconomics? is an ambitious research project. The author is interested in how mathematical ability as a form of human capital affects performance in economics, despite limited direct application in the macroeconomics principles course. The intent is to determine whether mathematical competence affects the final grade.

To assess mathematical competence, the author uses math course placement, standardized test scores, and an index value generated following placement testing. On the face of it, placement into a math course corresponds to mathematical ability. However, I wonder to what extent placement of education, science, and business majors distorts the continuous scale implied by the placements. Education majors are placed in the education sequence and business students either require remediation or are placed in the business calculus course. Does variation in math course placement reflect a compelling scale? In contrast, the math score on the ACT or SAT is a continuous variable unspoiled by the student’s major. The analysis loses potential efficacy by using the placement outcome rather than a measure of the input, math ability. Major choice represents personality characteristics and idiosyncratic preferences. The analysis may benefit if standardized math scores alone are used to measure math ability and dummy variables are included to reflect college or major to control for variation in personality traits and idiosyncratic preferences.

Data is collected over a period of time. How have grades changed over time? Have the grades of specific instructors inflated or deflated over time? Does the inflation or deflation of grades over time correspond with the trend in the quality of students admitted to the university during the same time period? Perhaps an index comprised of average ACT or SAT score, high school GPA, and class rank can be constructed to assess student quality over time. Finally, consider the colleague who sets the class average grade prior to curving grades. In this scenario the instructor consistently generates a course average of 2.25 regardless of student ability. If this is the case than using grades as output may not correspond with the input, student math ability. A review of instructor grades over time might identify instructors who impose a GPA. A control variable or omission of the observations originating from an instructor would need consideration.

The time series issue necessitates consideration of other changes during the time period. Has the method of instruction changed? Has the university replaced chalk boards with projection equipment? Has the average class size crept up? Have faculty members adopted something like Aplia?

At the branch campus admission standards may be lower, yet the grades of the instructor are higher. Is the instructor is easier? Is there institutional pressure to assign higher grades at the branch campus? Or, does the branch campus attract more non-traditional students with less innate ability but greater incentive to perform.

The author acknowledges that the paper is in an early stage of development. Nonetheless, the potential applications of the preliminary findings are intriguing. First, if math ability is not a strong predictor of success, shouldn’t we consider eliminating math prerequisites? Students who struggle in math may or may not struggle in macroeconomics so all parties are better served if students struggle sooner rather than later. Arguably, early struggle is preferable because students have more time to retake the course. In addition, difficulty in the course may motivate students to switch majors earlier in their academic career, which is a more efficient outcome. Second, if math ability doesn’t matter, economics instructors must ask, “Where’s the math?” Shouldn’t math ability contribute to success in the course? Have we taken too much analytical content out?

Basic Mathematical Competency and Success in Principles of Macroeconomics? is an interesting paper. The results suggest important implications to teaching economics. Completion of this paper will contribute to the discussion regarding the role of math ability in undergraduate economics principles courses.
RECONCILING STUDENT PREFERENCES FOR TARIFFS:
CLASSROOM APPLICATION OF MORAL SYSTEMS
TO GOVERNMENT INTERVENTION

David McClough
Ohio Northern University
525 S. Main St.
Ada, OH 45810

ABSTRACT
The arguments for free trade presented in introductory economics courses are compelling but reflective of a teleological ethical system that some students may ignore in favor of a deontological ethical system. This paper asserts that inclusion of deontological ethics in economics provides a context for understanding student disagreement with the free trade argument and affords the instructor an opportunity to engage competing perspectives relating to various economics policies beyond international trade.

INTRODUCTION
Scholars identify the final year of mercantilism as a school of economic thought with publication of An Inquiry into the Nature and Causes of the Wealth of Nations by Adam Smith. (Brue, 2007). Smith’s systematic dismantling of mercantilist ideas and policy delegitimized mercantilism as viable economic system. Nonetheless mercantilism persists and preferences for mercantilist policy permeate the general population as well as students enrolled in introductory economics. This paper posits that the persistence of mercantilism represents a teaching opportunity that can be extended to other examples of government intervention. Specifically, I assert that the presentation of competing moral systems can facilitate discussion and greater understanding of government intervention and the economic consequences.

Introductory economics textbooks acknowledge that economists frequently disagree. To explain why economists disagree, textbook authors distinguish between normative and positive economics. The discussion receives limited treatment, given the introductory purpose of the text. Informal review of economics texts reveals that some authors note that competing values can help to explain differing policy positions. Despite the acknowledgement of differing positions based on competing values, even these introductory level texts seldom, if ever, incorporate competing perspectives in the subsequent pages and, thereby, expose the economics teaching profession to challenges of proselytizing. Perhaps the most compelling example of this dynamic is associated with the presentation of the benefits associate with specialization and trade between countries.

Conventional introduction to undergraduate students of the benefits of international trade relies upon demonstrating that society gains social welfare, that is to say; the sum of consumer and producer surplus under the conditions of free trade exceeds the sum of consumer and producer surplus under less favorable conditions for trade. An instructor visually presents the benefits of trade graphically by showing that social welfare increases, due primarily to an expansion of the market. The graphical presentation lends itself well to a table summarizing the net gains to society whether the nation imports or exports at the prevailing world price. Despite the compelling nature and elegance of the presentation, some proportion of students remains unwilling or unable to accept the conclusion that free trade is a good thing. The remainder of this paper examines this puzzling phenomenon. Why do the benefits of trade resonate so loudly among economists yet ring hollow among so many students? More importantly, as instructors, how might we engage this phenomenon in the classroom?

According to Bryan Caplan (2007), the aforementioned students are a subgroup of a broader segment of the population that is quite simply wrong. Caplan distinguishes who is right and who is wrong based upon who agrees with the position of economists, who are, of course, the experts on the subject. Caplan’s assertion that anyone who does not favor free trade is wrong presupposes a system of ethics that likely differs from those who disagree with him. The conventional introduction of the benefits of international trade and the position of Caplan are reflective of a teleological ethical system, in which right and wrong or good and bad are determined based on consequences. In contrast deontological ethical systems rely upon rules to determine right and wrong without consideration of consequences. This paper argues that the conventional introduction to the benefits of international trade embodies a teleological ethical system and, perhaps too often but certainly not always, fails to recognize that some students are likely to impose a deontological ethical system. Recognizing the distinction presents a teaching opportunity to review competing ethical systems often neglected when teaching economics. The remainder of this paper briefly reviews competing ethical systems prior to applying the ethical systems to the topic of free trade. I have elected to focus on the topic of free trade because it is not only a controversial topic in the classroom but a provocative social and political issue that generates numerous examples in the popular press, which may be
useful when presenting the topic in class. Concluding remarks complete the paper.

ETHICS THEORIES

For the purpose of this paper, two traditions of ethics are introduced. Teleological ethical systems assess the morality of an act based on the consequences. As such, the statement, “the ends justify the means” presupposes a teleological ethical system. Utilitarianism is a prominent teleological ethical system that advocates “the greatest good for the greatest number” thus morality is assessed based on consequences. Utilitarianism was popular among philosophers of the Enlightenment because utilitarianism did not refer to an authority; specifically, the church, for determination of good and bad (Hartman 2002). Adam Smith’s compelling argument in Wealth of Nations is indicative of utilitarianism. Jeremy Bentham (1907) and John Stuart Mill (1906) later extend and formalize utilitarianism. To this day economists apply a utilitarian ethic when evaluating economic policy.

Despite broad application of utilitarianism, inherent problems plague it as a moral system (Posner, 1981; Hartman and Desjardins, 2008). Utilitarianism determines the morality of an action based on the outcome which suggests that outcomes can be quantified and compared. For example, determination of the greatest good for the greatest number implies we can measure happiness. Even if happiness can be quantified, whose happiness is included? How do we assess the happiness of those indirectly affected? What discount rate is applied to the happiness of future generations? More debilitating than measurement issues is the moral contradiction suggested by the idea that ends justify means. Indeed, among the earliest ethical principles of western civilization is that ends indeed do not justify means. The classic illustration of this point is slavery. If it could be demonstrated that enslaving a portion of the population resulted in a net gain in the happiness of society, utilitarianism would have to advocate slavery. Similarly, utilitarianism would have to support the decision to abandon efforts to rescue a child, if it could be demonstrated that the resources could do more good for society if allocated elsewhere, perhaps repairing roads or financing a sports arena. Finally, a parent would have to deny basic necessities to an ailing child, if the expected benefits accruing to the surviving children can be shown to exceed the benefit to the feeble sibling.

John Rawls (1971) has advanced an ethical system motivated by concern for fairness. Distributive justice identifies ethical acts as those that produce equity in the distribution of goods. The challenge rests in identification of a method of distribution. Rawls famously recommends a mental exercise to determine preference for a system of distribution. He suggests that individuals suppose they are shrouded in a veil of ignorance that denies knowledge of individual circumstances or circumstances of others. Cloaked we do not know whether we are rich or desperate, healthy or lame, secure or threatened, intelligent or dim. Under conditions of uncertainty, Rawls contends that individuals would favor redistribution of income to provide for the least able to provide for themselves.

In contrast to teleological ethical systems based on assessment of outcomes, deontological ethical systems rely upon rules to assess morality. Religion offers clear rules of behavior based on religious beliefs, such as the Ten Commandments from the Judeo-Christian tradition. Alternatively, virtue ethics can be traced back to Aristotle and his emphasis on character traits such as generosity, honesty, and courage (Mintz, 1996). In contrast, Confucius produced a litany of specific rules regarding how to live. However, the most comprehensive ethical system reliant upon rules is attributed to Immanuel Kant, who argued that morality is tied to performance of one’s obligations, duty, to others. Kant (1993) proposes the Categorical Imperative to assess the morality of an action. According to Kant, an individual should act only on principles that he or she would impose upon all of mankind thus; reminding a child not to hit another child is an example of application of the categorical imperative. This example reflects that it is categorically wrong to hit another person. If individuals act based upon their categorical imperative certain universal rights can be identified such as respect, autonomy, human dignity, freedom of speech, and a right to privacy. Kant contends that people are to be treated as ends not as means and to recognize others as subjects rather than as objects. Accordingly, using others for personal gain violates the Kantian ethical system because others are denied dignity and autonomy and used as means to another’s ends.

ECONOMICS AND ETHICS EDUCATION

Undergraduate students are seldom required to take an ethics course in college. Undergraduate business students, however, are likely required to complete a course in business ethics as part of a core curriculum. The course may or may not precede enrollment in an economics course. Accordingly, an economics course may very well be a student’s first or only formal exposure to ethics in an academic context, which raises an important question regarding whether or not an economics class is an appropriate venue for the introduction of ethics. I have no definitive answer for the reader but I offer some observations for consideration.

An argument against teaching ethics in an economics class is rooted in the very topic that serves as illustration for this paper; the benefits of specialization and trade. One might declare that students enroll in economics courses to learn economics and enroll in ethics courses to learn ethics. Any
effort to attempt to do both necessarily results in suboptimal instruction of both economics and ethics. Alternatively, one might assert that economists are ill-equipped to teach ethics and should yield to philosophers trained to do so. I find both positions unsatisfying. In the first instance, ethical considerations cannot be disentangled from introductory economics courses. In addition to international free trade, ethical considerations are fundamental to the topics: price floors, price ceilings, externalities, common resources, public goods, taxation, inequality, utility maximization, and the implications associated with fiscal and monetary policy. Indeed for many students, the ethical considerations of a policy prescription are the more interesting component of the analysis and offer insight into the economic analysis.

With respect to the more compelling second question, modern economists are not trained philosophers but it may be helpful to recall that the forefathers of today’s economists were trained philosophers. Adam Smith wrote An Inquiry into the Nature and Causes of the Wealth of Nations while holding the chair of moral philosophy at the University of Glasgow. Jeremy Bentham and John Stuart Mill are revered contributors to the western tradition of political philosophy. Karl Marx was a trained philosopher. More recently, it is difficult to challenge the significant contributions to philosophy of J. M. Keynes, F. A. Hayek, Ludwig Von Mises, Milton Freidman, and Amartya Sen. This brief listing is simply to suggest that trained philosophers played an instrumental part in the founding of political economy and defining economics. However, justification of teaching ethics in economics courses rests on two arguments. First, few undergraduate students take a course in ethics so introduction of ethics elsewhere in the curriculum represents a net gain in awareness and instruction whether the instruction occurs in economics, sociology, or physics courses. Second, economics is the most influential academic discipline in the formulation and assessment of public policy so it would seem essential that economic science must demonstrate a thorough understanding and appreciation of moral issues surrounding policy recommendations.

FREE TRADE: ECONOMISTS V. THE PUBLIC

Disagreement among economists is legendary yet the one topic economists nearly universally agreed upon is the benefits of free trade. Daniel B. Klein and Charlotta Stern (2007) review thirty years of survey results of the policy views of economists and find “economists oppose protectionism, but otherwise there has been no sign of any preponderant support for free-market principles.” (p. 312) Klein and Stern analyze survey results of 264 members of the American Economic Association to find opposition to tariffs is exceptional among the eighteen public policy questions in the level of agreement among Democrat and Republican voters. Reflective of economists’ commitment to free trade Robert McTeer (2001) writes, “No policy has failed as often, or been as widely applied and enthusiastically believed, as economic protectionism. Mercantilism has dominated the thinking of the majority of the world’s peoples and, therefore, most of their political leaders. In spite of masterful dissections and refutations of mercantilism by Adam Smith, David Ricardo and Frédéric Bastiat, the protectionist dogma remains powerfully alluring for tens of millions of people around the world.”

Cletus C. Coughlin (2002) presents survey results confirming the nearly universal support for free trade among economists as well as survey results demonstrating acceptance of protectionism throughout the general public. He reports that a 1999 survey conducted by the Chicago Council on Foreign Relations found that only 32% of the general public favored elimination of tariffs while 49% of respondents considered tariffs necessary to protect jobs. Coughlin cites additional surveys all providing evidence of the general public’s sympathy for various protectionist policies. William Poole (2004) notes that the general population understands the benefits of trade yet maintains reservations primarily associated with distributional effects. Poole cites a 1999 Gallup poll that finds that 56% of respondents believe that free trade benefits firms but only 35% agreed that trade benefits workers. In short, economists oppose trade intervention; however, the general public and politicians tend to view free trade less favorably. The obvious hypothesis is that economists know something that is shielded from the general population.

Caplan (2007) assesses potential explanatory variables to explain the disparity in opinion between economists and non-economists. He asserts that education is the primary explanatory variable between economists and non-economists. Indeed, Caplan challenges teaching economists to advance support of various economic truths including the benefits of free trade. Using survey data from the General Social Survey, Caplan and Miller (2010) find that education explains much less of the difference between economists and non-economists after controlling for intelligence. I find Caplan’s commitment inspiring but I fear that his zeal is misplaced.

ETHICAL SYSTEMS AND FREE TRADE

For nearly the past decade I have taught in a Midwestern state that has experienced extensive job loss in the manufacturing sector. It is not at all uncommon for students enrolled in introductory economics courses to know someone who has lost their job due to a plant closing. In this environment there is an inherent distrust of free trade policies and sympathy for protectionist policies among some students. Prior to arriving in the Midwest, I taught for a few years on the west coast at various colleges near Los Angeles. The innate animosity toward free trade policies seemed to exist in lesser degree in Los Angeles than in the Midwest. The
geographic distinction matters because the experiment controls for education as all students were taking the same introductory economics course. Of course, geography is only a proxy for many other differences such as the structure of the regional economy and unique experience of students. The aim of this paper, however, is to discuss how instructors might engage challenges to free trade policy regardless of the unique circumstances of students.

It might seem that Bryan Caplan is on the right side of this argument and that economists need to advance understanding of the benefits of trade. Be that as it may, the conventional introduction to the benefits of trade accomplishes what Caplan desires. What I am proposing is an approach to engage students for whom the conventional method remains less than compelling. In so doing, I think that I am enhancing the student’s understanding of economics more generally and the trade topic specifically.

The essence of my position is that the level of analysis differs when arguing in favor of free trade or against free trade. For Adam Smith and David Ricardo the unit of analysis is the state. They assess the benefits to the society overall when free trade reigns rather than mercantilism or even autarky. However, seemingly with a sense of disappointment, Smith (1994) writes that he fears, despite gains to society overall associated with laissez-faire policies, he sees no relief for workers, who he anticipates will forever be relegated to a state of subsistence as natural population growth off-sets the gains in national wealth. Suddenly, Smith shifts gears and is no longer examining the impact on the state but rather he is lamenting the (lack of positive) impact on individual workers. How can the lamentations of Smith and the predisposition of students be engaged thoughtfully, respectfully, and absent of dogmatism?

I propose that teaching economists would be well-served to distinguish between teleological ethical systems and deontological ethical systems when introducing the topic of free trade. Consider that the conventional introduction to free trade reflects a utilitarian ethical system. Free trade is viewed positively because the consequences generate gains to society in excess of the losses. The winners from free trade gain more in total than is lost by those harmed by free trade. The conventional introduction of free trade is consistent with the utilitarian ethic that assesses the morality of a policy based on the outcome. In particular the Smithian and Ricardian presentations clearly demonstrate that free trade policy generates the greatest good for the greatest number.

Opponents of free-trade policy can plainly comprehend the demonstration of the benefits of trade yet challenge the conclusion that the benefits exceed the costs. It would appear that opponents to free trade policy focus their analysis on the individual rather than the state. Whereas some individuals benefit from trade, others obviously do not. An opportunity exists to discuss the concept of distributive justice when students hesitate to embrace free trade due to experience with or sympathy for job losers. Indeed, opponents of free trade may indeed engage Rawls’ mental exercise and determine that society must compensate those who are dislocated due to trade. One can then discuss the political process associated with redistribution and the economic trade-offs associated therein.

Alternately, Kantianism affords the instructor an opportunity to engage students and their sense of duty and obligation toward workers and, of course, respect for the dignity and autonomy of the individual. Accordingly, when jobs are lost due to relocation abroad, a discussion regarding the beneficiaries of the move can ensue. Clearly executives and shareholders benefit at the cost of dislocated workers at all levels of the organization but has some one’s dignity or autonomy been violated? Are people being used to the benefit of others? Furthermore discussion of duty to workers, the firm, the community, lenders, shareholders, the environment, society at large can develop. I have found that these discussions present numerous trade-offs to evaluate and mitigate the zeal of both advocates and opponents of free trade or protectionist policies.

**CONCLUDING REMARKS**

This paper is motivated by the consistent resistance of undergraduate students to the presentation demonstrating the benefits of specialization and trade. In response to the question, “how can you not favor free trade having seen and heard the arguments favoring free trade?” I propose that advocates and opponents represent competing moral systems. Advocates of free trade embrace the utilitarian perspective that seeks the greatest good for the greatest number whereas opponents concerned with the impact of displaced domestic workers or exploited foreign workers seem to represent a deontological morality consistent with Kantianism and its emphasis on respect of individuals. I assert that incorporating discussion of the competing moral systems enhances the understanding of the economic concepts and offers an opportunity for increased student engagement in the economic way of thinking. In closing, economics is fundamentally a normative discipline, it seems only appropriate that economic instructors acknowledge the inherent conflict of competing moral systems when presenting policy debates.

**ENDNOTES**

1. Social welfare as measured by total surplus is greater under conditions of free trade compared to autarky or after imposition of trade barriers such as tariffs or quotas.
2. Caplan and Miller (2010) find that intelligence is the best predictor of whether non-economists share similar beliefs with the average economist. Previous research finds that education is the best predictor however; Caplan and Miller (2010) find that the estimated effect of education falls after controlling for intelligence.

3. Karl Marx (1848) opposed trade and would have been happy to share his position during the Free Trade Congress in Brussels in 1847 however, the congress closed before he had an opportunity to speak. He delivers the speech at the Democratic Association of Brussels a few months later in 1848. Jane Sasseen (2008) provides a brief overview of economists who are reconsidering the consequences of trade. Robert Driskill (2007) mounts a challenge to the traditional view of benefits from trade.

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DEVELOPING SOLUTIONS TO THE IMMINENT FINANCIAL CRISIS IN PENNSYLVANIA: AN OBJECTIVE REVIEW OF THE POLICY CONSTRAINTS

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ABSTRACT
This paper will be a dispassionate and non-partisan review of the upcoming fiscal tsunami which will soon effect the state of Pennsylvania and its many political subdivisions. Once the problem is defined we will explore the options available to the state to confront this problem and explain, perhaps for the first time, the real legal and constitutional constraints faced by policy makers in developing responses to the problem. Specifically, we will review those provisions of the Federal and Pennsylvania Constitution which are applicable to these matters and then outline the applicable provisions of PA Act 47 and Chapter 9 of the US Bankruptcy Code. The goal of this paper is to completely remove politics out of this analysis and provide policy makers with a realistic range of options within the legal constraints.

THE PROBLEM

The perspective toward public policy responses to the public pension problem varies depending on the political view of the respondent. However, there is one thing on which everyone agrees. The numbers don't add up. The legislature of Pennsylvania struggles each year to balance a budget of approximately $29 billion a year. Yet according to a recent analysis the cost of funding PSERS (the Public School Employees Retirement Fund) will rise from $616 million to 3.0 billion by FY 2012/2013. The cost of funding SERS (the State Employees Retirement System) will rise from $226 million to 1.77 billion by FY 2012/2013.1 And the unfunded liabilities of the approximately 3,100 separate municipal pension funds are already projected at a staggering $5 billion.2 Even if previous studies of public finance are repudiated and we assume that increasing taxes is purely inelastic, the option to cure this problem through substantial tax increases is not realistic. Given the public resistance to increasing tax burdens on both state and local levels and the fact that legislative bodies have exclusive power to appropriate money and raise taxes, this option is highly unlikely. What is sure is that within the next 10 years the State of Pennsylvania will face a full blown financial crisis due to this problem.

Providing small comfort is the fact the Commonwealth is not the only state that faces this problem. While the problem is most acute in California, Illinois and New York, the majority especially as it applies to the issue of unfunded liabilities and the public pension system in Pennsylvania. The financial problem will be objectively defined and explained of states now face serious unfunded liabilities and a resultant imminent financial crisis caused by public pensions. While political leaders of all stripes seem to place the blame on factors beyond their control- namely the stock market and the state of the national economy-these reasons have merely accelerated the day of reckoning and are NOT the main reasons for the financial problem. According to a study by the Pew Foundation the "$1 trillion gap reflect states' own policy choices and lack of discipline". Some recent studies suggest that assumptions on investment returns are still so rosy that the funding gap on a national level may be actually closer to $3 trillion.3 In other words, politicians for generations now have chosen to make promises to public workers that could not be possibly met and then kick the can down the road. The end of that road is now in sight.

If funding levels cannot be met by the usual recipe of slightly raising taxes and small changes in the rate of growth in spending, what then are the policy constraints to making drastic changes in public pensions? Most analysts assume that the "constitution prohibits the unilateral removal of pension benefits by statute, ordinance or similar action". Therefore, "The disturbing but inescapable bottom line ... there is no fiscally prudent way for cities and states to avoid higher defined benefit pension bills in the near future without unfairly shifting a massive burden to future taxpayers and jeopardizing their own financial stability and growth in the process."4 In other words we are in a trap and the legal constraints of public policy provide no way out. But is that really true?

POTENTIAL SOLUTIONS (AND WHY THERE WILL NOT BE ONE)

Solution #1: Do Nothing If a state facing these problems does nothing, then it is hoping for a financial and macroeconomic scenario which would be miraculous and difficult to imagine. One might call it a “Manna from Heaven” approach. Presently, the managers of the retirement systems by their own calculations admit that the PSERS has
an unfunded liability of $19 billion and SERS an unfunded balance of $10 billion. These figures are based on the projection of a 7.5% return on investment. ROI would have to more than double over the next 20 years for the funds to fully fund the retirement systems. Given the current structural problems in the economy and world financial markets, the probability of this occurrence is only slightly above zero percent.

Solution #2: Pretend to Do Something In 2010, the Pennsylvania Legislature passed Act 120 or HB 2497. While retaining the Defined Benefit nature of the funds, the Act does create meaningful changes. For example, the formula for full benefits was changed from 35 years of service to the “rule of 92”, meaning full retirement benefits will not be realized until the employee’s age plus years of service equal 92. Also, the formula for defining benefits has been reduced for new employees from 2.5% of last year’s salary to 2.0%. Other changes were also made to reduce the financial stress on the 2 retirement systems. However, it is important to note that these changes ONLY apply to new hires and not to present employees or retirees. It is unlikely that the changes will have any meaningful or beneficial affect on the systems for at least 20 years. HB 2497 was, therefore, a head fake which does very little to deal with the unfunded problem as it now exists nor does it stall the probability of a financial crisis due to the unfunded problems of the retirement systems.

Solution #3: Actually Do Something A true solution to the financial problems of the fund would involve a 3 part solution. First, through legislation the retirements systems need to be immediately changed to a Defined Contribution system for all new employees. If such legislation was passed the Defined Benefit system would eventually be abandoned. The Legislature had a chance to accomplish that goal with HB 2497 but it fumbled the ball. Second, through the process of voluntary relinquishment, state and public union negotiators will need to recognize the magnitude of the problem and come to an accord to alter benefits for current employees. A structure similar to HB 2497 would likely work if applied to current employees. Three, even if an agreement to relinquish benefits is reached, the state will still be facing a substantial shortfall in its retirement funds. Therefore, funds will need to be raised through either a special pension bond, revenue increases or cuts in state expenditures or, of course, a combination of all three approaches.

Why There Will Not Be A Solution To actually solve the problem, a bi-partisan consensus combined with an Agreement between the state and unions is necessary. Given the substantial shared sacrifices which would be needed from all stake-holders in this process, the odds of achieving this result, while necessary to a solution, is probably less likely that the “Manna from Heaven” solution explained in Solution #1.

IS THERE REALLY A CONSTITUTIONAL GUARANTEE?

Discussion of the Federal Contracts Clause The US Constitution in Article I, Section 10, Clause 1, often called the "Federal Contract Clause" restrains contracts from being unilaterally modified by the actions of state legislators. Specifically the Article provides that "No State shall ... pass any Bill of Attainder, ex post facto law, or Law impairing the Obligation of Contracts ... "5 The obvious intent of the Law is to prevent states from passing legislation that retroactively impairs contract rights. The promise to receive retirement benefits as consideration for employment services is of course a form of contract - whether that promise is made through a collective bargaining agreement or individual employment contract. As a result, the Federal Contracts Clause applies to public pension benefits and restrains subsequent changes to promised benefits.

There are, however, questions whether this is an absolute right or, as with most provisions of the constitution, this constitutional provision has realistic limitations imposed by the Judiciary or otherwise. An objective review of Article I, Section 10, and of case law reveals that there are indeed limits to the Federal Contracts Clause and that the guaranty of future pension benefits may not be as sacred as it appears. In the US Supreme Court decision of Energy Reserves Group v. Kansas Power & Light, 459 US 400 (1983) the Court established a three part test which can be used to determine whether state legislation violates Article I, Section 10 of the US Constitution. The 3 part test is:

Part One: The State regulation must substantially impair a contractual relationship. If it does, the analysis moves on to the next part.

Part Two: The decision requires that the law or regulation “have a significant and legitimate purpose behind the regulation, such as remedying of a broad and general social or economic problem." (459 US at 411-413). If the state can demonstrate such broad purpose then the 3rd part of the decision applies.

Part Three: The Court makes it clear that the test demands the state legislation or regulation must be reasonable and appropriate for its intended purpose.6 However, the point is if the state legislation is reasonable and appropriate, the courts may allow a legislative response to an economic crisis caused by the collapse of the public pension funds.

Therefore, state Legislative action as a reaction to a substantial financial crisis caused by a potential default caused by the underfunded liabilities of public pension systems may be constitutional under certain circumstances.
Indeed, restrictions on Article I of the constitution have already been well established in other Supreme Court decisions. For example, in a case which has been widely cited since the policy response to the 2008 economic crisis, the Supreme Court in Home Building and Loan Association v. Blaisdell, 290 US 398 (1934) decided that state legislation in Minnesota could constitutionally impose a moratorium on mortgage foreclosures during the Great Depression and that this moratorium did not violate the constitution even though it retroactively affected contracts. In Blaisdell, the Court did, however, recognize that the State law was in response to an emergency and was, therefore, a reasonable exercise of the state police power. Further in a number of 19th century Supreme Court decisions that still stand today, the Court has recognized the right of states to modify the available remedies for breach of contract. In remedy cases where the Federal Contracts Clause is at issue, the court stressed that state action will be allowed depending on the "reasonableness" of the modification and whether the changes affect a "substantial rights" of the parties. (Sturges v Crowninshield, 17 US 122, 1819); (Bronson v. Kinzie, 42 US 311, 1843). While the ability of states is clearly constrained by the Federal Contracts Clause it is not prevented in all circumstance. States may have the ability to fashion a government response to impose changes on pension rights even as those rights apply to already vested interests.

Discussions of the Pennsylvania Contracts Clause The Pennsylvania Constitution, in Article 1, Section 17, states "neither ex post facto law, nor any law impairing the obligation of contracts .... shall be passed." Court decisions in Pennsylvania have applied this Section of the state constitution to retirement benefits promised to public employees and retirees of Pennsylvania and its political subdivisions. Generally, retirement benefits cannot be changed or eliminated even if an employee has worked a single day and vesting of those rights are not necessary. Pension benefits are seen by the Courts as a part of employee compensation and, therefore, is a contractual commitment even though the actual receipt of the benefits are deferred. Hence, pension rights are constitutionally guaranteed. (Wright v Retirement Board of Allegheny County, 134 A.2d.231, 1957). Neither state statutory law nor local ordinances may be used to eliminate retirement benefits. Unilateral changes or modifications are also constrained by these constitutional standards. White v. Commonwealth State Employees' Retirement System, 565 A.2d 839. Police Pension Fund Association Board v. Hess, 562 A.2d 391 (1989). This constitutional guarantee has been repeatedly applied to situations where municipalities, faced by financial hardship, adopted ordinances to increase basic contribution rates for employees. Such increases in contributions are not allowed to be imposed unilaterally. Pennsylvania Federation of Teachers v. School District of Philadelphia. (484 A.2d 751, 1984). (AFL-CIO v. Commonwealth, 472 A.2d 746, 1984). The actuarial soundness of a retirement fund is not an issue and cannot be used as a basis for unilateral changes. (Geary v. Retirement Board of Allegheny Count, 231 A.2d 743, 1967). However, this is not to say that changes can never be made to retirement plans because of the constitution. There are several situations where this can occur under existing law. They are:

In cases involving municipal authorities if the pension plan in its "Plan Document" is ambulatory and provides for modifications of the plan by the employer. Transport Workers Union of America, Local 290 by and through Fabio v. Southeastern Pennsylvania Authority. Although ERISA exempts state and local organizations, one can assume a similar requirement that a summary of the plan document (SPD) must be provided to each employee for these modifications to be effective. Also it must be noted that the Fabio involved an employer organized under the Municipal Authorities Act not the Municipal Code.

-New Employees. The legislature and, presumably, municipalities may make changes or adjustments to the pension plans and the formulas to calculate benefits by legislation or ordinance if such changes apply to new employees hired after those changes were made. Even in situations involving new employees the state must prove that the newly hired employees did not satisfy the conditions of eligibility under the old plan. The state must also prove that the actuarial soundness of the retirement plan was reasonably enhanced by such adjustments. (McKenna v. Commonwealth State Employee Retirement Board, 421 A.2d 1236, 1980).

-Changes in plans have always been permitted in cases where employees, either by voluntary agreement, voluntary withdrawal from the system or through the collective bargaining process, "Expressly Relinquish" their benefits. As a result, benefits can be changed if there is a mutual agreement between the parties. Mutual agreement has even been extended to the results of an arbitration agreement. (City of Pittsburgh v. Fraternal Order of Police, Fort Pitt Lodge No. 1m 850 A2d 846, 2004).

-Implied Relinquishment of benefits may also occur in cases of performance or nonperformance of an act that carries legal repercussions. An example of implied relinquishment can be found in situation where a public employee has been convicted of a crime and would be, therefore, subject the Public Employee Pension Forfeiture Act of 1978. Judicial interpretation of this Act had led to a divided Pennsylvania Supreme Court decision in Miller v. Commonwealth State Retirement Board, 445 A.2d 88 (1981).

While the above discussion clearly leads us to the conclusion that the Pennsylvania constitution guarantees retirement benefits, there may be ways to remove such constraints.

DEFAULTS: POLICY CONSTRAINTS AND METHODS TO REMOVE THE CONSTRAINTS

Defaults of Municipalities: There are federal and state constitutional guarantees which prevent municipalities from

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reducing or adjusting public pensions in Pennsylvania. The use of state legislation or municipal ordinances as a reaction to the public pension crisis is constrained as a result. However, this does not mean that the constraints on policy caused by these constitutional guarantees preclude the removal of the constraints. There are ways to go about it. They are as follows:

**Voluntary Express Relinquishment** As mentioned previously the constitution would permit employees either alone or through their bargaining agents to negotiate adjustments to their pensions. Of course, the question arises, why would they agree to something which was so completely contrary to their own interests? But there are reasons why they may wish to seriously consider such changes. First, unfunded liabilities may contribute to such financial hardships for a local government unit that the municipality may be forced to consider the prospect of Chapter 9 bankruptcy. In such cases, though the collective bargaining process or otherwise, changes in pension formulas may be a part of recomposing the liabilities and, thereby, the finances of the municipality. This would require tough negotiations with public sector unions and groups that represent present retirees. Second, the prospect of doomsday remedies to be discussed below may also lead employees, retirees and their representatives to the conclusion that good faith negotiations to adjust retirement plans may be a useful part of the "Theory of the Second Best" to protect the interests of their members.

**The Application of PA Act 47** As a response to the increasing problems faced by local governmental units in Pennsylvania, the PA legislature adopted the Municipalities Financial Recovery Act in 1987. This law is often referred to as Act 47. Since 1987, when the law was passed, several provisions have already been carved out of it. The remaining operational provisions provide:

1. Allows the State, through the Pennsylvania Office of Community and Economic Development, to develop a state assistance plan to aid distressed municipalities until they restore financial integrity. Elected local officials remain in control of the municipality's fiscal affairs.

2. Act 47 also creates a mechanism which provides state grants and loans to the distressed locality which in theory allows the locality to use its locally generated revenue to retire or reschedule debts.

3. The Act also acts as a gatekeeper before a municipality can choose to file a petition for adjustments under Chapter 9 of the Federal Bankruptcy Act.

Political Subdivisions of the Commonwealth must get the approval of the State upon recommendation of the OCED before they can get into bankruptcy. Changes in the law have effectively removed the application of Act 47 to the Cities of Philadelphia and of Pittsburgh. In 1991 the Legislature functionally removed Philadelphia from the purview of Act 47. It is important to note that Act 47 does NOT apply to School Districts. Functionally then, School Districts in Pennsylvania cannot declare bankruptcy. Presumably, a special state receiver would be appointed to assist or direct a School District. No School District in Pennsylvania has tested this approach. And it is certainly plausible if a financial meltdown occurred as a reaction to the underfunded pension problem, that the Legislature could amend Act 47 to apply to Schools or a similar statutory law could be passed which would allow Districts a path to Chapter 9 bankruptcies.

The experience with Act 47 cannot be described as a wholly successful one. Between 1987 and 2009, 24 municipalities (including the Cities of Johnstown and Reading) have entered Act 47. However, no municipality has ever left the protection of Act 47 (yes, that's right - none). While Act 47 gives municipalities' time and space to face their fiscal problems, it has often been describe as "a Band-Aid where a transplant is needed". If or when a major systemic failure occurs, it is likely that Act 47 will prove to be inadequate as a response. The function of Act 47 and the Secretary of the OCED will likely prove to be a mere gatekeeper eager to approve Chapter 9 petitions by municipalities.

**Chapter 9 of the US Bankruptcy Code** Chapter 9 of the Federal Bankruptcy Code has been in force since 1937. However, fewer than 600 municipal bankruptcies have been filed under the Chapter during the time. This number is in contrast to the uncounted millions of consumer and business bankruptcies filed under Chapters 7, 11 and 13. While the experience under Chapter 9 is somewhat limited, the frequency of Chapter 9 filing is likely to become very common in the future. What are the components of Chapter 9 and how will it affect the unfunded liability pension problem in Pennsylvania. The following points make this unique:

**Pre-Filing Issues** State Authorization: Chapter 9 permits a copious amount of State involvement in the bankruptcy process prior to an actual filing. First, under the 1994 Bankruptcy Reform Act, State authorization of the filing must be specifically authorized; it cannot be implied or generally authorized. As we have mentioned Pennsylvania permits Chapter 9 filings if the municipality has already utilized the procedures of Act 47. Under Act 47, the process would work in this matter; the state coordinator appointed to handle the distressed municipality would make a recommendation to the Secretary of the Office of Community and Economic Development and then either the Secretary or the Governor of the Commonwealth can authorize the Chapter 9 filing. State coordinators would likely make bankruptcy recommendations in situations where creditors have either rejected an Act 47 plan and no resolution of the
rejection can be reached or if creditors threaten the ability of the municipality to provide services (such as a repossession of equipment or inventory in accordance with the UCC Article 9). Presumably, if local officials fail to follow the Act 47 plan or unable to do so, the Coordinator recommendation to the Secretary would be virtually automatic. While Chapter 9 permits School Districts to file, Pennsylvania law does not. Hence, Chapter 9 would not be available to Districts unless the Pennsylvania Legislature authorizes it under either a special statute or new broad-based statute:

- Insolvency: To File under Chapter the local governmental unit must prove that it is insolvent in a strict sense. Insolvency under Chapter 9 means something more than it does under the other Chapters of the Code. To prove insolvency the municipality must prove that it cannot pay its debts as they become due or, generally, presently not paying its debts as they are due. Further, as a legal standard the municipal entity must show that the non-payment of debt is imminent and certain - it cannot be merely based upon speculation or a possibility. Unions are likely to challenge any Chapter 9 filing based on this standard. Decisions based upon the facts are left to the Bankruptcy Courts to decide.

- Restrictions under Chapter 9: Chapter 9 restricts filing to a voluntary filing only. Unlike other Chapters of the Code, Creditors do not have the right to initiate an involuntary filing. Further, Chapter 9 restricts the bankruptcy to plan of adjustments only. Hence, a Chapter 9 filing will never simulate or devolve into a Chapter 7 liquidation or straight bankruptcy. The powers of the Court are also somewhat restricted by the 10th Amendment of the US Constitution. As a result, it is in the power of the local government officials or state appointed trustee to make decisions on how to operate the municipality during bankruptcy and the Court cannot interfere with those operational decisions. The Courts role is mostly restricted to settling matters of law and supervising the plan of adjustment. Further, only the municipality may propose a plan of adjustment, not the creditors, although the creditors would have right to approve or reject the plan.

Post-Filing Issues: - Affect on future pension obligations: Under 11 USC Section 365, the Municipal Debtor can decide which executory contracts to assume or reject. Since by their nature future pension contributions are executory in nature, the impact of future pension contributions and additional liabilities can be rejected by the municipal debtor. Presumably, a municipality driven by unfunded pension liabilities would obviously choose to do so.

- Affect on past pension liabilities: Under the recent City of Vallejo bankruptcy, the Court in its memorandum of law stated that once states permit a municipality to make the decision to place itself in the power of a federal bankruptcy court, then federal law is supreme and supersedes state law. State constitutional guarantees become meaningless to all creditors. The Court in Vallejo Case specifically addressed its decision to the matters by collective bargaining agreements. However, Chapter 9 also provides that all creditors be treated equally. As a result the local pension plan would stand side by side with financial creditors such as bond holders, trade creditors and vendors. Similar to other parts of the Code, Chapter 9 does permit secured creditors to file motions for a stay. Presumably, this would provide secured creditors to obtain collateral outside of bankruptcy court if the motion is granted.

Default of the Commonwealth As mentioned the application of the Pennsylvania Contracts Clause, Article 1, Section 17, prevents the Commonwealth from adjusting pension liabilities and therefore, provides a constitutional guarantee of public pension benefits. Further, unlike municipalities that can potentially discharge or adjust pension obligations in Chapter 9, as a sovereign entity Pennsylvania cannot go bankrupt in a legal sense. Does this mean that the Commonwealth has no options to adjust pension obligations? The answer to this question is no. What then are the options out of the constitutional guarantees?

Voluntary Express Relinquishment, revisited The same conditions and reasons for a mutual agreement to adjust pension liabilities might be available in situations of fiscal emergency faced by the Commonwealth. While such a situation might be politically charged and heavy resistance to change will obviously and understandably be expected from public employees and their supporters, such resistance may be overcome in a desperate financial crisis. As mentioned already, voluntary relinquishment would permit adjustments and changes to retirement benefits without violation of Article I, Section 17. Municipalities and their employees might be motivated to enter into mutual agreement that provide for partial relinquishment due to pressure and incentives from the Commonwealth and to avoid the impact of Chapter 9 bankruptcy. What then would motivate the State? In the case of the state the answer may be found in incentives offered to them by the United States if (or when) a financial crisis occurs due to sovereign defaults of the states. The parties to such an agreement would be the Commonwealth, the public section unions authorized to act as a bargaining agent for the employees according to Act 195 or Act 111 and federal officials acted on behalf of the US. In other words, if all parties agree, the state constitution does not act as a bar to adjustments in pensions liabilities.

Legislative Control of the Revenue and Appropriations Process. Most state and municipal retirement funds are already functionally bankrupt and actuarially cannot meet the contractual obligations promised to future retirees. Act 47 was created to help the occasional local governmental unit that found itself in financial trouble. The Act is not designed to handle a large number of financially stressed municipalities. Chapter 9 of the US Bankruptcy Code,
infrrequently used in the past, may become a common haven for Pennsylvania municipalities. The Commonwealth using its own financial resources could choose to assist and refinance municipal governments, authorities and school districts. With respect to the retirement funds that are managed by the state on behalf of state workers or state funds in which teachers or public safety workers are included, the case can be made that the constitutional guarantee provided in Article 1, Section 17 compels the payment of benefits by the state on a "pay as you go" basis if nothing else. While the judiciary would certainly be called upon by retirees that have their benefits affected, the separation of powers limits the remedies that courts can impose on the state. Article III, Section 10 of the P A constitution states "All bills for raising revenue shall arise in the House of Representatives, but the Senate may propose amendments as in other bills." Article III, Section 11 explains to what purpose legislative appropriations can be made and these appropriations include "for the public debt and for public schools". Other parts of Article III such as Sections 19,29 and 30 also provide or guide the Legislature on Appropriation matters. Read together, these Sections of the Constitution clearly give exclusive authority to the Pennsylvania Legislature to make appropriations. Courts cannot appropriate money even through judicial remedy. Therefore, in some ways, the constitutional guarantee for public pensions is functionally conditioned on the legislature's willingness to fund such a guarantee since it has sole control of the state appropriations process.

Potential Federal Bailouts The last state to default on its debts was Arkansas in 1934. In the Arkansas case, the United States came to the rescue and through the use of federal guarantees was able to assist the state in rescheduling and changing its credit and bond obligations. Bonds are also a form of contract and the Contract Clauses of the Federal and State constitutions clearly pertain to bond covenants and promises. In recent times, the United States has had a heavy hand in the rescheduling of both financial and trade credit obligations of automobile companies, bank and insurance holding companies and in other industries. The United States as part of the "bailout" process used its clout to compel the release of contractual claims of creditors and employee benefit funds. And this change has happened both inside and outside of the bankruptcy process. There are differences between the legal and constitutional basis of federal bailouts as far as they apply to the financial industry, which rests on federal statutory law such as the Federal Reserve Act of 1932 and the automobile bailouts where the US bankruptcy courts were used to permit the US to play a large part in pre-packaged bankruptcy resolutions. The 10th Amendment of the US Constitution does state that "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the State respectively, or to the people". A reading of the 10th Amendment does not seem to restrict the ability of states, as a condition of receiving federal aid, to enter into agreements with the United States to alter or adjust any credit obligation, whether they are to bond holders or state retirement fund trustees. Of course since no issue has been raised in court concerning this issue, no cases exist to guide us. However, what cases do apply to the altering of contracts by federal action (Schechter vs. Amalgamated Meat Packers, 295 U.S. 495, 1935), only seem to require that Congressional action is required before such action occurs. Remember the US Constitution clause ONLY applies to states, not to the US. Therefore, it is likely that the US has the authority through congressional action to condition federal help to states that face default upon the adjustment of ALL creditor and contractual claims against it. Hence, federal bailout legislation will be able to legally override state constitutional guarantees.

CONCLUSION

The problem of underfunded liabilities of state and municipal pension funds will not be solved unless revenues, tied to substantial improvements in economic growth rates, and investment returns tied to sizable increases in the returns on investable assets of the pension funds experience double digit increases in the future. Such economic and investment conditions do not seem feasible. What will happen depends on the extent of the underfunded liabilities. One can, however, reach the following conclusions:

-Municipalities, Public Benefit Corporations and School Districts will face the specter of default due to the unsustainable nature of these liabilities. Act 47, while available for municipalities, may not prove adequate to address the imminent financial problems caused by underfunded retirement systems. Unless new legislation is passed in Pennsylvania to deal with municipal defaults, it is likely that Pennsylvania will permit Chapter 9 filings to occur. As mentioned above the application of legal or constitutional restraints on changes in or reductions of benefit levels would be subordinate to the authority of the bankruptcy court. Adjustments can be made to pension benefits in the bankruptcy process. The Authority of the Bankruptcy Courts in Chapter 9 extends over all local governmental units, including school districts, authorities and special purpose districts. To avoid bankruptcy, voluntary relinquishment of benefits negotiated through composition agreements, novation or changes in collective bargaining agreements may be used as alternative to bankruptcy.

-State Pension Funds: The State may also lack the resources to assist political subdivisions and the Commonwealth itself may face the prospect of fiscal collapse as a result of a serious financial meltdown in public finances. In such emergencies, federal law would permit the state to refuse to honor constitutional guarantees of its own retirement system. There is, however, a state guarantee but that guarantee may prove to
be hollow if a substantial financial default occurs. Through federal bailout legislative action, such guarantees may be extinguished. Again, voluntary relinquishment may be employed to stave off default, but if a default does occur, the Commonwealth, like all states, would look to the United States to assist them. The Federal Government could require deep cuts in pension benefits and in the formulas used to calculate these benefits. The US is not restricted by the constitutional restraints on the impairment of contracts by either the state or federal constitutions. It is also unlikely that the 10th Amendment would act as a constitutional bar on requiring changes to these plans, especially if the state is forced to act as a supplicant for federal funds. Whether the US will require the adjustment of retirement plans on an ad hoc basis depending on the situation of each state, or as part of a comprehensive federal bill that provides uniformity to the bailout process.

Presently, there is a perception that constitutional constraints prohibit changes to retirement benefits in the public sector. However, in a financial or economic emergency, a firm guarantee may not exist. If the United States is compelled to provide a massive bailout similar or greater than the one given to the banking system and auto industry during the 2008/2009 financial panic, it is likely that federal bankruptcy filings and federal legislation or action will trump such guarantees, thereby rendering such guarantees void.

ENDNOTES


5. U.S. Constitution Article I, Section 10, Clause 1.


9. PA Statutes Annotated Section 53, Subsection 731.

10. PA Statutes Annotated Section 53, Subsection 12720.101


14. 11 U.S.C. Section 109(c)

15. 11 U.S.C. Section 109 and 110

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INCREASING INNOVATION IN TAX ADMINISTRATION COLLECTIONS:
Pennsylvania Department of Revenue

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ABSTRACT
State tax administration collections tend to behave like a typical monopoly, where one of the key performance characteristics is the slow to innovate due to lack of competitive pressures. Adoption of new technology and implementation of innovative processes tend to be gradual. The Pennsylvania Department of Revenue strategically recognizes this underperforming characteristic and has focused on accelerating technology innovation through mainframe modernization and the introduction of electronic processes into the collection procedures where the paper population and the transfer of its data costs can be reduced.

The Revenue Modernization initiative will create an Integrated Tax System to modernize and integrate antiquated individual computer systems, which in some cases date back to the 1970s, and electronically transform many manual processing procedures. The initiative began in December 2010 to be completed in 2015. The Keystone e-Initiative encompasses many strategic initiatives concerning taxpayer and administration collections where data filing and remitting by paper will be transacted electronically upon implementation that complement the Modernization initiative.

The objectives of the initiatives are to increase efficiency and effectiveness within the Department to meet the Corbett Administration’s budget principles of government reform and limited government by reducing the opportunity cost of administering state taxes and fiscal discipline by creating a sustainable foundation for future taxpayer cost reductions.

I. INTRODUCTION
The mission of the Department of Revenue is to administer the tax laws in a fair and equitable manner and other revenue programs of the Commonwealth to fund government services. The Department originated in 1927 and began operating in 1929.

The Department is responsible for collecting 32 different state taxes (except unemployment and workers compensation collected by the Department of Labor and Industry) including personal income tax and employer withholding; corporate taxes; sales, use and hotel occupancy tax, including local sales tax in Allegheny and Philadelphia counties; inheritance tax; realty transfer tax; excise taxes on cigarettes, malt beverages; and motor fuels taxes. The Department also collects various fees, fines and other monies due the Commonwealth. Generally, the Department is the sole state agency, or public monopoly, for collecting state taxes.1

Economists have long known that monopolies can be damaging to the economy. A monopoly is an agency that is the sole producer or supplier of a good or service, or one that is nearly so. One of the key ways in which a monopoly can damage an economy and society is by slowing down the rate of technological advance.2

A traditional view is that monopolies have less incentive to conduct research and development regarding new and improved technologies than do competitive firms, because they already have the dominant market share and are usually highly profitable. This is in spite of the fact that they generally have much greater funds available to support research and development. Rather, they often devote substantial amounts of their profits and managerial focus to efforts to maintaining and extending their monopoly powers.

Ways in which monopolies typically slow down or stop technical advance include the following (Greenstein, February 20, 2002; Linux Information Project, June 12, 2006):

- Conducting less and/or less productive research and development than would be the case if the same industry was more competitive. Although the research and development budget for a monopoly can look very large, the size of a budget is not necessarily a good measure of the quality or productivity of the research and development.
• Holding back on offering or using the most advanced technology, even if it is already available. One reason is that very large expenditures might be necessary to apply the new technology to the production equipment or products; such expenditures might provide little benefit to the monopolist and might merely cut into its profits. Furthermore, the protected monopolist will not want to cannibalize monopoly rents already enjoyed in the product market by the introduction of product innovation.

• Innovations maybe slow due to a monopoly because it may make the products so efficient that users will need to spend less on them (e.g., products that are more durable and thus will not have to be replaced as frequently). In addition, a monopolist may want to wait to incorporate newer technologies only in the newest versions of products and thereby put pressure on users to upgrade at additional expense.

• Making greater efforts to suppress the development and utilization of new or improved technologies by existing and potential competitors.

It can be argued that due to public monopoly characteristics of the Department of Revenue as well as any federal, state and local revenue departments, adoption of new technology and implementation of innovative processes tend to be slow. The Pennsylvania Department of Revenue strategically recognizes this underperforming characteristic and has focused on accelerating technology innovation of collection and remitting procedures by modernizing primarily Revenue’s antiquated mainframe tax systems through the implementation of an Intergrated Taxation System (ITS) and by reducing of the transfer of data by paper and its costs by the introduction of electronic process initiatives called the Keystone e-Initiative (KEI).3

Electronic filing is the most cost-effective filing method, saving the state about $3.18 per return filed electronic relative to paper using personal income tax return as an example. Electronic filing offers advantages to taxpayers not available to those filing by paper, such as error-reducing automatic calculators, instant confirmation of successful filing, faster refund processing, and direct deposit options.

ITS and KEI initiatives are aligned with the Department’s three key goals, consistent with the Corbett Administration’s agenda, of (1) improving customer service and building trust with all stakeholders; (2) creating efficiencies, reducing redundancies, lowering costs and improving productivity; and (3) enhancing the equitable collection of taxes due through clarity of compliance, education of tax obligations, and leveraging of technology, data and information so as to enforce the tax laws equally for all taxpayers.

Section II of this paper provides greater detail of the Department’s organizational structure of processing and collections within the Taxation Deputate. Also, this section provides details of taxation imposition, payment and filing dates, number of returns filed, and payments by electronic and paper methods for the Bureaus of Corporation Taxes, Business Trust Fund Taxes, Individual Taxes, and Motor Fuel Taxes. Section III of this paper discusses two of the Department’s technology innovations: Modernization Project and Keystone e-Initiative. Successful implementation of both innovations will bring considerable taxpayer and tax administration benefits. Lastly, the paper concludes that the Department’s two technology innovations are aligned with sound tax policy for ease of administration and the Corbett Administration’s budget principle of government reform and limited government that will result in greater taxpayer and administration efficiency as well as lower costs of voluntary compliance.

II. ORGANIZATIONAL STRUCTURE OF PROCESSING AND COLLECTIONS

The structural arrangement for processing and collecting of taxes is based on a mix combination of tax type and tax function (OECD, January 28, 2009). Revenue agencies have implemented organization reforms, with the key drivers being increased efficiency and effectiveness. In addition, economies of scale considerations have resulted such as centralizing taxpayer service centers. The Department of Revenue mirrors these trends. For example, the organizational structure is by tax type, such as the Corporate Net Income Tax within the Bureau of Corporation Tax and by functional type such as by processing, taxation, and accounting functions within the Bureau.

While technology innovation through electronic processing and collections has been part of the organizational framework of the Department, slow to innovate is a symptotic nature due the lack of competitive pressures. Nevertheless, technology innovation can be accelerated into collection processes where paper population and transfer of data can be achieved through introduction of electronic processes.

The current Department of Revenue’s electronic processing filing platforms, administered by the Bureau of Income Taxes are electronic Federal/State e-file to be upgraded to Modernized e-file (MeF), TeleFile, pa.direct.file, and e-TIDES platforms. The Pennsylvania Business Tax e-Services (http://www.doreservices.state.pa.us/BusinessTax/default.h
Federal/State e-file allows taxpayers to file federal and state income and certain business tax returns together or separately. It is available through tax preparers or computer software. E-file allows direct deposit of a refund, and the option to pay your Pennsylvania tax due by electronic funds withdrawal or with a credit card. Now, the Internal Revenue Service is in the process of replacing its current electronic tax return filing technology with a modernized, Internet-based electronic filing platform. The Modernized e-file (MeF) platform is a transaction based system that allows tax return originators to transmit returns electronically to the IRS in real-time, improving turnaround times. This is a major improvement over the current e-file system which processes returns in several batches per day, rather than in real time.

Telefile is the process where taxpayers and businesses can file simple tax returns over the telephone. If a taxpayer filed a Pennsylvania Personnel income tax return last year, then a taxpayer just needs their Social Security number and ZIP code to file. If the taxpayer is a business, the taxpayer can file the employer withholding or sales tax returns as long as the taxpayer has their corresponding eight digit PA ID number and the employee identification number or social security number. The TeleFile option is designed for taxpayers and small businesses that do not have Internet access. A taxpayer can dial, toll-free, and is available 24 hours a day.

Pa.direct.file allows taxpayers to file personal income tax returns over the internet. The Pa.direct.file option allows the taxpayer to make tax due payments via ACH debit or have refunds direct deposited via ACH credit.

E-TIDES, Electronic Tax Information and Data Exchange System, is an Internet filing system that allows electronic filing of returns, payments and/or extension requests. Corporation taxes, Sales and Use Tax, Employer Withholding Taxes and Unemployment Compensation using e-TIDES. The taxpayer can also purchase software to file online.

The PA Department of Revenue e-Services Center is the site for all of the Department's electronic filing services including estimated payments, check the status of returns and refunds, update information, pay taxes by credit/debit card, access online customer service, review answers to commonly asked questions, and download tax forms (http://www.doreservices.state.pa.us/Default.htm).

The Deputy Secretary for Taxation oversees the Bureau of Corporation Taxes, Bureau of Individual Taxes, the Bureau of Business Trust Fund Taxes, and the Bureau of Motor Fuel Taxes which perform the following key functions:

- Reviewing, examining and processing personal income tax returns, inheritance tax returns, realty transfer tax documents, property tax and rent rebate applications, corporation tax reports, sales and use tax returns, employer withholding returns, motor fuels tax returns and International Fuel Tax Agreement (IFTA) returns. The framework for tax administration is taxpayer registration, withholding, collection of tax by advancement payments by monthly or quarterly installments, assessment (self-assessment), information reporting, return filing obligations, and use of modern electronic services (OCED, January 24, 2009).

- Providing customer service to taxpayers by responding to incoming telephone calls, conducting scheduled call-backs, replying to taxpayer inquiries submitted through the Online Customer Service Center and maintaining the database of commonly asked questions and answers featured in the Online Customer Service Center.

**Bureau of Corporation Taxes**

The Bureau of Corporation Taxes is responsible for administering all corporate taxes including domestic (incorporated in Pennsylvania) and foreign (incorporated outside Pennsylvania) corporations doing business in Pennsylvania and are subject to Corporate Net Income Tax (CNIT) and Corporate Loans Tax. In addition, domestic corporations pay Capital Stock Tax, and foreign corporations doing business in Pennsylvania pay Foreign Franchise Tax (CSFT). It should be noted that one of the Corbett Administration’s initiatives is to continue the scheduled phase-out of the CSFT so as to be eliminated by January 1, 2014. Special classes of domestic and foreign corporations are subject to various selective business taxes including Gross Receipts Tax (GRT); a Public Utility Reality Tax (PURTA); a Gross Premiums Tax; the Bank and Trust Company Shares Tax, the Mutual Thrift Institutions Tax, and the Corporate Loans Tax. The Bureau is divided into four major divisions involving collections: Processing, Taxing, Accounting, and Computer Development and Support.

Pennsylvania’s CNIT tax is levied on federal taxable income, without the federal net operating loss deduction.
and special deductions, and modified by certain additions and subtractions. The CNIT rate is 9.99%. CNIT taxpayers file estimated payments quarterly with an annual payment generally on April 15th for calendar year filers. Approximately 117,000 annual returns are filed by either paper (89%) or Fed/State E-file (11%). Payment for CNIT can be by credit card (1%), Electronic File Transfer, EFT (9%), or by paper check (90%). The Corporate Tax Mainframe system is used for tax processing and is over 35 years old beginning in the mid-1970s. The Commonwealth received for 2009-10 almost $1.8 billion.

The CSFT is imposed on the corporation’s capital stock value at a 2.89 mills base rate for 2010 on formula valuation with a $160,000 valuation exemption. CSFT taxpayers file estimated payments quarterly with an annual payment generally on April 15th for calendar year filers. Approximately 368,000 annual returns are filed by either paper (88%) or Fed/State E-file (12%). Payment for CSFT can be by credit card (0%), EFT (39%), or by paper check (61%). The Corporate Tax Mainframe system is used for tax processing. The Commonwealth received for 2009-10 almost $761 million.

The GRT is imposed on gross receipts of certain electric, telecommunications, and transportation companies. GRT rate is 50 mills except for electric companies with a rate of 59 mills. GRT taxpayers file estimated payments due March 15th for the current taxable year and must exceed 90% of reported annual liability or 100% of the liability two years prior subject to the current rate. In addition, GRT taxpayers file an annual payment by March 15th with private bankers filing by February 15th. Approximately 550 annual returns are filed all by paper (100%). Payment for GRT can be by credit card (0%), EFT (31%), or by paper check (69%). The Corporate Tax Mainframe system is used for tax processing. The Commonwealth received for 2009-10 almost $1.3 billion.

PURTA is imposed on public utilities regulated by the Pennsylvania Public Utility Commission and levied at an annual variable rate. PURTA taxpayers file estimated payments due May 1st for the current taxable year and file an annual payment by May 1st. Approximately 264 annual returns are filed by paper (90%). Payment for PURTA can be by credit card (1%), EFT (39%), or by paper check (60%). The Mainframe system, web based application, and PC/server based applications are used for tax processing. The Commonwealth received for 2009-10 almost $1.3 billion.

The Gross Premiums Tax imposed on domestic and foreign insurance companies at 2% of gross premiums with certain exceptions. Gross Premiums taxpayers file estimated payments due March 15th for the current taxable year and must exceed 90% of reported annual liability, or 100% of the liability two years prior subject to the current rate. In addition, Gross Premiums taxpayers file an annual payment by April 15th (with Marine Insurance Underwriting Profits Tax due by June 1st and Surplus Lines Tax due January 31st). Approximately 2,550 annual returns for all tax types within the Gross Premiums Tax are all filed by paper (100%). Payment for Gross Premiums Tax can be by credit card (0%), EFT (52%), or by paper check (48%). The Corporate Tax Mainframe system is used for tax processing. The Commonwealth received for 2009-10 over $418 million.

The Bank and Trust Company Shares Tax is imposed on all bank and trust companies doing business in Pennsylvania at a rate of 1.25%. The Bank and Trust Company Shares taxpayers report and file 100% of the tax on the value of the shares on the preceding January 1st are due on March 15th of each year. About 260 annual returns for all tax types within the Bank Shares Tax are all filed by paper (100%). Payment for the Bank Shares Tax can be by credit card (0%), EFT (52%), or by paper check (48%). The Corporate Tax Mainframe system is used for tax processing. The Commonwealth received for 2009-10 almost $192 million.

The Mutual Thrift Institutions Tax is levied on savings institutions, savings banks, savings and loan associations, and building and loan associations doing business in Pennsylvania at a rate of 11.5%. The Mutual Thrift Institutions file estimated payments quarterly by applying the current tax rate to 100% of the tax base for the second preceding year, or by paying at least 90% of the reported annual liability for the current year. Taxpayers file annually where final reports are due 105 days after the close of the fiscal year. About 132 annual returns are filed by paper (100%). Payment for the Mutual Thrift Institutions Tax can be by credit card (0%), EFT (51%), or by paper check (49%). The Corporate Tax Mainframe system is used for tax processing. The Commonwealth received for 2009-10 over $15.6 million.

The Corporate Loans Tax is imposed on all domestic and foreign corporations doing business in and having fiscal officers in Pennsylvania. The Loans Tax is imposed at the rate of 4 mills on each dollar of the nominal value of all script, bonds, certificates, and evidences of indebtedness. Payments are due 105 days after the end of the taxable year. About 329,000 annual returns are filed by paper (86%) or by Fed/State E-file (14%). Payment for the Corporate Loans Tax can be by credit card (1%), EFT (12%), or by paper check (87%). The Corporate Tax Mainframe system is used for tax processing. The Commonwealth received for 2009-10 almost $14 million.
Bureau of Business Trust Fund Taxes

The Bureau of Business Trust Fund Taxes is responsible for administering the tax programs for Employer Withholding Tax, Consumption taxes and other business taxes.7 Consumption taxes are levied on the purchase of certain types of tangible personal property and selected services. Consumption taxes are imposed on the ultimate consumer, but collected and remitted to the Commonwealth by licensed agents of the Commonwealth such as manufacturers and retail vendors. The Consumption taxes are Sales, Use and Hotel Occupancy Tax, Cigarette Tax, the Malt Beverage Tax, Public Transportation Assistance Fund Taxes and Fees; and the Vehicle Rental Tax. The Bureau includes four major divisions: Sales Tax, Employer Tax, Miscellaneous Tax, and Registration.

Employer Withholding Tax is imposed upon employers to withhold and remit Pennsylvania Personal Income Tax on employees’ wage and salary income. Employers remit Personal Income Tax withheld on a quarterly basis if the total withholding tax is under $300 per quarter; monthly if $300 to $999.99 of tax is withheld per quarter; semi-monthly if $1,000 to $4,999.99 in tax is withheld per quarter and semi-weekly if $5,000.00 or more is withheld per quarter. Over 1.2 million returns are filed annually by e-TIDES (83%), Telefile (11%), or paper (6%). Payment for Employer Withholding can be by EFT (74%), paper check (25%), or credit card (1%). The Keystone Integrated Tax System (KITS) is used for tax processing and administration of Employer Withholding Tax and Sales and Use Tax and has been in place since 1996.8 For Fiscal Year 2009-10 the Commonwealth received for over $7.7 billion.

The Sales, Use and Hotel Occupancy Tax is imposed on the retail sale, consumption, rental or use of tangible personal property, or rooms for rent in Pennsylvania. The tax is also imposed on certain services relating to tangible personal property, real estate and on the charge for specific business services. The tax is imposed on the consumer, but vendors are liable for collecting and remitting the Tax to the Commonwealth. The state Sales, Use and Hotel Occupancy Tax is imposed at a rate of 6.0%.9 Allegheny County imposes a local sales and use tax rate of 1%, and Philadelphia County imposes a local sales and use tax rate of 2% (after June 30, 2014, the rate reverts to 1%). Philadelphia and Allegheny County Hotel Occupancy tax is imposed at a rate of 1%.

Sales tax licensees must file and remit tax on a quarterly basis when the total tax reported due in the third quarter of the preceding calendar year was less than $600, but greater than $75 or monthly when the total tax reported in the third quarter of the preceding calendar year was less than $25,000, but greater than $600. Licensees whose total tax reported due is $300 or less annually, may file and remit on a semi-annual basis. Payments and returns are due on the 20th day of the month following the established filing period except for semi-annual returns and payments which are due on the 20th day of the second succeeding month following the established filing period.10 About 1.7 million returns are filed annually by e-TIDES (76%), Telefile (23%), or paper (1%). Payment for Sales Tax can be by EFT (78%), paper check (21%), or by credit card (1%). KITS is used for tax processing. Pennsylvania collected almost $8.5 billion in FY 2009-10.11

Use Tax, the counterpart of Sales Tax, is due on taxable purchases of tangible personal property or specified services used or consumed in Pennsylvania where Sales Tax is underpaid or not paid to a vendor. Use tax is often due on purchases made over the internet, through toll-free numbers (800, 888, 866, and 877), from mail order catalogs, and from out-of-state locations. The Use Tax rate is the same as the Sales Tax rate: 6.0% state, with an additional 1.0% local tax for items purchased or used in Allegheny County. Furthermore, 2% local tax applies to items purchased or used in Philadelphia. Licensees must report and pay use tax at the time their regular Sales Tax return is due. Non-licensees must report and pay Use Tax on or before the 20th day of the month following the month during which the Tax was incurred. Individual taxpayers file monthly by paper (100%) where 35,600 payments are by paper check (100%). KITS is used for tax processing. Pennsylvania collected over $22 million for FY 2009-10.

The Cigarette Tax is imposed on all cigarette packs for sale in Pennsylvania where each pack must be affixed with a valid Pennsylvania cigarette tax stamp. The Cigarette Tax rate is 8 cents per cigarette. The cigarette stamping agent files with the Department, on or before the 20th day following the end of each fiscal or calendar month, a cigarette tax report covering the preceding month. Over 1,330 returns are filed annually by paper (100%). Payments are made by EFT (48%) or by paper check (52%). A client server application, placed into service in 1999, is used for Cigarette Tax processing. Pennsylvania collected about $1 billion for FY 2009-10.

The Malt Beverage Tax is levied on malt or brewed beverages manufactured and sold for use in Pennsylvania, or manufactured outside of Pennsylvania but sold for importation and use in Pennsylvania. The tax is remitted to the Department by the manufacturer or importing distributor. About 2,600 returns are filed annually by paper (100%). Payment for the Malt Beverage Tax can be either EFT (92%) or by paper check (8%). A client server application, placed into service in 2001 is used for tax processing. Pennsylvania collected almost $27 million for FY 2009-10.
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The Local Option Small Games of Chance Act of 1988 allows certain nonprofit organizations to conduct small games of chance for the purpose of raising funds for the promotion of “public interest purposes”. The Act permits the following games: punchboards, pull-tabs, raffles (including lotteries), daily drawings, and weekly drawings. An annual registration fee is imposed on manufacturers and distributors of small games of chance. Each manufacturer pays $2,000 and each distributor pays $1,000 in registration fees plus $10 investigation background check for each owner or officer of either entity type. About 160 applications are filed annually by paper (100%) and payment by paper check (100%). A Small Games of Chance client server application, placed into service in 2003, is used for processing the annual fees. Pennsylvania collected approximately $200,000 for FY 2009-10.

The Public Transportation Assistance Fund (PTAF) receives funding from any person making sales, rentals, or leases subject to tax or fees and requires such persons to obtain a Public Transportation Assistance Fund Tax License from the Department of Revenue. Licensees are required to file quarterly returns in a manner consistent with the requirements established under Article II of the Tax Reform Code. If a transaction is taxable and the purchaser does not pay the tax to the vendor, then the purchaser must pay the tax directly to the Department. The taxes and fees are the following: (1) the New Tire Fee is a $1.00 per tire fee imposed on the sale of new tires for highway use in Pennsylvania; (2) the Motor Vehicle Lease Tax is imposed at 3% of the total lease price where the lease is 30 days or more; and (3) the Motor Vehicle Rental Fee is a $2.00 per day on the rental vehicle where the rental is less than 30 days. There are 35,000 returns filed annually by paper (100%) and payment by paper check (100%). The PTAF mainframe application, placed into service in 1991, is used for tax processing. Approximately $87 million was collected for FY 2009-10.

The Vehicle Rental Tax is imposed at a rate of 2% on the purchase price for each rental contract for a period of 29 days or less on rental companies that have available for rental five or more motor vehicles designed to carry 15 or less passengers, or a truck, trailer, or semi-trailer used in the transportation of property other than commercial freight. Returns are filed quarterly on the 20th day of the following month following the established filing period and the annual reconciliation is due on February 15th of the following year. There are approximately 2,000 returns filed annually by paper (100%) and payment of paper check (100%). The Vehicle Rental Tax client/server application, placed into service in 1994, is used for tax processing. Over $13 million was collected for FY 2009-10.

Bureau of Individual Taxes

The Bureau of Individual Taxes is responsible for administering all of the tax programs related to individuals, such as Personal Income Tax, Inheritance Tax, Realty Transfer Tax and the Lottery-funded Property Tax/Rent Rebate program. The Bureau is also responsible for administering the Federal/State e-file, TeleFile and pa.direct.file programs. This bureau consists of four divisions: Inheritance Tax, Property Tax/Rent Rebate, Examination and Personal Income Tax Delinquent Tax.

The Personal Income Tax is levied against taxable income of resident and nonresident individuals, estates and trusts, partnerships, S-corporations, business trusts, and limited liability companies that are not taxed as corporations for federal tax purposes. The Personal Income Tax rate is 3.07%. Returns are due by April 15th of each year. Returns filed annually were 6.3 million for 2009-10 by paper (39.3%), Fed/State E-file (49.8%), Telefile (4.1%), or pa. direct.file (6.8%). Payment for Personal Income Tax can be made by credit card (0.9%), EFT (10.8%), or by paper check (88.3%). The Annual Personal Income Tax Mainframe system, placed into service in 1987, is used for tax processing. The Commonwealth received for 2009-10 over $10.9 billion.

The Inheritance Tax is imposed on the value of the decedent’s estate transferred to beneficiaries by will, intestacy or by operation of law. The Inheritance Tax is due upon the death of the decedent and becomes delinquent nine months after the individual’s death. The Inheritance Tax rate is determined by the relationship of the beneficiary, heir or transferee to the decedent: spouses and parents of decedent 21 years of age or younger-0%, other lineal heirs-4.5%, siblings-12%, all other heirs-15%. In 2009, there were 85,000 returns filed by paper (100%). The Inheritance Tax must be paid to the county register of wills only by paper check (100%). The Inheritance Tax Mainframe system, placed into service in 1994, is used for tax processing. The Commonwealth received for 2009-10 over $828 million.

The Realty Transfer Tax is a documentary stamp tax imposed at a rate of 1 percent on the value of an interest in real estate transferred. The tax is payable at the earlier of the time the document effecting the transfer is presented for recording to the county recorder of deeds or within thirty days of acceptance of such document. Payment for Realty Transfer Tax can be made by paper check (95%) or by EFT (5%; in some counties with electronic document recording systems). A Client-Server system is used by the Department of Revenue for Realty Transfer Tax examination and assessment processing (for tax that was unpaid or underpaid at time of document recording) and

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was placed into service in 2000. The Commonwealth received for 2009-10 over $349 million.

The Property Tax and Rent Rebate (PTRR) program is not a tax, but a rebate program, generally, for senior citizens. PTRR rebate claims are processed through the Bureau of Individual Taxes and the program is funded by the Pennsylvania Lottery and slots gaming revenues. Over 586,000 Pennsylvanians are benefiting from the program where filing is completed by paper (100%). Rebate payment to recipients is done by ACH credit (21.8%) or by paper check (78.2%). The PTRR Mainframe system, placed into service in 1997, is used for rebate claims processing. The PTRR program paid out over $247 million.

**Bureau of Motor Fuel Taxes**

The Bureau of Motor Fuel Taxes is responsible for licensing and bonding activities for applicants within registration guidelines for the various Motor Fuels and Motor Carrier Road Tax/IFTA. Furthermore, this Bureau directs the collection programs for delinquent accounts for these various taxes. In addition, the Bureau conducts investigations/cursory audits of suspect files; files criminal complaints for violations of tax acts; and issues and files citations for infractions of tax laws. The Bureau consists of a Taxing and Collections Division and four district offices.

The Liquid Fuels and Fuels Tax is a permanent trust fund tax of 12 cents per gallon or a fractional part is imposed on all liquid fuels and fuels used or sold and delivered by distributors in Pennsylvania. The tax is imposed on the ultimate consumer, but the distributor is liable for collecting and remitting the tax. Payments and reports are due on or before the 20th of each month for fuel sold or used in the preceding month. Returns filed annually were 7,000 for 2009-10 by paper (80%), e-TIDES (18%), or Telefile (2%). Payment for the Liquid Fuels and Fuels Tax is by credit card (2%), EFT (80%) or by paper check (18%). The Liquid Fuels and Fuels Tax Mainframe system is used for tax processing and has been in use since the 1980. The Commonwealth received for FY 2009 was about $752 million.

The Oil Company Franchise Tax is imposed on all taxable liquid fuels and fuels on a cents-per-gallon equivalent basis and is remitted by distributors of liquid fuels and fuels. The rate is 19.2 cents-per-gallon on all liquid fuels and 26.1 cents-per-gallon on all fuels used or sold and delivered by distributors within the Commonwealth. Payments and reports are due from distributors on or before the 20th of the month following the month of fuel sales. Returns filed annually were 750 for 2009-10 by paper (75%), e-TIDES (23%), or Telefile (2%). Payment for the Oil Company Franchise Tax is by credit card (2%), EFT (80%) or by paper check (18%). The Liquid Fuels and Fuels Tax Mainframe system is used for tax processing. The Commonwealth received for FY 2009 was about $448 million.

The Alternative Fuels Tax is imposed on alternative fuels used to propel vehicles on public highways. Each alternative fuel is converted to a gasoline gallon equivalent where the basis of this conversion is statutorily set at 114,500 Btu. The tax rate applied to the gasoline gallon equivalent equals the current liquid fuels tax and oil company franchise tax applicable to one gallon of gasoline. Alternative fuels dealer-users are required to remit this tax. Reports and payments are due on or before the 20th of each month for fuel sold or used in the preceding month. Returns filed annually were 960 for 2009-10 by paper (100%). Payment for the Alternative Fuels Tax is by EFT (80%) or by paper check (20%). Tax information is keyed into an Access database. Payments are batched and sent to the Department’s facility (Brookwood Street) for processing and collections for depositing. The Commonwealth received for FY 2009 was about $119,000.

Pennsylvania joined the International Fuel Tax Agreement (IFTA) effective January 1, 1996. This agreement provides for state reporting of fuel taxes for operators of qualified motor vehicles used in interstate operations. Qualified motor vehicles operated in Pennsylvania intrastate activities only are subject to fuel taxation under the Motor Fuels Road Tax. The Motor Fuels Road Tax is equivalent to the rate per gallon in effect on liquid fuels, fuels, or alternative fuels, plus an oil company franchise tax component. IFTA payments and reports are due on or before the last day of April, July, October, and January for the quarter ending the last day of the preceding month. Motor Carriers Road Tax reports are filed annually. Almost 6,000 returns are filed annually for 2009-10 by paper (100%). Payment is by EFT (10%) or by paper check (90%). The MCI/IFTA system is used for tax processing. The Commonwealth received for 2009 was over $40 million.

**III. DEPARTMENT OF REVENUE’S TECHNOLOGY INNOVATION**

Paper-based processes associated with tax returns and payments processing have consumed significant usage of a revenue agency resources. With an economic climate of staff reductions and compliance service and enforcement enhancements, revenue agencies have considerable incentives to automate these processes through greater use of technology. From OECD (January 28, 2009), the key benefits of accelerating the slow pace of technology innovation are the following:
• Faster collection of government revenue
• Improved data accuracy and elimination of reverse workflows
• Reduced paperwork for taxpayers
• Faster crediting of tax refunds
• Faster capture of taxpayer data for a range of administrative purposes.

With these and other benefits to the taxpayer and Revenue administration, the Department has introduced two significant initiatives: Modernization and Development of an Integrated Tax System (ITS) and the Keystone e-Initiative (KEI) discussed below.

**Modernization and Development of an Integrated Tax System**

The purpose of the Revenue Modernization Project is to make the Department of Revenue more efficient and effective at tax administration. Many routine tasks are handled manually within the Department due to the antiquated computer systems which in some cases date back to the 1970s. Many processes are duplicated in various areas of the Department because each tax has its own computer system and set of procedures.

All of the major information technology (IT) systems currently supporting the Department’s tax processing have been in existence for more than 15 years, some for more than 35 years. The Department currently maintains 33 separate IT systems that support its operations. Revenue spends more than 80% of maintenance funding just to keep the system operational—less than 20% is actually spent to improve or expand the service of these systems (Accenture, 2010). The need to modernize these systems grows each year due to changes in technology, the risk of failure associated with the aging systems, the retirement of a workforce familiar with COBOL (a computer language no longer taught in computer programming classes), and a desire for more customer-friendly systems.

Further, the Department’s systems are information silos that cannot efficiently speak to each other, so the Department is unable to view a taxpayer across all taxes and tax types. This hinders the Department’s ability to efficiently and effectively administer the state tax laws.

The centerpiece of modernization is to acquire a state-of-the-art integrated tax system (ITS). The Department recently executed a contract with Accenture to begin development of an integrated tax system for the Department. The goal is to reduce the cost of tax administration by adopting streamlined and uniform procedures for all taxes, and to provide better customer service by reducing routine errors in handling taxpayer accounts.

ITS will replace the following applications including: ACH debit, audit assignments, Bankruptcy Information Center, Business Trust EFT payments, Cigarette Floor Tax, Cigarette Licensing, Cigarette non-participating, Cigarette Tax, Combined liability system, Corporate Tax, CT registration, electronic filing for PIT, Inheritance Tax, Keystone Integrated Tax System, Liquid Fuels and Fuels Tax, Malt Beverage, manual refund, mass transit, modernized e-file, Motor Carrier Road Tax/IFTA, pass through business office, PIT-annual system, Property Tax Rent Rebate, Public Utility Reality Tax Administration (tax account only), revenue integrated clearance system, Small Games of Chance, treasury refund, validation of electronic transmissions, and Vehicle Rental Tax.

The Department embarked on a multiple year, multiple phase project, beginning in Fiscal Year 2007-08. Modernization of business processes and an integrated tax system will enable the Department to improve efficiency, reduce administrative costs, respond more quickly to ever-changing tax laws, and improve overall taxpayer service. The total costs to implement ITS is $103.92 million from FY 2007-08 to FY 2014-15.

The first system scheduled to go live under the ITS contract is corporation taxes on July 1, 2012 (Corporate Net Income, Capital Stock/Foreign Franchise, Gross Receipts, Gross Premiums (including Retaliatory) Marine Insurance, Bank Shares, Mutual Thrift, Bank Loans, Agriculture and Electric Cooperative, PURTA); with personal income taxes going live by August 1, 2013 (Personal Income, Fiduciary Income, Pass Through Entity, Inheritance, and PTRR); employer withholding and sales, use and hotel occupancy taxes on July 1, 2014 (Employer Withholding, State and Local Sales & Use and Hotel Occupancy, Malt Beverage, Public Transportation Assistance, Vehicle Rental, and Small Games of Chance), and remaining taxes on July 1, 2015 (Cigarette Excise, Floor & Licensing, Motor Carriers Road Tax/IFTA, Liquid Fuels, and Alternative Fuels).

**Keystone e-Initiative**

The Keystone Electronic or e-Initiative (KEI) is a broad Department initiative to require paper processing internally and externally with stakeholders to be processed in electronic form. The presumption is that taxpayers can operate and send in an electronic environment with appropriate exceptions.18 KEI implementation will expedite funding processes, data received electronically reduces administrative costs, capability to automatically audit, reduces error possibilities, and enhances enforcement opportunities. The KEIs are focused within...
the five bureaus and voluntary disclosure program under the Taxation Deputate. A significant number of the KEIs are complementary with ITS Modernization. Below is a partial listing of KEIs:

- **Incoming Internal and External Correspondence Account Information/Maintenance.** Taxpayer’s could send account maintenance requests to a generic e-mail address. The e-mail could be imported into Corporation Taxes external correspondence queue. To assist with specific account maintenance requests a template could be made available to taxpayers that could be inserted into the e-mail. The interactive template could be imported into the appropriate correspondence queues to be processed in a FIFO sequence.

- **Provide Internet Access by Taxpayer’s to their Account.** Provide taxpayer access to their own account can offer the ability for taxpayer’s to print all department generated notices, at their expense. This controlled functionality could provide a means for the taxpayer to maintain their account. (Note: any electronic communications with taxpayer’s can also provide an opportunity to advertise key Department initiatives or identify DOR services available to taxpayers.) Expanding the use of e-mail will reduce fax transmissions further eliminating document preparation, imaging and subsequent discarding of fax correspondence.

- **Electronic Filing Mandates, Inducements, Refunding, and Payment Processing.** Act 50 of 2009 provides that the Department may require any return, report, or other document required to be filed for a tax administered by the Department prepared by a third party who submits 50 or more returns per year to be filed by any method prescribed by the Department. Leveraging Act 50 practitioner mandates post ITS conversion, the system should provide the ability to warehouse a refund to the last day required by statute. The refund should be direct deposited into a predefined account approved by the taxpayer. In addition, mandate that all payments below a threshold level must be done electronically.

- **Electronic Transmission of Licenses, Certificates, and other Taxpayer Information.** Create functionality where Bureau of Trust Fund Taxes could electronically transmit Sales, Use and Hotel Occupancy Tax licenses, Employer Certificates of Registration, KOZ Certificates of Exemption, non-filer notices in a PDF format to taxpayers or administrators who would log in to access account information.

- **On-Line Filing and Payment.** Develop, test and implement e-TIDES functionality or TeleFile functionality that facilitates the on-line filing and payment of Public Transportation Assistance Fund Taxes and Fees, Vehicle Rental Tax, Voluntary Use Tax, and Malt Beverage Tax.

- **Cross-Match of Federal Income Information with Property Tax and Rent Rebate Records.** Perform a cross-match of federal income information with Property Tax and Rent Rebate records to validate the accuracy of eligibility income reported on rebate claims.

- **Automate the Process of Applying PIT Payment Information.** Automate the process of applying PIT payment information received from the Office of Attorney General. This will improve reconciliation; eliminate paper reporting; and the manual entry of payment data.

- **Liquid Fuels and Fuels Electronic Reporting.** The Bureau of Motor Fuel Taxes is to have all Liquid Fuels and Fuels reporting completed/submit by electronic filing. Business benefits of this initiative will include, though not be limited to: elimination of the examination of paper returns, which can be several hundred pages long; the ability to quickly query the data received and cross check against other records; receiving all tax returns in a standardized format; expediting the processing of funds due to department; and reducing the volumes of paper to be imaged.

Complete implementation of Modernization and KEI initiatives will provide considerable cost administrative savings. For example considering Personal Income Tax returns, pa.direct.file costs are estimated at $2.61 per return, Telefile at $3.22 per return, Fed/state e-file at $2.47. The average electronic costs per return is $2.54 while the costs to the Department is $5.72 per paper return—thus the savings of $3.18 per return of filing electronically relative to filing with the Department.

**IV. CONCLUSION**

One of the five broad principles for sound tax policy is ease of administration (Armstrong, 2002).19 Ease of administration requires minimizing the costs of compliance for taxpayers and collection costs for government. The Corbett Administration has focused on government reform and limited government as one of three budget principles (Pennsylvania Office of the Budget, March 8, 2011).20 Initiatives for streamlining government and achieving efficiencies will provide taxpayer savings and a more efficient use to taxpayer resources. Implementation of an Integrated Tax System and the Keystone e-Initiative will substantially increase electronic transfer of reporting, payment and compliance data where compliance and collections costs will be reduced for both taxpayers and the Department of Revenue. The Department of Revenue’s
technology initiatives are aligned with Administration’s budget principles and sound tax policy.

ENDNOTES

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1. The Department of Revenue annually collects between $27 billion to $28 billion in state taxes that account for 96 to 98 percent of General Fund revenue. The General Fund is the major operating fund of the Commonwealth. It receives most tax revenue and other receipts not assigned by law to special funds. Special funds receive monies set aside for particular purposes. The General Fund is the primary funding source for most Commonwealth agencies. Additionally, the Department collects about $2.6 billion for the Motor License Fund—one of the Commonwealth’s special funds. Finally, the Pennsylvania Lottery is under the jurisdiction of the Department, a $3-billion-a-year retail sales and marketing operation that remains the only state Lottery to dedicate 100 percent of profits to seniors. The Department has about a $997 million annual budget where over 2,100 employees who serve in more than two dozen bureaus and offices across Pennsylvania.

2. Among the other ways in which a monopoly can damage an economy and society are by (1) charging higher prices than would otherwise be charged, (2) producing products with quality inferior to what would otherwise be produced, (3) providing services associated with their products inferior to what would otherwise be provided, and (4) corrupting the political system in order to perpetuate and extend its monopoly position.

3. Revenue agencies, including the Department of Revenue, have responded to an economic environment demanding changes including government demands for increased efficiency; technology-driven changes in organizing work; and technology-driven changes in delivering services to taxpayers (OECD, January 28, 2009).

4. The Deputy Secretary for Taxation also oversees the Taxpayer Service and Information Center (TS&IC) and the Voluntary Disclosure Program. TS&IC is responsible for providing taxpayers, practitioners, members of the General Assembly, and other state and local agencies with information and service in regards to tax related issues. Taxpayer Services is an interactive call center providing verbal and e-mail responses to inquires received via telephone, facsimile, RightNow e-mail, or through the Internet for all taxes administered by the Department of Revenue. The Voluntary Disclosure Program provides an opportunity for businesses and individuals who have recently become aware of their Pennsylvania tax obligations to voluntarily come forward. In return for voluntarily coming forward, as long as they are not registered with the Department and no investigations or collection actions have begun, penalties for the taxes administered by the Department are waived and the taxpayer only pays the taxes and interest.

5. Information for this section is primarily from The Tax Compendium (December 2010), The Statistical Supplement for the Tax Compendium (October 2010), and Information Technology Systems (December 29, 2009).

6. The Bureau of Corporation Taxes collects additional taxes and fees listed below:

- Gross Premiums Unauthorized Insurance. When insurance is procured from an insurance company that is not registered with the Pennsylvania Insurance Department, and a licensed surplus lines agent is not involved, the insured must remit a report and payment within 30 days of the date the insurance was procured. There were 375 returns filed by paper (100%). Payment can be by credit card (0%), EFT (22%), or by paper check (78%). The Corporate Tax Mainframe system is used for tax processing. The Commonwealth received for 2009-10 over $5.4 million.

- Retaliatory Fee. The Retaliatory Fee is a fee paid by foreign insurance companies doing business in Pennsylvania and is the difference between the home state rate and Pennsylvania rate for Foreign Casualty, Foreign Life, and Foreign Title Insurance. Returns are filed with the Gross Premiums Tax with all returns filed by paper (100%). Payment can be by credit card (100%), EFT (0%), or by paper check (0%). The Corporate Tax Mainframe system is used for tax processing. The Commonwealth received for 2009-10 over $9 million.

- Agricultural and Electrical Cooperative Taxes. The agricultural cooperative tax is imposed in lieu of corporation taxes and electric cooperatives are exempt from gross receipts tax on electric companies for sales within their service territory. The agricultural cooperative tax file is due on April 15th and electrical cooperative tax file is due July 1st. For the agricultural cooperative tax, 71 returns are filed annually and for the electrical
cooperative tax 79 returns are filed annually all by paper (100%). Payment is by either EFT (3%) or paper (97%). The Corporate Tax Mainframe system is used for tax processing. Over $2.3 million was received in 2009.

7. The Bureau of Business Trust Fund Taxes collects additional taxes, fees, and other information listed below:

- Cigarette Licensing. Cigarettes may be legally distributed in Pennsylvania only by dealers licensed by the Department. All cigarette dealer licenses expire on the last day of March and must be renewed annually. For FY 2009, the Department received and processed approximately 17,000 paper renewal applications. Payments are received by paper check (100%), and totaled over $881 million in 2009.

- Cigarette Floor Tax. When the cigarette tax increases, the difference between the previous and current tax amount is due for each pack of cigarettes in inventory and must be filed by every cigarette dealer. Given no statutory change in 2009, no returns were filed. The returns would be filed by paper (100%) and payments by paper check (100%). The cigarette floor tax is a stand-alone system used for processing.

- Cigarette Non-Participating Manufacturers. Act 54 of 2000, Tobacco Settlement Agreement, requires the Department to compile information about Non-Participating Manufacturer cigarettes sold in Pennsylvania bearing the PA cigarette excise tax stamp. Over 1,300 returns are filed annually by paper (100%). The cigarette floor tax is a non-participating manufacturer’s stand-alone system used for processing.

- Pari-Mutuel Taxes. Each licensed corporation pays to the Department a tax on the total amount wagered and also the total amount wagered in multiple/exotic race per race day. For FY 2009-2010, Pennsylvania-collected in excess of $15 million (100% EFT) in wagering taxes with 72 paper reports (100%) filed annually. Each month, funds are transferred to the Department of Agriculture. Admission taxes are collected and remitted to the Department upon the price of admission at a rate of 5%. For F.Y. 2009-2010, Pennsylvania collected $50,830 all by paper checks (100%) in admission taxes with 1,750 paper returns (100%) filed annually. Checks are deposited directly into the thoroughbred and harness fund. OUTS Tickets are tickets resulting in a distribution from the Pari-Mutuel pool, but have not yet been presented for payment. For FY 2009-2010, Pennsylvania-collected approximately $1.4 million (100% paper checks) in OUTS with 10 returns (100%) filed annually. Checks are deposited directly into the uncashed tickets thoroughbred and harness revenue fund.

8. KITS is a mainframe computer system, which ended the segregation of stand-alone or legacy Sales and Use Tax and Employer Withholding Tax systems and united them into one blended system. In short, it allows for the processing and administration of both tax types in one system. The Integrated Tax System when fully implemented will encompass most of taxes administered by the department and provide greater systemic responsiveness to changing needs than is currently available in KITS.

9. The Hotel Occupancy Tax, imposed at the same rate as Sales Tax, applies to room rental charges for periods of less than 30 days by the same person.

10. Pursuant to Act 48 of 2009, sales tax licensees whose total tax reported due in the third quarter of the preceding calendar year of $25,000 or greater, must remit tax payments to the Department on a semi-monthly basis.

11. Effective July 1, 2011, pre-paid telecommunication services and wireless telephones will be subject to a pre-paid wireless Emergency-911 surcharge (pre-paid E-911 surcharge) at the rate of one dollar per retail transaction and will be administered by the Department. The E-911 surcharge is collected on each retail transaction regardless of whether the service or pre-paid wireless telephone is purchased in person, by telephone, through the Internet or by any other method. The pre-paid E-911 surcharge is to be charged and collected by the retailer in addition to any other charges or fees and is not to be included for purposes of calculating sales tax. The pre-paid E-911 surcharges are to be collected by the seller and shall be reported and remitted to the Department of Revenue at the same filing frequency and due dates as each seller’s sales and use tax returns.

12. The Bureau of Fiscal Management collects table game taxes (Act 1-2010). From the Tax Compendium (December 2010), Act 1-2010 established a 12% table game tax imposed on gross table game revenue; however, for 2 years following commencement of table game operations at the facility, the rate is 14%. Fully automated electronic gaming tables are subject to a 34% tax, in addition to the percentages above. An additional 2% is collected for the local share assessment. This amount is distributed quarterly to the host county and municipality according to the enabling legislation. Gross table game revenue is defined as total cash or cash equivalents received in the course of playing of table games, contest or tournament fees or payments, and total amount of rakes collected minus cash or cash equivalents paid out, paid to purchase annuities to fund prizes, and paid for personal property distributed to patrons as a result of playing a table game. Table games tax returns are due weekly along with payments. Table games tax returns are due weekly along
with payments. A monthly return is also due the 15th of the month. Currently there are 10 casinos filing returns. All payments are electronic. Any credits on the monthly return are taken on the next weekly report. The first table games returns were filed July 2010. Through April 2011, the Commonwealth received approximately $57 million in table games taxes and $8 million for local share assessments.

In addition, the Bureau of Fiscal Management collects taxes from slot machines. Act 71-2004 established a 34% slot machine tax, a 4% local share assessment, a 5% assessment for the Pennsylvania Gaming Economic Development and Tourism Fund assessment, and an assessment for the Pennsylvania race horse improvement fund capped at 12%. These taxes and assessments are imposed on gross terminal revenue reported by the Central Control Computer System. Each of the 10 casinos is invoiced every banking day. The payments are due the following banking day. All payments are electronic. The Commonwealth received approximately $1.2 billion in FY2009/10.

13. The Bureau administers school district information and county information exchange programs. Furthermore, the Bureau of Income Tax assists in the preparation of exchange agreements with the Pennsylvania Higher Education Assistance Agency, Pennsylvania Housing Authority, and the Department of Aging’s Pharmaceutical Assistance Contract for the Elderly (PACE). Act 80, the annual school district code validation process, occurs where the Bureau administers the school district information. The current process involves over 125,000 paper reports and about 200,000 school code changes that are keyed to the PIT Annual System by the Bureau staff. Each year, the more than 350 school districts that participate in the Act 80 Program spend many thousands of hours in reviewing/comparing the Revenue-provided data with their taxpayer records and preparing the taxpayer residency change/transfer information on paper for the transverse school districts and for Revenue.

14. OECD (January 28, 2009) observed that a number of revenue agencies are given various non-tax responsibilities. This trend reflects an increasing rationalization of using the tax and collection system to deliver social policies. The PTRR program is one example of the Department collecting and delivering a non-tax service.

15. This PTRR program was initially funded by the Pennsylvania State Lottery and in April 2006 became co-funded by the Property Tax Relief Fund, which was created by the 2006 Taxpayer Relief Act to expand the benefits. This program benefits citizens who are a) 65 years of age or older, b) widowed and at least 50 years of age, or c) permanently disabled and at least 18 years of age. The expanded program increased the income eligibility requirements for Property tax/Rent Rebate from $15,000 to $35,000 for all homeowners and boosted the maximum rebate from $500 to $650 for all recipients. Eligibility requirements for renters remained at $15,000 (which excludes half of Social Security income).

Revenue from slots gaming have begun providing general property tax relief to all Pennsylvania homeowners, supplemental property tax rebates, equal to 50 percent of a taxpayer’s base rebate, are also available. Homeowners in Pittsburgh, Scranton and Philadelphia with eligible incomes of $30,000 or less will receive additional payments, as well as homeowners in the rest of the state who meet the same income-eligibility requirement and pay more than 15 percent of their household incomes in property taxes.

16. Alternative fuels include natural gas, compressed natural gas, liquid propane gas and liquefied petroleum gas, alcohols, gasoline-alcohol mixtures containing at least 85% alcohol by volume, hydrogen, hythane, electricity, and any other fuel not taxable as liquid fuels or fuels.

17. Qualified motor vehicles include those used, designed, or maintained for the transportation of persons or property which: a) have two axles and a registered or gross weight greater than 26,000 pounds, or b) have three or more axles regardless of weight, or c) are operated as a vehicle combination exceeding 26,000 pounds.

18. Exceptions may be for taxpayers who have a reasonable reason that they cannot provide data in an electronic format. Despite the progress in the use of electronic payment methods, a slight majority of revenue agencies (27 out of 43) report non-automated methods (mailed checks or in-person payments) as the primary or secondary most common tax payment method (OECD, January 28, 2009).

19. The four other principles for sound tax policy are: adequacy, neutrality, equity, and accountability.

20. The other two budget principles are fiscal discipline and core functions of state government. Maintaining each of the three budgetary principles in practice is creating sustainable state government activity thereby setting the Commonwealth on a path to prosperity.

REFERENCES


ABSTRACT
This paper investigates the cost efficiency of Indian public and private sector banks over the period 1990-2009 with unbalanced panel data by employing non-parametric data envelopment analysis technique (DEA). The paper has examined the determinants of cost efficiency of banks by employing panel data least square regression model. The study found that private sector banks are more efficient than public sector banks with an average cost efficiency score of 72.8 for the latter versus 76.5 for the former. It is found that dominant source of cost inefficiency among these banks is allocative inefficiency rather than technical inefficiency. The impact of merger activity on the cost efficiency has emerged to be positive and significant and so also those of size and profitability.

Key words: Efficiency, DEA, Profitability, Banks, Regression, Mergers

JEL Classification: G21, G34, C23

INTRODUCTION

The Indian banking sector consists of the Reserve Bank of India (RBI), which is the central bank, commercial banks and co-operative banks. Commercial banks in India play a dominant role in the Indian economy and public sector banks account for 90 per cent of the total assets of the banking system. Banking sector in India has experienced fundamental changes following financial sector reforms in the early 1990s. The reform measures were introduced on the recommendations of Narishmam Committee I (1991), Narishmam Committee II (1998), and Verma Committee (1999). The main objective of the banking sector reforms was to improve the efficiency of banks and to promote a diversified and competitive financial system. Consolidation of the banking industry through mergers and acquisition was one of the steps adopted by the policy makers in this direction.

Merger is a process of combining two business entities under the common ownership whereas acquisition is an act of acquiring the effective control by one firm over the assets or management of the other corporate without any combination of both of them. Here, we have used the term merger and acquisition (M/As) interchangeably. The phenomenon of bank mergers and acquisition is not new one in the history of Indian banks. It was intensified following the recommendations of Narasimham committee (1998). The committee recommended that merger between strong banks/financial institutions would make for greater economic and commercial sense and would be a case where the whole is greater than the sum of its parts and have a “force multiplier effect.”

The main objectives of this paper are to (i) examine the cost efficiency of Indian public sector banks (PSBs) and private sector banks (PVTs) (ii) to study the impact of mergers on the cost efficiency of participating banks and (iii) to examine the impact of other environmental and bank specific factors on the efficiency of banks.

The paper is set out as follows: Section II highlights the process of mergers in Indian banking Sector; Section III reports brief review of existing literature on bank efficiency; Section IV provides the methodology followed in the empirical analysis; Section V describes the sample; Section VI presents the results and Section VII provides conclusions.

MERGERS IN INDIAN BANKING SECTOR

In India, legal framework governing mergers and acquisitions between banks is has been broadly categorized into (i) Voluntary Merger and (ii) Compulsory Merger. The procedure for voluntary merger among banks has been laid down under Section 44 - A of the Banking Regulation Act 1949. Under the provisions of this Act a bank may be merged with another bank by approval of shareholders of each banking company by resolution passed by two third in value of the shareholders of each participating bank. Although as per the recommendations
of Joint Parliamentary Committee, the role of RBI is limited but the sanction of RBI is essential for the approval of any merger scheme. Generally, the scheme for merger among banks is encouraged by the RBI when it is confirmed that the scheme is in the interest of depositors of the amalgamating or merging banks.

The Section 45(4) of the Banking Regulation Act, 1949 provides provisions for the compulsory merger of banking company with other banking institution. Under sub-section (15) of section 45 “banking institution means any banking company and includes State Bank of India or a subsidiary bank or a corresponding new bank.” (IBA, 2005). A compulsory merger or amalgamation is pressed into action where the financial position of the bank has become weak and urgent measures are required to be taken to safeguard the depositors’ interest (Deshpande, Shri N.V, 2005).

Mergers come with several benefits such as creation of synergies, economies of scale, cost reduction, and quickly acquire new technologies, skills, markets, and resources. There are several reasons for mergers and the primary ones are deregulation and technology. In India 21 M/As took place during post reform period with as many as 17 mergers taking place since 1999, leading to a marked decline in the number of private and foreign banks. Recently, the RBI under Section 45 of the banking regulation Act 1949, in case of some troubled banks suggested the compulsory merger with stronger banks. These included the merger of Global Trust Bank with Oriental Bank of Commerce in August 2004, Ganesh Bank of Kurndwad Ltd. with Federal Bank Ltd. in September 2006 and the merger of United Western Bank with IDBI Ltd. in October 2006. Banks in India since 1993 witnessed compulsory merger of PVTs banks by PSB as directed by RBI.

LITERATURE REVIEW

The substantial merger wave that affected the banking industries of many countries has spurred large literature on the effects of mergers on the efficiency and bank performance. In particular, some studies support the view that consolidation via merger is beneficial because more efficient bank managers substitute less efficient ones. Greater bank size can yield economies of scale and scope, increase diversification, opportunities and greater cost savings (Berger, 1999). The available empirical evidence on the effects of bank mergers is mixed. Among the studies’ findings positive impact of the M/As activity may be cited as those of Resti(1998), Vennet (1996), Akhavein et al. (1997), Rhoades, S.A (1998), Peng Ya-Hui (2004) and Gourlay et al. (2006). R.B.I (2008) also drives the same conclusions and found that PSB have been able to get higher level of efficiency than PVTs or during post merger period. Wu, H.W (2008) also been affected by other pre and post-merger factors of banks. Wu, H.W (2008) examined the X-efficiency gains from mergers and acquisitions among the 34 listed commercial banks in Taiwan. He found that banks have not experienced any efficiency gains from mergers due to the fact that efficiency gains might emerge more than three years after the merger completion and losses from bad loans may erode the efficiency gains from mergers and acquisitions. However, impact of this activity on efficiency of banks has become as empirical issue. Hence, this study has been undertaken to examine the case of merger activity for Indian banking industry.

METHODOLOGY

There are diverse ways to measure the efficiency of banks. Researchers and analysts do not agree upon a single method of measuring the efficiency of Decision Making Units (DMU's). A DMU is an entity that produces outputs and uses up inputs. In this study each bank constructs a DMU (Alkhathan and Malik, 2010).Berger and Humphrey (1997) provide an extensive account of 130 studies that applied different frontier efficiency analysis for 21 countries. Two approaches are frequently used for the estimation of bank efficiency in the literature of banking efficiency. These are parametric approaches and non-parametric approaches. Parametric approaches include Stochastic Frontier Analysis (SFA), Thick Frontier Approach (TFA). Among all parametric approaches, SFA also referred as econometric approach is widely used to measure the efficiency of DMUs. The SFA specifies a particular form for the cost function and allows for random errors. It assumes that these errors consist of inefficiencies, which follow asymmetric distribution usually, a truncated, or half normal distribution [Ferrier and Lovell (1990)]. Contrary to parametric approaches, non-parametric approach requires few assumptions about the estimated frontier and does not assume a specific functional form to represent the cost and production functions. Among, a non-parametric approach, Data Envelopment Analysis (DEA) is used extensively to estimate the efficiency of DMUs. DEA is a mathematical, linear programming based approach and Charnes, Cooper and Rhodes in 1978 have proposed this model. They introduced this model to measure the efficiency of DMUs under input orientation and constant returns to scale. DEA is based on a concept of efficiency very similar to the microeconomic one; the main difference is that some functional form does not determine the DEA production frontier, but it is generated from the actual data for the evaluated firms [Casu, Barbara, and Molyneux, Philip (1999)]. Later, Banker, Charnes, and Cooper (1984) extended CCR model to allow variable returns to scale. The CRS assumption of DEA is suitable only when all DMUs are operating at an optimal scale. However, in practical situation, many factors like imperfect competition, regulatory and legal framework put constraints on DMUs not to be operating at optimal scale. As a result, the use of CRS when some DMUs
are not operating at optimal scale will result in measures of technical efficiency, which are confounded by scale efficiencies (Philip, 1999). DEA is a mathematical programming approach for characterizing the relationship among multiple inputs and outputs and has been a proven way to measure bank performance (Charnes et al, 1990, Seford and Zhu, 1999).

(a) Data envelopment analysis (DEA)

DEA computes the efficiency of banks on the basis of estimated piecewise linear frontier made up by a set of efficient banks. The banks that lie on the frontier are treated as best practice banks and obtain efficiency score equal to one whereas the banks that do not lie on the frontier are relatively inefficient and their efficiency score lie in the range of zero and one. The DEA approach decomposes the CE (cost efficiency) into its two different components, TE (technical efficiency) and AE (allocative efficiency). Technical efficiency reflects the ability of a firm to maximize output from a given set of inputs whereas allocative efficiency reflects the ability of the firm to use these inputs in optimal proportions, given their respective prices where the cost of production is minimum. Technical efficiency implies that there is no waste in using inputs to produce specific quantity of output. A firm is said to be technically efficient when it cannot increase any output or decrease any input without reducing the quantities of other outputs or inputs. Combining these two, measures provide a measure of cost efficiency. A firm is said to be cost efficient when it is both allocatively as well as technically efficient. Cost efficiency is the ratio between the minimum cost to the observed cost written as follows:

$$CE = \frac{w_i^*x_i^*}{w_i^*x_i^*}$$

Thus, the cost efficiency of any given bank is obtained as the ratio of minimum cost to the observed cost written as follows:

On the other hand, allocative efficiency is the ratio of cost efficiency to technical efficiency, thus $AE = \frac{CE}{TE}$. This procedure of cost efficiency includes any slacks into allocative efficiency because the slacks reflect sub optimal input mix [Ferrier and Lovell (1990)].

(b) Measuring technical efficiency: The technical efficiency is obtained by using the following input oriented DEA model.

$$\text{Max } Z_0 = \sum_{i=1}^{n} \sum_{k=1}^{h} \mu_k y_{kg}$$

Subject to:

$$\sum_{k=1}^{h} \mu_k y_{kg} \leq \sum_{i=1}^{z} v_i x_{ig}$$

$$\mu_k \geq \epsilon, \ g = 1,2,\ldots,n, k=1,2,\ldots,h, i=1,2,\ldots,z$$

$w_i = \text{vector of input prices for } i^{th} \text{ bank}$

$y_i = \text{vector of output levels for } i^{th} \text{ bank}$

$x_{ig}^* = \text{cost minimizing vector of input quantities}$

$\lambda = n \times 1 \text{ vector of constants}$

$u_k, v_i = \text{weights given to output } k \text{ and input } i$.

$y_{kg} = \text{quantity of output } k \text{ achieved by } \text{DMU } g$

$x_{ig} = \text{quantity of input } i \text{ used by } \text{DMU } g$
One of the distinct features of these models is that the weights $u_k, v_r$ are positive and unknown. The values of $u$ and $v$ are found in such a way that the efficiency of $g^{th}$ DMU is maximized. This model is in a ratio form and one of the key problems related with the ratio form is that it has an infinite number of solutions. The above fractional form can be transformed in a straightforward way into the following linear programs

**CCR Efficiency Measure (Linear Form)**

\[
\text{Max} \ Z_0 = \sum_{i=1}^{n} \mu_k y_{kg}
\]

Subject to:

\[
\sum_{k=1}^{h} \mu_k y_{kg} - \sum_{i=1}^{z} v_i x_{ig} \leq 0
\]

(3)

\[
\sum_{i=1}^{z} v_k x_{ik} = 1
\]

\[
\mu_k \geq \varepsilon_i, v_i = \varepsilon_i, g = 1,2,...,n, k=1,2,...,h, i=1,2,...,z
\]

**Measurement of inputs and outputs in banking**

It is well known in the literature of banking efficiency studies that the choice of input and output variables significantly affects the efficiency scores of banks, and at the same time, it is not an easy task to measure and define bank input and output variables. There is considerable disagreement among researchers about the constituents of inputs and outputs of the banking industry. Mainly two different approaches have appeared in the literature regarding the measurement of inputs and outputs of banks. These approaches are the production approach and intermediation approach. The production approach views banks as financial intermediaries that collect funds from units in surplus and then transform these resources into loans and other investments. According to this approach, banks are measured in terms of the number of accounts and transactions serviced during a particular period. A shortcoming of this approach is that it considers only operating costs and excludes the interest expenses. In contrast, the intermediation approach views banks as financial intermediaries that collect funds from units in surplus and then transform these resources into loans and other investments. According to this approach, banks are measured in terms of the total cost of inputs and output variables. The selected input variables are 1) labor (measured in terms of number of full-time employees), 2) loanable funds (measured as the sum of deposits and borrowings), and 3) physical capital comprises fixed assets and book value of premises at the end of the year. The output variables used for the estimation of efficiency are 1) non-interest income and 2) net-interest income (measured as the difference between interest earned and interest expended). Advances. Further, all the input and output variables except labor are measured in rupees. All the nominal input and output variables except (labor) have been converted into real variables by using GDP price deflator (Base 1999-2000=100) whereas establishment expenses incurred on staff has been deflated by consumer price index for non-manual employees. One of the important pre-requisites for calculating the efficiency of banks is the information of input prices. Therefore, in the present analysis we also incorporate the input prices. Labor costs are proxied by dividing the establishment expenses of all banks employees by the total number of employees. The unit price of physical capital is measured by dividing the sum of expenses on rent, repairs, and depreciation by total fixed assets. The price of loanable funds is computed by the total interest expenses divided by the total loanable funds.

**DATA BASE**

This paper has used time-series cross section data of commercial banks in India for the period 1990 to 2009. The relevant data has been extracted from the Performance Highlights of Indian Banks published by *Indian Banks Association*, Statistical Tables relating to Banks in India, Annual Accounts of Banks, and Report on Trend and Progress in Banking published by Reserve Bank of India. The numbers of observations varied across time due to entry of new private banks in 1995 and exit of banks due to merger of banks in the banking industry, which leads to unbalanced panel data. The selection of the study period is justified on the ground that prior to 1990s few banks were merged in Indian banking sector and after 1990s bank merger phenomena has gained momentum.

**EMPIRICAL FINDINGS**

Table 1 presents the analysis of average cost efficiency scores of Indian commercial banks along with its two components technical efficiency and allocative efficiency. It is evident from the table that average cost efficiency estimate of total banking industry during the entire study period is 0.739 which suggests that on average banks are 73 percent efficient in optimally using input cost compared to efficient banks, operating under same business conditions. As depicted in the table cost efficiency of PVTs is 76.5 per cent followed by 72.8 per cent of PSBs during the entire study period, which indicates that the PVTs have the potential for cost saving by 23.5 per cent. In other words, PVTs could have used only 76.5 per cent of resources actually employed to produce the given level of output. The results also indicate that PSBs can cut
their costs by 27.2 per cent to become fully efficient banks and to capture the position of best practice frontier. The findings of this study concluded that PVTs have performed better than PSBs in cost savings with the given state of technology. The decomposition of CE into its two components clearly indicates that in each year allocative inefficiency is always higher than technical inefficiency. It implies that the dominant source of cost inefficiency among Indian commercial banks is allocative inefficiency rather than technical inefficiency. It suggests that managers of Indian banks are relatively expert in using the minimum level of inputs at a given level of outputs but they were not expert in selecting the optimal mix of inputs at given prices.

**IMPACT OF MERGER ACTIVITY ON BANK EFFICIENCY**

The present study has investigated the factors that affect the efficiency of commercial banks in India. The efficiency of banks is not only influenced by the merger activity; rather many variables affect the efficiency of banks. Several bank and industry specific factors may influence a particular bank’s efficiency level. Some of these factors may be neither inputs nor outputs in the production process, but rather circumstances faced by a particular bank (Sufian, Fadzlan 2007). It is apparent from the analysis that the efficiency scores differ among different banks in India. The analysts, bank managers and policy makers are interested in determining whether their differences are significant or not in a statistical sense. This can be done by using regression analysis. As the efficiency scores derived from DEA model is bounded between 0 and 1, an application of simple regression model may provide biased results and application of Tobit regression is more appropriate than simple regression model. However, Alexander, J., and Jaforullah (2004) pointed out that 100% efficiency or 0% inefficiency is a valid score and no higher (or lower) score is possible, by definition. In this sense, the data are not truly censored at one (or 0), OLS is therefore quite appropriate.

Following Burki and Niazi (2003), Alexander, J and Joforullah (2004), Attaullah and Le (2006) Ketkar and Ketkar (2008), in this paper following panel least square regression equation has been fitted to explain efficiency scores. The econometric software package E-views version 5.1 is used to estimate the parameters.

\[
EFF = \alpha_0 + \alpha_1 SIZE + \alpha_2 ROA + \alpha_3 QSTAFF + \alpha_4 ORISK + \alpha_5 OFBALANCE + \alpha_6 DUMERGER + \alpha_7 DUMPUBLIC \\
\mathrm{(4)}
\]

\(\epsilon_i\) is the disturbance term and \(\epsilon_i = v_i + \mu_i\), where

\(v_i =\) capturing the unobserved bank specific effect and \(\mu_i =\) idiosyncratic error

Where EFF denotes the DEA efficiency scores derived at first stage. Table 2 provides the description of these factors and their hypothesized relationship with efficiency of banks.

Table 3 provides the results of the above regression. As observed from the table signs of the estimated regression coefficients are in accordance with a priori expectations. In the present paper logarithm of total assets is used to explain the SIZE of banks. From the table it is observed that the value of SIZE co-efficient has worked out to be (0.046476) for all CBs and the co-efficient bear positive sign. Further, SIZE co-efficient is noted to be highly significant at one percent level of significance. It implies that efficiency of large banks is higher than that of small ones. These results are consistent with the results obtained by Favero and Papi (1995), Hauner (2004), which highlighted that cost efficiency, is positively related to size of banks.

ROA reveals a positive relationship and the value of ROA coefficient is noted to be (0.045745) for all CBs which indicates that higher level of profitability of banks leads to lower level of cost inefficiency and vice-versa. The findings of Isik and Hassan (2002), Verma and Kumar (2002-03), Sufian, Fadzlan, support these findings (2009).

QSTAFF has also been considered as major determinant of cost efficiency of commercial banks in India. Table provides that the value of quality of staff co-efficient is (-0.002046) and the results delineate a negative sign of co-efficient but it is not significant at any conventional level of significance.

The coefficient of the variable OFFBALANCE ( non-interest income to total assets) though bears expected sign but is not significant which suggests that banks tend to become more cost efficient as they increasingly engaging themselves in modern banking activities. The above finding is consistent with the findings of earlier findings by Kwan (2006), Sufian, Fadzlan (2007) which highlighted the positive impact OFFBALANCE sheet activities on bank’s efficiency. Loans/TA ratio can be considered as another important variable affecting cost efficiency of commercial banks in India. It indicates the risk taking behavior of bank management. It shows positive co-efficient and suggest that banks with higher loans to asset ratio tend to have higher efficiency levels.

Further, to investigate the relationship between bank ownership of bank and banks’ efficiency, in this paper a dummy variable, DUMPUBLIC is introduced as an explanatory variable in the regression model. It has been observed from the table that the value of DUMPUBLIC co-efficient is found to be highly significant at 1 percent level of significance. It implies that public sector banks enjoy lower efficiency scores than private owned banks. Dummy variable of merger (DUMERGER) shows a positive association with
cost efficiency of banks. It implies that merged banks gain access to cost saving technologies or spread their fixed cost over a larger base, thus reducing average cost.

**CONCLUSION**

Applying, a non-parametric DEA approach, this paper has examined the cost, technical and allocative efficiencies of Indian banks over the period 1990-2009. This paper also sheds light on the bank specific and environmental factors affecting cost efficiency of PSBs and PVTs in India. Over the entire study period average cost efficiency of PSBs works out to be 73.4 and for PVTs is 76.3 percent. The findings suggest that PSBs (except State Bank of India and its associates) are lagging far behind their counterparts in terms of efficiency and public sector banks need to transform their business strategies to raise their efficiency levels and to attain position in the global financial market. According to the empirical findings, the size, profitability, and merger activity have significant impact on the CE of banks in India. The findings of this study suggest that the government and banking authorities should have to promote mergers. As mergers resulted in expansion of banks and it enables banks to raise money from the capital markets. The Indian financial system requires very large banks to absorb various risks that have emerged from operating in local and global market. The prime factors for future mergers in Indian banking industry included the Basel–II environment, challenges of free convertibility and requirement of large investment banks. Therefore, the government and policy makers should be more aggressive in promoting merger as a way to reap economies of scale and scope.

Table 1: Average cost efficiency, technical efficiency and allocative efficiency of Indian banks

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost Efficiency</th>
<th>Technical Efficiency</th>
<th>Allocative Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PSBs</td>
<td>PVTs</td>
<td>CBs</td>
</tr>
<tr>
<td>1989-90</td>
<td>0.787</td>
<td>0.813</td>
<td>0.802</td>
</tr>
<tr>
<td>1990-91</td>
<td>0.792</td>
<td>0.792</td>
<td>0.796</td>
</tr>
<tr>
<td>1991-92</td>
<td>0.669</td>
<td>0.728</td>
<td>0.697</td>
</tr>
<tr>
<td>1992-93</td>
<td>0.781</td>
<td>0.649</td>
<td>0.709</td>
</tr>
<tr>
<td>1993-94</td>
<td>0.595</td>
<td>0.825</td>
<td>0.704</td>
</tr>
<tr>
<td>1994-95</td>
<td>0.632</td>
<td>0.720</td>
<td>0.68</td>
</tr>
<tr>
<td>1995-96</td>
<td>0.594</td>
<td>0.415</td>
<td>0.496</td>
</tr>
<tr>
<td>1996-97</td>
<td>0.735</td>
<td>0.799</td>
<td>0.77</td>
</tr>
<tr>
<td>1997-98</td>
<td>0.744</td>
<td>0.754</td>
<td>0.75</td>
</tr>
<tr>
<td>1998-99</td>
<td>0.757</td>
<td>0.817</td>
<td>0.79</td>
</tr>
<tr>
<td>1999-00</td>
<td>0.762</td>
<td>0.821</td>
<td>0.795</td>
</tr>
<tr>
<td>2000-01</td>
<td>0.820</td>
<td>0.769</td>
<td>0.795</td>
</tr>
<tr>
<td>2001-02</td>
<td>0.763</td>
<td>0.815</td>
<td>0.791</td>
</tr>
<tr>
<td>2002-03</td>
<td>0.985</td>
<td>0.798</td>
<td>0.764</td>
</tr>
<tr>
<td>2003-04</td>
<td>0.723</td>
<td>0.816</td>
<td>0.772</td>
</tr>
<tr>
<td>2004-05</td>
<td>0.775</td>
<td>0.737</td>
<td>0.756</td>
</tr>
<tr>
<td>2005-06</td>
<td>0.796</td>
<td>0.763</td>
<td>0.779</td>
</tr>
<tr>
<td>2006-07</td>
<td>0.751</td>
<td>0.826</td>
<td>0.79</td>
</tr>
<tr>
<td>2007-08</td>
<td>0.492</td>
<td>0.842</td>
<td>0.649</td>
</tr>
<tr>
<td>2008-2009</td>
<td>0.612</td>
<td>0.820</td>
<td>0.705</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>0.728</td>
<td>0.765</td>
<td>0.739</td>
</tr>
</tbody>
</table>

*Note: PSBs (Public sector banks), PVTs (Private sector banks) CBs (Commercial banks)*
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Hypothesized relationship with efficiency</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE</td>
<td>Natural logarithm of total assets</td>
<td>+</td>
<td>Is used as a proxy to examine the association of size with cost efficiency and it is expected to take a positive sign</td>
</tr>
<tr>
<td>ROA</td>
<td>Net profits over total assets</td>
<td>+</td>
<td>Is used as a proxy variable to examine the relationship between profitability and efficiency. A positive relationship is expected.</td>
</tr>
<tr>
<td>Quality of staff (QSTAFF)</td>
<td>Establishment expenses over total no. of employees</td>
<td>+/-</td>
<td>Is used as a proxy variable for overheads cost and there is no priori expectation on the variable sign.</td>
</tr>
<tr>
<td>Exposure to off balance sheet activities (OFFBALANCE)</td>
<td>Non-interest income over total assets</td>
<td>+/-</td>
<td>Is used as a proxy for banks diversification strategy. A positive relationship is expected.</td>
</tr>
<tr>
<td>Operational risk (ORISK)</td>
<td>Total loans over total assets</td>
<td>+</td>
<td>Is used as a measure of risk taking behavior of bank management. The variable is expected to have a positive sign.</td>
</tr>
<tr>
<td>DUMMERGER</td>
<td>Dummy variable that takes a value 1 for banks that participate in merger activity, 0 otherwise</td>
<td>+</td>
<td>Is used to examine the impact of merger on the efficiency of banks. This variable is expected to have positive sign.</td>
</tr>
<tr>
<td>DUMPUB</td>
<td>Dummy variable that takes a value 1 for public sector banks, 0 otherwise</td>
<td>+/-</td>
<td>Is used to examine the association between bank ownership and efficiency. There is no priori expectation on the variable sign.</td>
</tr>
</tbody>
</table>
Table 3: Regression explaining efficiency scores

<table>
<thead>
<tr>
<th>Explanatory variables</th>
<th>Estimated co-efficient</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.578428</td>
<td>15.33231***</td>
</tr>
<tr>
<td>SIZE</td>
<td>0.046476</td>
<td>4.119974***</td>
</tr>
<tr>
<td>ROA</td>
<td>0.045745</td>
<td>11.62231***</td>
</tr>
<tr>
<td>QSTAFF</td>
<td>-0.002046</td>
<td>0.389742</td>
</tr>
<tr>
<td>OFFBALANCE</td>
<td>0.001999</td>
<td>0.260417</td>
</tr>
<tr>
<td>OPERATIONALRISK</td>
<td>0.000015</td>
<td>0.052745</td>
</tr>
<tr>
<td>DUMMERGER</td>
<td>0.037739</td>
<td>2.500176**</td>
</tr>
<tr>
<td>DUMPUBLIC</td>
<td>-0.087674</td>
<td>-6.242362***</td>
</tr>
<tr>
<td>R-square</td>
<td>0.315888</td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.299251</td>
<td></td>
</tr>
<tr>
<td>F-statistics</td>
<td>18.98709</td>
<td></td>
</tr>
</tbody>
</table>

Note: *** Significant at 1 percent level of significance, ** significant at 5% level of significance

Source: Authors’ calculations

ENDNOTES

The authors would like to thank John S. Walker chair and discussant for his assistance and comments.

REFERENCES


AN ANALYSIS OF THE LINK BETWEEN A COMMUNITY BANK’S PROFITABILITY AND THE ABSOLUTE AND RELATIVE SIZES OF ITS LOAN PORTFOLIO

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ABSTRACT
This paper revisits research done by Walker and Buetow (2005) where they found the surprising result of no relationship between community banks’ return on average equity (ROAE) and the ratio of loans to total assets (L/A). However, they did find a connection between ROAE and the absolute size of the loan portfolio. Our research confirms the link between ROAE and the size of the loan portfolio using an expanded data set starting in 1993 and ending in 2007, just before the financial crisis. The link between profitability and size is not surprising, as one would expect that a bank would generate economies of scale as it grows in size. Our independent variable of loan portfolio size is a proxy for the bank’s overall size of the balance sheet.

In contrast to Walker and Buetow’s findings, we find that there is a connection between banks’ ROAEs and L/A ratios. We postulate that banks increased their cross-selling efforts in anticipation of and after the passage of the Financial Services Modernization Act in 1999. This could have generated greater economies of scope, which enabled banks to improve profitability. A high L/A ratio suggests more loan customers, providing a bank with more cross-selling opportunities.

The business strategy implication of our findings is different than the strategy suggested by the Walker and Buetow findings. Their findings suggest that a community bank should do whatever it can to grow the balance sheet, without concern about the mix between loans and investments. In contrast, our findings confirm the size advantage, but also suggest that banks will be more profitable if they can maintain or increase an asset allocation that favors loans over investments. During the current period of time, when banks have been faulted for not lending, our research provides evidence that banks that lend more will be more profitable than those that do not. Our research also leads to another research question: If a bank cannot simultaneously increase its size and proportion of loans, is it better to maintain a bank’s size and shift the allocation toward loans or simply grow the bank even if the portion of loans remains static or decreases?

INTRODUCTION
While there are various business strategies used by banks to generate profits (see DeYoung and Rice, 2004), the basic business model of banking involves collecting deposits and using those funds to write loans. A bank’s primary revenue component is net interest income, which is determined by the difference between the interest income on loans and interest expense paid on deposits. A bank’s “net interest spread” is determined by the difference between the yield on earning assets (YEA) and the cost of funds (COF). When calculating a bank’s YEA, all interest-bearing assets are included, including investments as well as loans. For the COF calculation, some banks include non-interest bearing accounts (demand deposits) while others limit the calculation to interest-bearing accounts. Net interest margin is an alternative method of measuring a bank’s net interest income, calculated as the difference between interest income and interest expense as a percentage of total assets or total earning assets.

In addition to monitoring their stock performance, banks tend to track several accounting-based measures, such as return on average assets (ROAA) and ROAE, to assess their overall performance. Banks’ strategic plans will usually have ROAA and ROAE goals and growth targets for assets, loans, and deposits. One financial benchmark that is of particular interest to bankers is the L/A ratio. If a bank has a lower than average L/A ratio, then its investment-to-asset ratio is greater than average, unless a higher-than-average level of nonearning assets explains the low L/A ratio. Hypothetically, if a bank has a very low L/A ratio, meaning that its portion of investments to assets or investments to earning assets is very high, then much of the asset side of a bank’s balance sheet could resemble a fixed-income mutual fund containing Treasury, agency, mortgage-backed, and other fixed-income securities.

At the other end of the spectrum, a bank could have a sizable loan portfolio that is as much as 80 percent or more of its
earning assets. Figure 1 shows the average asset allocation for community banks in 2006.

**Figure 1: Asset Allocation for Community Banks (2006)**

![Asset Allocation Chart]

Source: SNL Financial

One concern when the balance between loans and investments is highly weighted toward loans is that the bank’s liquidity might be too low. Typically, investments and cash are far more liquid than a bank’s loans, so liquidity needs can constrain a bank’s L/A ratio. Nevertheless, many banks strive for high L/A ratios because loans tend to produce higher yields than investments because of greater credit risk. Plus, they often generate deposit accounts.

In a corporate research paper, Walker and Buetow (2005) investigated the relationship between loan portfolio size, loan proportion of assets, and ROAE. The purpose of their paper was to test the causality between loan portfolio size—both magnitude and relative to assets—and returns on average equity. Their research had practical importance, as it was motivated by a bank that assumed that a below average L/A ratio would preclude them from achieving an ROAA and an ROAE that were consistent with other banks’ performance. The Walker and Buetow (henceforth, W&B) study found that:

1. Banks with larger loan portfolios, in terms of absolute size, tend to produce higher returns on equity than banks with smaller portfolios, but
2. When controlling for the size of the loan portfolio, the portion of loans—namely, the L/A ratio—did not correlate to performance.

The implication of these findings was noteworthy because it meant that a bank of a given asset size could perform as well as another bank of similar asset size regardless of the size of its loan portfolio. One explanation offered by W&B in their paper is that overhead costs grow as the portion of loans increases, and this offsets the higher yields generated by loans. Also, as the portion of loans grows, loan losses expand, which diminishes profitability. Overheads and loan losses would also increase as the absolute size of the portfolio increases, but if costs grow at a diminishing rate this could explain why banks with larger loan portfolios have higher ROAAs and ROAEs. The size of the loan portfolio is a proxy for the overall size of the bank and it could correlate to economies of scale. Hein, Koch and Macdonald (2005, p. 20) discuss how a growing bank shifts from relationship lending to transactional lending and that “transactional banking is generally associated with economies of scale because unit costs fall with increasing bank size.”

This research revisits this topic using a more rigorous research methodology to test the link between performance and loan portfolio size and to see if the augmented data set, since the W&B study, would support the original findings. Also, we have identified a weakness in the W&B approach that we have corrected. Going forward, the outline of this paper is (1) review of literature (2) description of data and analytical approach, (3) data analysis and results, (4) discussion of results, (5) conclusions, and (6) ideas for future research.

**REVIEW OF LITERATURE**

Other researchers have studied the effects we wish to examine. Haslem (1968) studied 64 operating ratios from 1963–1964 for all member banks of the Federal Reserve System. For each year an average was computed for each ratio and tested for management, size, location, and time effects using analysis of variance. Although, summary statistics are not provided in the paper, profitability is claimed to be “generally” related to asset composition (p. 173) but not related to the total-loans-to-total-assets ratio (p. 172).

Holdren (1991) studied a sample of 251 Tennessee community banks using data from 1983–1987. At the time the accepted size limit for community banks was $1 billion and Tennessee was chosen due to the diversification of the state’s economy and the diversification of its community banks (p. 1). The data for the five years was averaged. Sample banks were screened into high performers (based on ROAA) and high L/A ratio groups, and then further subdivided into three asset size groups. Fifty-four banking variables were tested for significant differences between the high-performer group and all other banks using univariate tests of means. Average loans/average assets was found to be significant at the one percent level (p. 2).
Demirguc-Kunt and Huizinga (2000) use data from the BankScope database compiled by Fitch IBCA covering all Organization for Economic Co-operation and Development (OECD) countries as well as many other developing countries, a total of 44 countries, for the 1990–1997 period. Averaging observations by country, they run six structural models differentiated by the size of the economy (small, medium, large) and whether the economy is banked-based (dominated by its central bank) or market-based (dominated by its stock market). The total-loans-to-total-assets ratio regression coefficient is positively related to profitability and significant in three of these models.

DeYoung, Spong, and Sullivan (2001) use data from 1,414 state chartered banks in the Tenth Federal Reserve District from 1994. Using adjusted net income (net income before taxes, provisions for loan losses, and extraordinary items) as their measure of profitability for procedural reasons, they find that total loans is not significantly related to profitability.

Altunbaş and Marqués (2008) examine the pre- and post-merger performance of merged banks in the European Union using data from 262 such mergers between 1992 and 2001. One of the financial characteristics which they find to have a significant effect on post-merger profitability is the total-loans-to-total-assets ratio. For domestic mergers they find that the difference in total-loans-to-total-assets ratio is negatively related to increases in profitability, indicating the difficulty of integrating dissimilar bank strategies. But, for cross-border mergers they find that the difference in total-loans-to-total-assets ratio is positively related to increases in profitability, evidencing the benefits of economies of scope.

Our results imply that banks can increase their ROAE by increasing the absolute size of their loan portfolio and by increasing their loans as a proportion of assets. An obvious issue is how implementation of such a strategy would affect a bank’s risk. Emmons, Gilbert and Yeager (2004) address the limitations on a community bank’s ability to limit credit risk through diversification. Logically, community banks do not exhaust the benefits of idiosyncratic diversification (many similar borrowers) or sectoral diversification (many different types of borrowers) because of their small size and regional nature. However, the large (and growing) number of extant community banks argues against this limitation. Emmons et al. contend that market concentration merger guidelines might be responsible for what they see as an excessive number of extant community banks, but we know that this circumstance continues to the present day in spite of greatly reduced limitations on mergers. Acharya, Hasan, and Saunders (2006) mention the “winner’s curse” aspect of expanding the loan portfolio (p. 4). This circumstance occurs when a bank attempts to enter sectors or locales already being served by other banks. The loan customers which would be available to the new entrant would provide low returns and high risk due to the increased competition.

**DESCRIPTION OF DATA AND ANALYTICAL APPROACH**

The data used for this research were obtained from SNL Financial. We collected total assets, total loans, and ROAE data for all of the banks in the SNL Financial database for the calendar years 1993 to 2007, inclusive. Our choice of that timeframe was based upon our desire to overlap that of the previous W&B study, to include the time of the enactment of two significant pieces of legislation, the Financial Services Modernization Act (1999) and the Sarbanes-Oxley Act (2002), and to avoid the obvious complications of the financial meltdown that occurred in 2008. We filtered out banks for which there was incomplete data and banks which had total assets greater than $5 billion, as this is the size limit we’ve set in our definition of community banks. The filtering was done for each year rather than for the dataset as a whole, thus the number of banks in the data set varies by year. Table 1 shows the size of each year’s sample.

**Table 1: Number of Sample Banks**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Banks</th>
<th>Year</th>
<th>Number of Banks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>5,400</td>
<td>2001</td>
<td>6,115</td>
</tr>
<tr>
<td>1994</td>
<td>5,430</td>
<td>2002</td>
<td>6,218</td>
</tr>
<tr>
<td>1995</td>
<td>5,445</td>
<td>2003</td>
<td>6,295</td>
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<td>1996</td>
<td>5,508</td>
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<td>2007</td>
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<tr>
<td>2000</td>
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Source: SNL Financial

Our study focuses on community banks. While there is no clear definition of a community bank in terms of asset size, typical attributes of a community bank include (1) that “they tend to obtain deposits from local individuals and businesses and lend them out to local borrowers, (2) they specialize in ‘relationship banking,’ as opposed to ‘transactional banking,’ and (3) they make most of their money from loans” (Welter, 2010). We chose banks with $5 billion or less in assets because our personal consulting experience with community banks tells us that these banks meet the three criteria listed above. Also, the Independent Community Bankers Association (ICBA) (J. McNair, personal communication, October 3, 2010) states that community banks have assets of $10 billion and less. The fact that the banks in our sample fall well within that benchmark also gives us confidence that they exhibit the attributes listed above. Moreover, there are relatively few banks in the total assets range between $5 billion and $10 billion.

Using the total assets and total loans data we calculated each bank’s L/A ratio for each year. Then each year’s data were
double-sorted; sorted first on total loans (and assigned a total loans quintile bucket number) and then sorted on L/A ratio (and assigned a L/A quintile bucket number). It should be well-noted that this process achieves rankings which are independent of the sequence of the sorting. Figure 2 shows an example for 2006 of the five-by-five matrix obtained from this process.

Figure 2: Example Double-Sort Matrix

<table>
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<tr>
<th>Total-Loans-to-Total-Assets Ratio – 2006</th>
<th>0.0% – 53.4%</th>
<th>53.4% – 64.1%</th>
<th>64.1% – 71.7%</th>
<th>71.7% – 79.1%</th>
<th>79.1% – 100.0%</th>
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</table>

For each year and each of the 25 quintile “buckets,” bucket size, bucket mean ROAE, and bucket standard deviation of the ROAEs were calculated. Corresponding calculations yielded row and column sizes, means, and standard deviations. Differences of means hypothesis tests were conducted to test for significant differences between adjacent rows (loan portfolio size) and adjacent columns (L/A ratio). Figure 3 shows an example of the output obtained to include t-statistics and p-values. The relevant test statistics lie on the diagonals and significant differences (at 5%) are indicated in bold.

Figure 3: Example of Bucket Statistics Calculation and Difference of Means Hypothesis Tests (2006)

In addition to the differences of means hypothesis tests, two-way ANOVA tests, with and without interaction, were conducted for each year. Since the bucket sizes are typically all different (an unbalanced design) a regression technique was applied to obtain ANOVA results. This process can be found in Kleinbaum, et al. (2009). Summary tables of the difference of means and ANOVA processes can be found in Appendix 1.

DATA ANALYSIS AND RESULTS

Figure 4 shows the effect of increasing loan portfolio size on ROAE for each year of the study.

Figure 4: The Effect of an Increasing Loan Size on ROAE

Each year has five bars representing the difference between that quintile’s average ROAE and that year’s average ROAE. The bars for each year are arranged from lowest to highest loan portfolio size. The solid bars above the 0.0% axis indicate that quintile outperformed the year’s average. The hollow bars below the 0.0% axis indicate that quintile underperformed the year’s average. For every year there is a clear positive relationship between loan portfolio size and ROAE.

Figure 5 shows the effect of increasing L/A ratio on ROAE for each year of the study using the same layout as Figure 4.

Figure 5: The Effect of an Increasing Total-Loans-to-Total-Assets Ratio on ROAE

Each year has five bars representing the difference between that quintile’s average ROAE and that year’s average ROAE. The bars for each year are arranged from lowest to highest L/A ratio. The solid bars above the 0.0% axis indicate that quintile outperformed the year’s average. The hollow bars below the 0.0% axis indicate that quintile underperformed the year’s average. For every year there is a clear positive relationship between L/A ratio and ROAE.
DISCUSSION OF RESULTS

Figure 6 shows a scattergram for all community banks’ L/A ratios and total assets for 2006.

Figure 6: Community Banks’ Total-Loans-to-Total-Assets Ratio versus Total Assets (2006)

Source: SNL Financial

Recall from Table 1 that there are 6,661 banks in the 2006 sample. Clearly the great majority of those banks have total assets of less than $1 billion. Recall from Figure 1 that the average L/A ratio in 2006 was 73%. Our results indicate that there are thousands of community banks which could increase their ROAE by growing the size of their loan portfolios (which might be somewhat difficult since it would require additional deposits, borrowing, or equity) and/or increasing their L/A ratios (which would be somewhat easier since this merely requires an exchange of assets).

These conclusions differ from those found in the W&B paper which did not identify the L/A ratio effect. There are two significant differences in methodology which account for the disparity in findings: (1) W&B aggregated all years of data into a single test of means hypothesis; our paper treats each year separately; and (2) the sequential sort method used by W&B masked the L/A effect which is readily identified by this paper’s simultaneous sort method. Additional discussion regarding the difference in sorting methods appears in Appendix 2.

CONCLUSIONS

Walker and Buetow used bank data obtained from SNL Financial spanning 1990 through 2003 for total assets, total-loans-to-total assets ratios, and ROAEs. The firm sponsoring the original research served the niche of community banks that were $3 billion in assets and smaller. Thus, the W&B study examined banks of that size. For the current study, we obtained data from SNL Financial for the years 1993 through 2007 for banks with total assets ranging up to $5 billion, consistent with the marketing footprint of the firm sponsoring this current research.

In the prior research, the banks were divided into a five-by-five matrix by creating quintiles based on loan portfolio size and the L/A ratio. The objective was to group similarly sized banks based on their absolute loan portfolio size and then based on the portion of loans to assets. For this study a different sorting process was used. Details regarding the differences in sorting processes and the effect of those differences appear in Appendix 2.

For the time period from 1993 to 2007, we also consistently find significance in the loan portfolio size variable. Prior research has shown that larger banks are more efficient than smaller banks, since they enjoy greater economies of scale and scope as the size of their balance sheet grows. Therefore, the finding that there is a positive connection between ROAEs and loan portfolio size is not a surprise.

For the time period from 1993 to 2007, we also consistently find significance in the L/A ratio variable. This finding is noteworthy for two reasons. First, it is not consistent with W&B’s findings in 2005 when they found that ROAEs do not depend on the relative portion of loans to assets for the period 1991 to 2003. Second, it suggests a strategy whereby a community bank might improve its ROAE without increasing its absolute size. Such a strategy may be easier to implement than a pure growth strategy, especially in recessionary times. The passage of the Financial Services Modernization Act (FSMA) in 1999 makes it easier to pursue such a strategy because it opens the door to cross-selling of various financial services.

The Banking Act of 1933—also known as the Glass-Steagall Act—separated banking and securities activities. This was an historic change to the banking industry that was aimed at making the financial industry more stable after the run on banks in 1929 by reducing conflicts of interest. The Financial Services Modernization Act essentially repealed the Glass-Steagall Act and gave banks permission to sell securities and insurance as well as other financial services, opening the door for more cross-selling. Now banks are able to market themselves as one-stop shopping sources for financial services.

Economies of scope are potentially realized when a bank offers more services. The L/A ratio could be a proxy for the size of the bank’s customer base. Consider a bank with a low L/A ratio. This would be a bank with few loans and a lot of investments. There is an obvious correlation between a bank’s loans and number of customers, whereas the volume of investments has no connection to the number of customers, as the investments are transactions between a bank and the capital markets.
With the passage of the FSMA, banks are now permitted to cross-sell more services to their customers. The ability to sell more services created the opportunity to achieve greater economies of scope. Banks with greater L/A ratios likely have more customers, more cross-selling of services, and more economies of scope. DeYoung and Rice (2004, p. 57) make the point that while the FSMA “completely relaxed the restrictions on the permissible volumes of nonbanking activities and allowed commercial banks to engage in completely new activities such as merchant banking,” the restrictions were being relaxed incrementally all during the 1990s. Thus, banks did not have to wait until 1999 to shift to another business model. Indeed, a bank’s transition could have started earlier in the decade, with an acceleration once the FSMA went into law.

Another explanation as to why there is a potential statistical link between the L/A ratio and ROAE is the potential increased profitability of loans relative to investments. You could see that happening particularly if credit spreads were widening, as that would give loans a yield advantage over investments. In the banking industry, investments typically found on the balance sheet of a bank have minimal credit risk, as banks can only purchase investment grade bonds. In contrast, there is a greater credit risk component found in banks’ loan portfolios.

As a bank increases in size, we might expect both economies of scale (unit costs go down with increasing size) and economies of scope (unit costs go down with expanding business offerings). Evanoff and Israilevich (1991) summarize the findings of various researchers on scale efficiency and conclude that “scale advantages are fully exhausted once an institution achieves a size of approximately $100-200 million.” Our study did not control for risk. Some research (see Demsetz and Strahan, 1997) suggests that as banks becomes larger, their firm-specific risk does not go up. They explain that banks can lower risk through diversification of activities, but they then use that diversification benefit to leverage more and to pursue riskier lending. So the net risk change is approximately neutral. This would suggest that controlling for risk offers no significant advantage.

**IDEAS FOR FUTURE RESEARCH**

The results of this paper suggest three additional lines of research. First, an examination of stockholders’ returns and systematic risk could determine whether banks with larger loan portfolios and/or higher L/A ratios have higher absolute market returns and/or higher risk-adjusted market returns. Thus, does the market reward banks which follow our recommended strategies?

Second, a cursory examination of Table 3 in Appendix 1 reveals that a high L/A ratio is more likely to have an effect on ROAE than a low L/A ratio. This implication can be examined formally with non-parametric testing methods. Further, division of the L/A ratio data into deciles might reveal more details regarding this observation. Third, an examination of Tables 2 and 3 reveals that the year 2007 did not follow the trend present in the previous years of this study. A comparison of 2007 versus the prior years, perhaps via an event study methodology, might indicate that the 2008 financial meltdown was being predicted by diminishing bank profitability in 2007.

**REFERENCES**


### APPENDIX 1

**Table 2: Difference of Means Loan Size Quintile Comparisons**

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<tr>
<th>Year</th>
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<th>p-value</th>
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Table 3: Difference of Means Total-Loans-to-Total-Assets Ratio Quintile Comparisons

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Table 4: Two-Factor ANOVA with Interaction

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APPENDIX 2
Explaining the Difference in Sorting Methods

Since this paper contradicts earlier work it is important to understand how that result might be explained by a difference in statistical technique. The W&B paper readily identified the loan portfolio size effect on ROAE but failed to identify the L/A ratio effect on ROAE. This was due to the flawed sorting technique which was used to assign banks to buckets in the five-by-five matrix. A particularly damning fact is that the W&B matrix is not reproduced if the order of sorting is reversed. Walker and Check (2011) (henceforth, W&C) use a sorting techniques which is independent of the sequence of the sort.

The W&B paper first sorted banks into quintiles based on loan portfolio size (rows) and then, within the rows, into quintiles based on L/A ratio (columns) resulting in a five-by-five matrix containing 25 cells. That sequential-sort process results in all cells having approximately the same number of banks. For example, if we used such a process on 5,000 banks we would have 1,000 banks in each row, 1,000 banks in each column, and 200 banks in each cell, regardless of how loan portfolio size and L/A ratio were actually distributed amongst the banks. See Figure 7 which shows the W&B quintile, row, and column sizes.

Figure 7: Walker and Buetow (2005) Quintile Sizes for 1990–2003

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thresholds (lower limit and upper limit) for each column, and assigns column (quintile) numbers for each bank. Thus the banks are assigned to cells in the five-by-five matrix via a process which is independent of the sequence of the sort. Figure 8 shows the W&C quintile, row, and column sizes.

In order to force each cell to have the same number of banks (technically, “replications”), the W&B process results in cell thresholds that vary amongst the rows. By comparing the results of the two sorting methods it can be seen that the W&B sequential sort overpopulates some cells [for example (5, 1) and (1, 5)] and underpopulates other cells [for example (1, 1) and (5, 5)]. For any year of the W&C sorts, banks tend to cluster along the northwest to southeast diagonal, and avoiding the far southwest and far northeast cells.

All this matters because the W&B method results in biased cell means and it is differences in these cell means that we wish to test statistically. The W&B method puts too few low L/A ratio banks and too many high L/A ratio banks in column 1, thus biasing its profitability high. Similarly, too many low L/A banks and too few high L/A banks in column 5 biases that column’s profitability low. That reduced range of column means explains why W&B could not show a significant L/A ratio effect on ROAE. Figure 9 shows the W&B quintile, row, and column means; Figure 10 shows the same information for W&C. Note the smaller difference between the column 5 mean minus the column 1 mean in the W&B table as compared to the W&C table.

Thus, the sorting technique used by W&B assured that no statistically significant L/A effect on ROAE would be identified.

**ENDNOTES**

In banking, the sizes of the loan and investment portfolios are alternatively given as a percentage of total assets or as a percentage of total earning assets. Whether total assets or total earning assets are used is determined by preference and makes little difference quantitatively.
DOES ONLINE HOMEWORK SYSTEM FOR BUSINESS STATISTICS IMPROVE LEARNING?

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ABSTRACT
Online homework system has been becoming a popular practice in business statistic, account, finance and other business courses. This study investigates whether the use of such system increases student learning in an introductory business statistic course. A survey was given to Students who participated in online homework activities to determine their satisfaction with online homework and their perceptions about its effectiveness in enhancing their learning. The test scores of students used online homework system are compared to the test scores of a control group of students who use traditional paper homework. The results indicate that the majority of students have favorable opinions about the online homework and they also perceive the online homework help them learn statistics. However, based on the test scores, students who used the online homework do not always perform better.

INTRODUCTION
Introductory business statistic is one of the least popular courses among undergraduate business students. Majority of students consider it as being abstract; requiring numerous formulas and memorizations, and it is difficult to comprehend. Consequently, teaching business statistics has been a challenging endeavor. Over the years, educators have discussed and proposed a number of alternative pedagogies (Brightman, 1977). Some suggested changing the course delivery mode, or applying active learning methods to encourage student engagement and, perhaps, improve student performance.

However, student success in the business statistic course ultimately requires practices; that is, doing homework assignments regularly. Students often will not do sufficient homework problems unless they are collected and graded. From the instructor’s point of view, frequent collection and grading of homework assignments consume enormous amounts of time, and it may not even be practical when there are several hundred students taking this introductory business statistic course. The delay of feedback from the instructor is also an obstacle for learning for some students.

With the advances of modern technology, an increasing number of faculty members are integrating technology into their courses in the attempt to increase student learning. For introductory business statistics, online homework system is one such technology tool many instructors use with the help from the textbook publishers. The online homework allows students to do their homework at their convenient time for as many times as they wish before the due date. Students can also receive instant assistance and feedback. A primary benefit for the instructors is the time saved from grading homework may be spent on developing more examples or other course-related activities. It may result in an increase in the number of assignments, thus, has the potential to enhance student learning without significantly increasing instructor workload. The objectives of this study is 1) to determine if online homework system, MyStatLab from Prentice Hall, increases student learning for introductory business statistics course which is taught in the face-to-face setting; 2) student attitude toward MyStatLab; 3) student perceptions of MyStatLab as a learning tool for the course.

LITERATURE REVIEW
There have been mixed results found in the literature about the benefits of online homework. Fyneweaver (2008) found that an online homework is as effective as traditional homework for student learning in a general chemistry course. Bonham et al. (2001) used an early version of an online homework system in a physics class and concluded that it did not have greater benefits to students than traditional homework. Porter and Riley (1996) found that, while students in the section with computerized homework had significant higher scores on the final exam questions that
related to the homework, but they performed worse on questions not related to computerized homework.

Chua-Chow et al. (2011) found that students obtain many benefits from online homework and their ability to understand business statistics concepts increased because of immediately feedback feature of the online homework. Doorn et al. (2010) concluded that students overwhelmingly reported the benefits of online homework, but the study did not indicate that online homework is better or worse than the traditional homework. Palocsay et al. (2008) found that after controlling teacher experience and student academic competence, the technique used to deliver homework makes little difference in student success in undergraduate business statistics course.

**METHOD**

Students participated in this study were enrolled in the introductory business statistics class during 2009 and 2010 academic year taught by the same instructor. It is a one semester required course for all business students. The textbook used, the number of tests given, the content of the tests, and the type of questions for each test are almost identical except some variations on the numerical values. Students in 2009 academic year (n=99) were given traditional paper-pencil homework assignments, while students in 2010 academic year (n=126) were required to use online homework system (MyStatLab) for their homework assignments. Students in 2010 academic year also filled out a survey questionnaire. Data includes rating of overall helpfulness of MyStatLab, possibility of doing online homework if it is not required, helpfulness of the online learning aids (help me solve this, view an example, and ebook), and helpfulness of learning each of the topics covered in the course through online homework.

There are three tests and a final exam during the semester. The topics for test 1 are discrete random variables, binomial distribution, Poisson distribution, and normal distribution; for test 2 are confidence interval, and hypothesis testing for one population mean; for test 3 are two independent t-test for the means, paired t-test, and one-way analysis of variance; for final exam are the topics covered in previous tests, but 60% of questions related to simple linear regression. Descriptive statistics are calculated for the ratings. Several t-test are used to compare the mean test scores of each test between the two groups of students.

**RESULT**

It is found that the overall rating of MyStatLab by students is favorable. Approximately 40% of students give a rating of 9 or 10 (1=least helpful, 10= most helpful).

The mean ratings of helpfulness of the subjects range from 7.32 for one-way analysis of variance to 8.04 for confidence interval for the mean. MANOVA test does not show any significant difference in mean ratings of the helpfulness among subjects.

MyStatLab provides several online learning aids: Help me solve this, View an example, ebook, and Stat crunch. Students are asked to express their opinions on how helpful these learning aids are. It is found that 76% of students strongly agree or agree Help me solve this is a helpful learning aid, and overwhelmingly 96.7% of students felt View an example is helpful. Stat crunch is the least helpful aid.

When asking students if they would do the online homework if it is not required, 5% of them indicate that they would never do online homework if it is not required; while 48% of students indicate that they would always or frequently do the online homework even it is not required. ANOVA test shows that the mean overall rating of MyStatLab is significantly higher for students who would do online homework at least most of the time even it is not required compared to the mean rating provided by the rest of students.

Comparisons of mean test scores of students in 2009 and those in 2010 were conducted. Interestingly, students doing online homework have a higher mean test scores for test 1 and test 3, but a lower mean test score for test 2. There is no significant difference in mean test scores between the two groups of student for the final exam.

**CONCLUSION**

This study shows that students, in general, have favorable opinions about the online homework (MyStatLab). It is perceived by students as a very helpful tool in learning the introductory business statistics. Students particularly like View an example learning aid. However, less than half of the students indicate that they would do the online homework frequently if it is not required. This suggests that in order to make online homework a potential helpful learning tool, the instructor needs to make it a requirement.

Comparisons of test scores do not show that using online homework (MyStatLab) will improve learning in all topics of introductory business statistics. Topics such as confidence interval, hypothesis testing, and simple linear regression require students to understand the concepts and make meaningful interpretations after the numerical calculations are done. This is the weak area of MyStatLab; it is difficult, if it is not possible, for online homework to grade open ended
questions. Many students can do the routine calculations and find the numerical answers, but they are struggling in the interpretations of the results and the conceptual parts of statistics.

Online homework system is a very helpful supplement for teaching and learning introductory business statistics. But, to fully understand and learn the subject online homework alone is not sufficient.

REFERENCES


AGENCY THEORY AND THE EFFECTS OF EXECUTIVE COMPENSATION ON STOCKHOLDERS’ WEALTH

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ABSTRACT

This is a theoretical paper that addresses the relevance of agency theory to the issue of corporate executive compensation. Agency theory suggests that if a principal hires an agent to act on behalf of the principal, the agent may sometimes take actions that benefit the agent to the detriment of the principal. In a corporation, stockholders are the principals. Corporate executives are the agents. If corporate executives have the authority to determine their own compensation, (or if they can influence the compensation committee) and if their compensation were to exceed the amount that would be determined by market forces, excess compensation could reduce stockholders’ wealth. Topics to address will include market forces that determine compensation, the effects of executive compensation on corporate earnings, growth and rate of return, and the market forces that may serve to correct excessive executive compensation.

INTRODUCTION

Agency theory (Jensen and Murphy, 1990; Jensen and Meckling, 1976; Nyberg, Fulmer, Gerhart and Carpenter, 2010) suggests that if principals hire agents to act on the principals’ behalf, an agency problem may arise if agents fail to act in the best interests of the principals. In a large corporation, stockholders are principals who hire managers or executives who make decisions on behalf of the stockholders. Corporate executives may fail to expend sufficient effort to perform well. Agents may choose sub-optimal investments that fail to maximize firm value. If executives have the authority to determine their own compensation, (or, if compensation committees are influenced by executives), the resulting levels of executive compensation may adversely affect stockholders’ wealth.

The possibility that excessive executive compensation may adversely affect stockholders’ wealth is the focus of this paper. If income is defined as revenue minus expenses, then the greater the expenses in the form of executive compensation, the lower the income. If corporate income is a determinant of the market value of corporate stock, and thus stockholder wealth, excessive executive compensation could reduce stockholder wealth.

Agency theory researchers (Dalton, Hitt, Certo and Dalton, 2007; Jensen and Murphy, 1990; Nyberg, Fulmer, Gerhart and Carpenter, 2010) identify three ways that agency problems can be reduced: (1) board independence, (2) the market for corporate control, which entails mergers and acquisitions, and (3) agent equity ownership. Board independence suggests that if a corporate board of directors is independent of the executives, and if the board members act in the best interests of stockholders, executives who fail to act in the bests interests of stockholders would be replaced or perhaps persuaded to act appropriately. Mergers and acquisitions have the potential to reduce agency problems through changes in corporate governance. After a merger or acquisition, the board of directors as well as corporate executives could be replaced. Agent equity ownership entails the issuance of company stock and stock options to executives in hopes that stockholders’ and executives’ interests will be aligned.

If executives are issued stock and stock option as well as bonuses and other compensation based on company performance, executives will have incentives to act in the best interests of the stockholders. Growth in income and market value of company stock should benefit both stockholders and executives. Although substantial executive compensation likely benefits stockholders by providing incentives to executives, it seems plausible that beyond some point, the marginal benefit to stockholders of additional executive compensation may be negative, and that excessive executive compensation may be detrimental to stockholders.

A main issue to address is the definition of excessive compensation. Excessive executive compensation will be defined as compensation that would exceed the level that stockholders would agree to in well functioning market. Topics to be addressed in the remainder of this paper are the market determinants of compensation, the potential effects of excessive executive compensation on stockholder wealth, and market forces that might correct the problem of excessive compensation.

ECONOMIC DETERMINANTS OF COMPENSATION

General economic theory (Peterson, 1980; Samuelson, 1970) suggests that compensation is related to a person’s contribution to the generation of goods and services. The
production of valuable goods and services arises from the combination of capital, labor, raw materials and other resources. If a company with a particular combination of capital, labor and raw materials were to hire a new employee, the total output would change. The amount of change could be called the marginal productivity of that person’s labor. If the marginal productivity results in greater revenue for the company, compensation related to the greater revenue would be warranted.

Compensation based on a person’s marginal productivity can be substantial. Prominent examples include entertainers and athletes. When employers pay entertainers and athletes huge sums, it is because the employers consider the compensation to be worthwhile. For example, (Vanity Fair, 2011) reports that during 2010, movie star Johnny Depp earned an estimated $100 million. It can be inferred that the producers of Johnny Depp’s movies believed that his presence would result in revenues that would be more than $100 million greater than if a different star were hired. (Mastrobernardino, 2011) reports that New York Yankee baseball player Alex Rodriguez earned a salary of $32 million for a recent year. It can be inferred that the owners of the New York Yankees believe that additional ticket sales, broadcast fees and other revenues will exceed the $32 million paid to Alex Rodriguez.

Although the earnings of entertainers and athletes may be thousands of times the earnings of the average person, and some envious people may say that nobody should be allowed to earn that kind of money, the economics of marginal productivity suggests that such compensation can be warranted.

In a corporate setting, tremendous income can be warranted if it arises from a person’s productivity. Consider an example of the founder of a corporation who is also the owner of the corporation. If a corporation starts with the founder’s idea and grows to a value of several billion dollars, the founder’s wealth can similarly grow to several billion dollars. Such an increase in wealth is justified because the founder’s ideas, efforts and management skills created the wealth.

Consider an illustration of a corporation in decline that is turned around by a highly skilled executive. Imagine a large corporation that has done poorly in recent years and is on the verge of bankruptcy. Further imagine that an executive with a reputation for turn arounds were hired, and as an incentive, were issued stock equal to 5% of the corporation. If the total market value of the corporation were to rise to $20 billion, the executive’s 5% share would be $1 billion. If it could be argued that the executive’s skill saved the corporation from bankruptcy and that the executive’s decisions created $20 billion in value, a billion dollar increase in the executive’s wealth could be warranted.

In each of the preceding illustrations, high compensation and wealth increases arise in situations where business owners knowingly agree to wealth transfers that they believe to be economically justifiable. Consider next corporate settings where corporate executives have the authority to set their own compensation (or are able to influence the compensation committee) and abuse that authority. Imagine a large corporation that at one time was worth many billions of dollars but has incurred losses for a number of years and now has equity of $1 billion. Suppose that a group of senior executives arrange to receive compensation that collectively totals $1 billion, and that their compensation, combined with other expenses and losses, drives the corporation into bankruptcy. In this case the high level of executive compensation would not be warranted.

EFFECTS OF EXECUTIVE COMPENSATION ON RATES OF RETURN AND STOCKHOLDER WEALTH

The preceding example of excessive executive compensation driving a corporation into bankruptcy is perhaps an extreme example. More common would be corporate settings where corporations are profitable and substantial executive compensation is consistent with market forces. The issue to address is the possibility that executive compensation may be excessive if equally talented executives could be hired for less compensation.

Consider an illustration of the effects of excessive executive compensation on corporate income. Suppose that income as a percentage of sales, before subtracting senior level executive compensation, were 11%. Suppose that in a competitive market for executives, senior level executive compensation would be 1% of sales, resulting in income as a percentage of sales of 10%. In this corporation, however, senior level executives receive compensation equal to 6% of sales. The result would be income of 5% of sales.

Consider an example of a corporation that issues stock to senior executives. Agency theory (Jensen and Murphy, 1990; Jensen and Meckling, 1976; Nyberg, Fulmer, Gerhart and Carpenter, 2010) suggests that stock ownership provides an incentive to act in the best interests of the stockholders since increases in stock price would benefit all stockholders, including executives who own stock. However, if the amount of stock issued to executives were excessive, the result would be unwarranted dilution of ownership. For example, imagine a corporation where for a particular year, executive salaries and bonuses are consistent with the market for executives, but, in addition, senior executives are issued stock equal to 5% of outstanding stock. Suppose that during the year the total market value of the corporation were to rise by 10%. The increase in market value per share of stock would be calculated as:
Market value of corp as percentage of beginning value = 1.0
Shares of stock outstanding as % of beginning shares
= 1.10 / 1.05 = 1.047619
= .047619

Accordingly, without issuance of stock to executives, the increase in stock value would be 10%. With issuance of stock to executives, the increase in stock value would be reduced to 4.76%.

Next, consider how excessive executive compensation could reduce stockholder wealth through reduction in the market value of stock. According to finance theory (Block and Hirt, 2005; Ross, Westerfield and Jordan, 2006), a corporate stock’s value can be calculated as the present value of future cash flows, typically in the form of cash dividends. If a company’s sales, profits and dividends were expected to grow, an investor would expect the stock value to grow as well. Such an investor would expect a rate of return that is the sum of 2 components: (1) a dividend yield and (2) a capital gain yield. For example, if expected dividend yield were 2.5% and expected capital gain yield were 10%, total expected rate of return would be 12.5%.

To illustrate the calculation of a stock’s market value, consider the constant growth valuation model presented by Block and Hirt (2005, p 283). If a company’s dividend is expected to grow at a constant rate, the future value of future dividends can be expressed as the following formula:

\[ P_o = \frac{D_1}{K_e - g} \]

Symbols are defined as:

- \( P_o \) is the market price of the stock today.
- \( D_1 \) is the dividend expected at the end of the coming year.
- \( K_e \) is the required total rate of return.
- \( g \) is the constant growth rate for dividends.

To illustrate a decline in stockholder wealth, consider first a company where the executives receive salaries and bonuses that are consistent with the market for corporate executives, and the executives do not receive company stock. Suppose the company’s sales for the most recent year were $12,500 and income before executives’ compensation were 11% of sales. Suppose that the dividend payout rate would remain at 20%, the growth rate were 10%, the required total rate of return were 12.5%, and the number of shares outstanding were 100. Income for the most recent year would be $12,500 X 11% = $1,375. Earnings per share (EPS) would be $1,375 / 100 = $13.75. Dividend per share for the most recent period (Do) would be $13.75 X .20 = $2.75. The market price of the stock would be calculated as:

\[ P_o = \frac{D_1}{K_e - g} \]

\[ = \frac{2.75}{.125 - .10} = \frac{2.75}{.025} = $110.00 \]

Next, consider how the market price per share would change if executives were to receive excessive compensation in the form of higher salaries and bonuses that would increase their compensation from 1% of sales to 6% of sales. Income as a percentage of sales would fall by 5 percentage points, from 10% to 5% of sales. Assume that the dividend payout rate would remain at 20%, the growth rate were 10%, the required total rate of return were 12.5%, and the number of shares outstanding were 100. Income for the coming year would be $12,500 X 5% = $625. Income for the coming year would be $625 X 1.10 = $687.50. Earnings per share (EPS) would be $687.50 / 100 = $6.875. Dividend per share at the end of the coming year would be $6.875 X .20 = $1.375. The market price of the stock would be calculated as:

\[ P_o = \frac{D_1}{K_e - g} \]

\[ = \frac{1.375}{.125 - .10} = \frac{1.375}{.025} = $55.00 \]

The drop in income arising from the greater executive compensation would result in smaller dividends. That in turn would cause the market value to fall. If the growth rate were to also fall, which is likely if less income is available to reinvest, the decline in market price would be even greater.

Alternately, consider next how the market price per share could change if stock were issued to senior executives. Imagine the same data as the initial scenario except for the number of shares of stock outstanding. Suppose that a policy were adopted that would result in the yearly issuance, to senior executives, of stock equal to 5% of outstanding stock. Thus, the number of outstanding shares would increase from 100 shares currently to 105 shares one year hence. The dividend per share for the most recent period (Do) would be EPS (income / number of shares) X dividend payout rate of 20%:

\[ (\frac{1,250}{100}) X .20 = 12.50 X .20 = 2.50 \text{ per share} \]

The dividend per share at the end of the coming year (D1) would be based on the increased number of shares outstanding:

\[ (\frac{1,375}{105}) X .20 = 13.095238 X .20 = 2.6190476 \]

The growth rate for dividends (g) would be calculated as:
The market price of the stock would be calculated as:

\[ P_0 = \frac{D_1}{K_e - g} \]

\[ = \frac{2.6190476}{0.125 - 0.047619} = \frac{2.6190476}{0.077381} = 33.846132 \]

Although the total income and total dividends would be the same as the initial scenario, the dilution of ownership would result in a drop in both stock price and growth rate in dividends as well as stock price. If an investor, unaware that corporate executives will annually receive stock equal to 5% of outstanding shares, were to buy stock for $110.00 per share with the expectation of dividends plus a 10% growth rate, the investors would instead experience a fall in value to $33.846, followed by a growth rate of 4.76%.

The preceding examples may be exaggerations, but they illustrate how economic harm to stockholders could occur.

**MARKET FORCES THAT COULD CORRECT EXCESSIVE EXECUTIVE COMPENSATION**

If corporate executives receive salaries and bonuses and/or are issued stock that exceeds amounts warranted by the market for executives, market forces may result in actions to correct the excesses. As stated in the introduction, agency theory researchers (Dalton, Hitt, Certo and Dalton, 2007; Jenson and Murphy, 1990; Nyberg, Fulmer, Gerhart and Carpenter, 2010) suggest that ways to reduce agency problems include board independence, and the market for corporate control entailing mergers and acquisitions.

If the board of directors were independent of corporate executives, the board could negotiate new, more appropriate compensation packages. If necessary, the board of directors could replace executives. If the board of directors were not independent, or otherwise refused to take action to correct excessive executive compensation, stockholders could vote to replace the board of directors with new members who would take actions necessary to correct excessive executive compensation.

Problems may arise if there are so many stockholders that reaching an agreement amongst owners of more than 50% of stock is difficult. No individual stockholder may have the resources to organize the votes necessary to achieve a majority. However, if significant percentages of a company’s stock were owned by mutual funds and pension funds, the managers of those funds may be able to join forces and create the publicity necessary to achieve a vote to replace board members and executives.

A corporate takeover could also result in the replacement of executives. If excessive executive compensation were to result in a sharp decline in the market value of a corporation, a group of investors, or perhaps another corporation, may recognize an opportunity for gain. If a group of investors could acquire a majority of the stock of the target corporation, and thus achieve control of the corporation, the board members and executives could be replaced.

**CONCLUSIONS**

In a large corporation, stockholders are principals who hire managers or executives to act as agents on behalf of the stockholders. An agency problem may arise if excessive executive compensation were to adversely affect stockholder wealth.

A level of compensation that may seem to be exorbitant may not necessarily be excessive if market forces warrant the compensation. If an extraordinarily talented executive develops products and makes decisions that greatly increase profits and corporate value, extremely high compensation may be justified.

If executives with ordinary talent exploit their authority or their undue influence with the compensation committee to receive compensation that is greater than the market for corporate executives would warrant, the result could be diminished stockholder wealth. However, market mechanisms may serve to mitigate the harm to stockholder wealth. If investors become aware that excessive executive compensation adversely affects income and market value, stockholders may vote for the replacement of board members with board members who would replace the executives. Alternately, a corporate acquisition may result in the replacement of executives.

Additional research may entail the study of data to determine whether actions to reduce excessive executive compensation have occurred. For example, data might be gathered and analyzed related to stockholder votes on board members, corporate acquisitions, executive dismissals, subsequent changes in income and market value, and other potentially relevant data.

**REFERENCES**


THE IMPACTS OF ETHANOL PRODUCTION ON GLOBAL FOOD INFLATION: FOOD VS. FUEL

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ABSTRACT
Between mid-2007 and early 2008, the issue of rising global food prices moved to the forefront of the international political agenda. As a result of higher food prices, tens of millions of people were pushed into hunger and poverty around the world. Civil unrest flared up around the world, many countries introduced export restrictions on food subsidies and instituted price controls. Food price inflation has been sparking protests in North Africa that toppled longstanding presidents in Tunisia and Egypt. We are going to analyze the immediate causes of food prices; in particular the role of biofuel will be examined in detail. What action policy makers need to take now to ensure global food security in the future will be assessed. In this paper special consideration will be made to African countries with social cost associate with food inflation.

INTRODUCTION
In this paper, we examine the roots of increases in food prices, particularly the underlying global factors, and will investigate to see what governments around the world have done to tackle the issue and what we can do to economize on food demands. Obesity in advanced nations, and malnutrition and poverty in developing countries have been with us all the time, but the global food crisis have been grabbing headlines recently. The food crisis has been serious enough that the UN Human Rights Council adopted a resolution on 22 May 2008 and had a special session on the food crisis from a human rights perspective (United Nations, 2008).

Many experts have looked at the issue and explored the role of biofuel production to see how likely it is that in the future it will undermine or weaken the access to food for vulnerable people. There are overriding ethical concerns that can justify biofuel production even if it harms access to necessary and sufficient food to avoid world hunger. According to UN Article 11, 1966, (Covenant on Economic, Social and Cultural Right), “everyone has the right to adequate food and the fundamental right to be free from hunger” (Eide, 2008). Then after 30 years of this covenant, the heads of State and Government gathered in 1996 at the World Food Summit (WFS) to reaffirm such rights.

In 1996 at the time of the summit, the number of undernourished people in developing countries was estimated to be 823 million people (Eide, 2008). If the commitments made in 1996 had been followed through, the number of undernourished people in developing countries should have been reduced by approximately 20 million each year, and by 2008 there should consequently be some 583 million hungry people in the world. The world’s population is estimated to increase to 9.2 billion in 2050; most of the increase will be in developed regions of the world, where population is projected to rise from 5.4 billion to 7.9 billion in 2050 (Evans, 2009).

The tragic fact is that the number of undernourished people in the world today is over 900 million (FAO, 2008). In other words, there are many more undernourished today than in 1996. This is a devastating failure of the UN 1996 summit resolution, and the major contributing factor has been to lower purchasing power of people and raise inflation, this has left them unable to have access to food. The International Monetary Fund (IMF) estimated in April 2008 that food prices represented 44% of global inflation in 2007 and as much as 67.5% in Asia (Evans, 2009).

Surging food price that contributed to sparking uprisings in Tunisia and Egypt threaten to fuel more unrest. The United Nations index of global food prices reached a new high in the month of January 2011, eclipsing the peak in July 2008, due to rising prices for cereals, sugar and vegetables oils. The price hike has affected virtually all major commodities. Prices of dairy and many cereals more than doubled in 2007, reaching all-time record highs causing middle-income households to cut spending on other areas, such as education and health. Food price inflation is an indirect and major contributor to poor health and inadequate education as a result of the necessary (and unwilling) diversion of discretionary funds by many households from education and health to basic food and survival.

In spring 2007, economists were talking about "agflation" referring not just to short run price increase for grain, soybeans, corn and corn products, but to a secular price increase we have seen in the global agricultural business that may be more long-lived (Rasco and Bernstein 2007). Given this food inflation, we will validate whether everyone is going to be affected equally domestically and globally. In order to do that, we are going to examine the consumption patterns of people in different income categories.
FOOD CONSUMPTION PATTERNS

Food price increases have had a more dramatic effect on the purchasing power of low-income households than that of high-income households. As indicated in Table 1, the top income quartile spends 12.1 percent of their income on food, versus those in the bottom income quartile spending 14.9 percent on food. Of all the groups, food stamp recipients concentrate the highest percentage on their consumption on food. This is because low-income households concentrate more of their total budget on food and spend relatively more on food consumed at home rather than away from home. In general, households in the U.S spent 13.5% of total expenses on food, with over half consumed at home (McGranahan, 2008). As households’ income levels increased, spending on food decreased as a percentage of total expenditures. This result also held for food consumed away from home, the higher the income, the more people eat out. Also, globally speaking, U.S. consumers generally spend a smaller portion of their income on food compared to many other countries, that share varies widely across income levels. However, the picture is vastly different for low-income households. In 2006, households with incomes in the lowest reported income category spent 17.8% of their income on food. When food prices rise, families with lower incomes feel the pinch more acutely since food expenditures make up a larger share of their total expenditures (U.S Department of Labor, 2010).

Elderly households spend less than any of the other groups on food, possibly because they frequently eat at home and consume fewer calories. Of all the groups, food stamps recipients concentrate the higher percentage of their total consumption on food. As a result, recent increases in food prices have a more substantial impact on their purchasing power of lower income families than higher income families. Furthermore, different fluctuations were noted depending upon whether food was being consumed at home or away from home. In the U.S, price increases for food consumed at home were higher (up 7%) in 2007, while price increases for food consumed away from home were lower (only 4.6%). Prices for food consumed at home have historically been more volatile than prices for food away from home and prices for food consumed at home tend to increase more quickly when food prices are increasing quickly in general. Studies have shown that the percentage of food expenditure as a fraction of total expenditures increases with income when foods are consumed away from home (Capehart and Richardson, 2008).

More than half of all food expenditures occurs away from home for the higher-income households (top income quartile) compared with one-third for the lowest-income households bottom income quartile. Prices of foods a household consumed at home increased more rapidly than food consumed away from home in the past years. Food inflation has ranged from 5.8% to 6.4% in the U.S (McGranahan, 2008). It has been the lowest for the highest-income households, while it has been the highest for the lowest-income families, elderly, and food-stamp recipients (Capehart and Richardson, 2008).

Globally, the United Nation Food and Energy Agricultural Organization noted in late 2007 that food prices in developing countries were up 11% in the past years, spurring concern about food riots. The key point is that food inflation not only affects different income categories within a nation, but also affects different countries in different ways. In the U.S. food represents 15% of the Consumer Price Index (CPI), but the ratio is much higher in China (33%), Thailand (35%), India (46%) and Philippines (50%). In the Philippines, food accounts for 50% of the basket of goods included in the consumer-price index and are considered to be an inflation benchmark (Barta, 2007). Therefore, food inflation affects poorer, less-developed countries more than the rich, well-developed ones. Most American have not benefited from the food crisis.

ROOTS OF INCREASES IN FOOD PRICES: SUPPLY AND DEMAND FACTORS

Food prices have been going up for a number of different reasons. Some of the factors driving food inflation vary from country to country: union-negotiated wage hikes in Germany, drought in China, an electricity squeeze in South Africa, pay rises for civil servants in India.

Factors such as weakness of the U.S dollar, climate change related droughts and floods, trade restrictions, speculation on commodities, higher price of land, and soaring petroleum prices contribute to higher food prices by raising costs of transportation, fertilizers, and fuel for farm machines. Moreover financial investors’ speculation in commodity prices aggravates food prices and increases volatility in the markets. Some sources indicated that 40% of food inflation might even be due to commodity speculation. Ministers of the G-20 industrialized and developing nations are also considering ways to make agricultural markets more transparent, including publishing more information on international supplies and improving forecasting mechanisms. Some financial hubs fear further regulation of the commodity market due to the loss of lucrative trading.

World grain prices have increased dramatically on three occasions since World War II, each time as a result of weather-reduced harvests. It is argued that food prices are largely being driven by supply and demand coupled with supply shocks including floods and droughts. Rising prices for food are more likely to boost inflation in countries where growth is strong and unemployment is low. In low demand
and high unemployment economies, workers will have a hard time to cover their rising food bill, so they cut back on other kinds of spending. The same is true about the companies, as they are forced to eat their higher costs because they know raising prices will affect their sales. In a weak economy, higher commodity prices are like a tax on growth.

Regarding the exchange rate, the dollar depreciation against major global currencies by 11 percent from 2006 to 2008 affected food prices in two ways: it caused higher costs of imported goods on one hand, and on the other hand, it increased demand for U.S agricultural exports leading to higher prices and hence higher inflation globally.

Many countries such as Saudi Arabia, Hong Kong, and Mongolia peg their currencies to the dollar and if they do not take measures to protect their peg, investors are likely to move their money elsewhere, placing devaluation pressure on their currencies and imperiling their dollar pegs.

**THE ROLE OF BIOFUELS**

Biofuels are a wide range of fuels which are derived from biomass. The term biomass refers to any liquid fuels and various biogases. Biomass means any organic matter available on a renewable basis. This includes dedicated energy crops and trees, agricultural crops wastes and residues, wood wastes residues and aquatic plants as well as animal, municipal, and other waste. The energy derived from biomass is known as bio-energy. In most cases bio-energy is derived from production of corn, wheat, sugar and soy into biomass. Biomass is converted into a byproduct called ethanol. Most ethanol in the Unites States is manufactured from corn ears, a valuable source of food for humans and animals, the very process of making it, moreover, entails a large and wasteful input of energy (Klare, 2008).

Food prices have soared because agricultural production (supply) has not kept up with the rising demand for cereals for food consumption, cattle feeding and biofuel production. Growing economies such as China (with a population of 1.3 billion and rate of growth of GDP of 9.8%) and India (with a 1.1 billion and GDP of 7.3% contributed to the burgeoning middle class, which placed more demands for food, in particular for meat products (CIA fact book). It is not just China and India, but world population has also doubled from 1950 to 2000, and meat consumption has increased fivefold. Higher demand for food has also contributed to higher demand for natural resources and non-land resources in all countries. Among developing economies, such as India and China, the prices of raw materials, such as the prices of seed, fertilizer and land have increased, which in turn contribute to higher food costs. In the U.S., the price of farmlands increased by 16% in 2007 (McGranhan, 2008).

The other side of the market is the supply side, where allocations of resources have been diverted from food to fuel. U.S. government policy to subsidize the farmers affects the allocation of resources. Starting in 1978 with the higher price of oil, the United States Congress passed important policies subsidizing alternative fuels as a means to combat fuel costs. During the 1980s and 1990s more subsidies were given out to farmers who raised crops for alternative fuels. Then, the Energy Act of 2005 was passed that required the use of 7.5 billion gallons of gasoline additive (biofuel) every year beginning in 2012, almost doubling the production of Biofuels. In addition, one of the most important policies today regarding biofuel is the 2008 Farm Bill also referred to as the Food, Conversion and Energy Act of 2008, which included a cellustic biofuel tax credit of $1.01 per gallon for cellulosic biofuel producers through 2012 (Sastri and Lee, 2008). Finally, the Renewable Fuel Standard or public Law 110-140, requires progressively increases the required volume of renewable fuels used in motor vehicles.

From June 2006 through June 2008, the crude petroleum price increased at an average annual rate of 40 percent while grain prices grew still faster, at a rate of 62 percent. Subsequent months, however, saw a reversal in trends, with both oil and grain prices falling by 20 percent (annually 60 percent) (Hobijn, 2008). The energy effect operates in two ways:

First, energy price increases affect food prices because crop production is fairly energy intensive (operating costs). About 12 percent of corn farm operating expenses were for direct energy inputs (fertilizers and pesticides). Energy is used for energy inputs (fertilizers and pesticides). The effects of higher energy prices on farms differ in the short-run and long-run. Farmers have limited ability to substitute other inputs for energy in the short-run, but over time farmers can take advantages of information and technology improvements to find alternatives for traditional energy sources such as fossil fuels.

Second, the rising price of oil helped to increase the attractiveness of biofuel as a substitute for oil in the U.S, Europe, Brazil and elsewhere. Oil price increases have led to increased demand for ethanol and other alternative energy sources as a good investment. The increase in demand for corn to produce ethanol has led to an increase in the price of corn as well as price of other agricultural commodities (See Figure 1) that depends on corn. The prices of rice, the staple for billions of Asians, has also increased 147 percent over the past year. 40 percent of the world’s corn is produced in the U.S., and 1/3 of it was set to be converted to ethanol to fuel cars in 2008.

That percentage is a big displacement of global food products away from corn. The estimate of the impact of food-into-fuel production is 3 percent (Steward, 2007) to 75 percent (Chakrabortty, 2008). Other sources argue that ethanol...
production growth of biofuel production led to about a 10 percent increase in food price inflation (Glauber, 2009) and he estimated that with expectations for tight and volatile agricultural markets in the near terms, food price inflation likely will remain higher than the average of the past decade.

By the end of 2008, the United States' ethanol production capacity reached an estimated 11.4 billion gallons per year. In his latest State of the Union address, President George W. Bush called on the country to produce 35 billion gallons of renewable fuel a year by 2017 and 36 billion gallons by 2022, nearly five times the level currently mandated (Runge and Senauer, 2007).

Some economists blame biofuel production for 390,000 additional deaths among children under age five and project that this number will continue to rise to 475,000 by 2010 if the Congressional mandate holds. There is no doubt that biofuel production has had a substantial impact on the increasing cost of food, though opinions differ on the degree of the rise caused by biofuel and its related factors (Doornbusch and Steenblik, 2007). Don Mitchell (2008), Lead Economist at the Development Prospects Group of the World Bank, has pointed out that the World Bank’s index of food prices increased 140 percent from January 2002 to February 2008, and he argues that three quarters (105 percent) of the rise was due to biofuel and the related consequences of low grain stocks, large land shifts, speculative activity and export bans.

While Mitchell recognizes that the increase was due to a confluence of factors, the most important was the large increase in biofuel production in the U.S., where 25% of the production of maize goes to ethanol production, and in the EU, where 47% of vegetable oil production is used for biofuel production (Eide, 2008). Without the increase in biofuel, Mitchell argues global wheat and maize stocks would not have declined appreciably and price increases due to other factors would have been moderate.

Some economists argue that government policies around the world to replace oil with ethanol and other liquid biofuel could draw the world into a “food-versus-fuel” battle as they both compete for the same inputs. They focused in particular on the impact of food prices. Any diversion of land from food or feed production to production of energy biomass will influence food prices from the start, as both compete for the same inputs (Doornbusch and Steenblik, 2007). Putting it starkly, the ‘food versus fuel’ game could make it possible for a car owner in a developed country to fill his or her tank (50 liters) with biofuel produced from 200 kg of maize, which would have been enough to feed one person for one year.

“The stage is now set for direct competition for grain between the 800 million people who own automobiles, and the world’s 2 billion poorest people” (Brown, 2008). Some suggest sugar as an alternative as it is more efficient (Brazil is using sugar cane), but the long-term impact is still the higher price of food as a result of using land to grow anything other than food for people.

In addition to directly threatening food security, there are concerning examples of how biofuel production causes environmental harm and speeds up global warming. Until recently, few voices critical of biofuel were heard, but now an increasing number of policy makers and analysts strongly oppose converting food into fuel. U.S. ethanol production uses large amounts of fuel, fertilizer, pesticides and water and most analysts consider its environmental impact quite negative. Also in other countries, such as Indonesia, Malaysia and Brazil, companies have slashed thousands of hectares of rain forests to cultivate palm oil or sugarcane for biofuel production.

Thus concerns about global climate change become more intense as biofuel production causes a number of environmental problems, reduces biodiversity and further competition for water. Ethanol production is a prime example of how industrial activity can boost water demand. Despite recent efficiency gains in using less water than before, ethanol production remains a water-intensive process. Recent estimates indicate that roughly three gallons of water are required to produce a single gallon of ethanol, down from six gallons of water a few years ago (Henderson and Akers, 2008).

In light of this, the question is whether there are sufficient ethical justifications for biofuel production to override the negative consequences. The first conclusion is that the most widely used justification that replacing fossil fuel (gasoline and diesel) by biofuel can reduce greenhouse gas emissions and thereby reduce global warming, is mostly not tenable. Most liquid biofuel production, distribution and use lead to as much and sometimes more greenhouse gas emissions than the use of fossil fuel. When both the direct and indirect consequences of the process are taken into account, including the unavoidable land shifts that will be required by any expansion of such production. The second concern is that biofuel production cannot significantly improve the energy security of developed countries – to do so would require such a vast allocation of land that it would be impossible for a multitude of reasons.

The National Academies of Science made a calculation using the year 2005 as an example, showing that, even if all the corn and soybeans produced in the U.S. in 2005 had been used for bioethanol production, this would only replace 12 percent of the country’s gasoline demand and 6 percent of its diesel demand (Muller, Yelden and Schoonover, 2007). Some scientists have suggested development of new technologies or new variants of plant feedstock, such as switch grass,
miscanthus, and poplar and willow trees, which can be grown on marginal lands with fewer fossil fuel inputs that could yield more biomass per unit of land, in addition to generating biofuel from agricultural waste and garbage.

Also, ethanol production has caused land concentration for plantation-type production, due to considerations of economy of scale; this has led and is likely to continue to cause evictions or marginalization of vulnerable groups and individuals, mostly small land owners. Many women in the developing countries, particularly in Africa, are likely to be particularly severely affected if extensive biofuel production spreads to their part of the world. Indigenous peoples and other groups with insecure title to the land on which they make their living have also been harmed and are likely to be so harmed in the future.

THE ROLE OF INTERNATIONAL TRADE

Analysts generally consider higher food prices beneficial to poor countries that depend on export of agricultural goods. Moreover, net exporters of food are benefiting from the current price hikes. But in the past decades, international trade liberalization has transformed most developing countries from net-exporters into net-importers of food. Caving to pressure from the World Trade Organization, the International Monetary Fund and the World Bank, developing countries dismantled tariffs and other barriers to trade, enabling large agribusiness and subsidized goods from rich countries to undermine local agricultural production. To some degree, food aid - in the form of subsidized goods produced in rich countries - also played a role in diminishing farming in poor countries. Roughly 70% of all developing countries are currently net-importers of food (Wahlberg, 2008).

Among the least developed countries, this figure is even higher. At a slower and more stable speed, higher food prices could encourage agricultural production in poor countries. But with an impending food crisis and no time and resources for a major transformation of the agricultural sector, import-dependent countries are instead attempting to boost imports by reducing import duties and tariffs, and providing subsidies to importers. Meanwhile, exporting countries are implementing export restrictions such as export quotas, export duties, minimum export prices, and even export bans of certain commodities. These policies certainly have been contributing factors to global food inflation.

ANALYSIS AND FINDINGS

We used energy prices from 1980 to 2009 as the independent variable in regression analyses to find the correlation between energy and higher food prices. We obtained non-seasonally adjusted Consumer Price Index (CPI) data from a publicly available database found at http://stats.bls.gov/opub/hom/homch17_itc.htm. Then we determined our variables of interest, namely food, energy, and all items excluding energy from CPI data and indexed it for download on an annual basis from 1980 to 2010. We obtained a strong correlation (R-square = 71.5%) between food prices and energy, with a confidence interval of 99%.

The regression equation for food versus energy was found to be as follows:

Food (y) = 0.8006x + 49.674 … Equation (1)

where x is energy, the independent variable. The R-square for this regression was 0.7151.

This correlation means that 71.51% of the increase in food prices between 1980 and 2009 can be explained by the increase in energy prices over the same time period.

When we ran the regression for food versus all items in the Consumer Price Index excluding energy for the same parameters, i.e. non-seasonally adjusted data, obtained annually from 1980 to 2009 and confidence level of 99%, this correlation was even stronger. Our R-square here was found to be 0.99032, an extremely strong correlation. The regression equation for all items in the CPI less energy versus food was found to be as follows:

Food (y) =0.9287x + 5.3256… Equation (2)

where x is All items in the CPI excluding energy, the independent variable.

This strong correlation means that 99.032% of the increase in food prices between 1980 and 2009 can be explained by the increase in the prices of all items belonging to the Consumer Price Index excluding energy prices over the same time period.

For seasonally adjusted data, the same 2 regression analyses as earlier yielded similarly strong correlations, in the order of 0.7167 for R-square in the food versus energy analysis, and R-square of 0.9903 for the food versus all items in the CPI excluding energy regression.

A third regression analysis was performed to examine the correlation of food prices based on ethanol production in millions of gallons per year, from 1980 to 2009. The R-square was 0.6724 with a confidence interval of 99%. The regression equation for this analysis is as follows:

Food (y) = 0.0122x + 121.58… Equation (3)

where x is ethanol production in millions of gallons, the independent variable. The R-square for this regression was 0.6724.
This correlation found above is explained in that 67.24% of the increase in food prices between 1980 and 2009 can be explained by the increase in ethanol production over the same time period.

The above analyses and the results prove that the increase in food prices over the last 30 years can be explained satisfactorily, with a high confidence level, based on the increase in energy prices and ethanol production over the last 3 decades, a conclusive finding confirming our thesis.

IMPLICATIONS OF HIGHER FOOD PRICES

It is estimated that world food demand could double by 2050, putting additional stress on world water supplies and productive agricultural land. With higher demand comes higher food prices globally, the incidence of hunger grew in many developing countries because of the reduced purchasing power of the poor and fixed budgets for food aid. The vulnerability is compounded by lack of access to social protection systems such as welfare safety nets, food assistance or cash transfer with 80 percent of the world’s population lacks access to social protection systems of any kind (United Nations, September 2008). A record 43.6 million people in the U.S.-more than one of every eight received food stamps in November of 2010 the USDA reported (Pooley and Revzin, 2011). In most parts of the developing world, there is no comparable safety net, which is why national leaders and other national agencies are seeking solutions before the worse comes to pass.

Rising food prices promote malnutrition and hunger and this affects people in rural areas more than the ones living in urban areas. Three quarter of the world’s poor people live in rural areas and most of them are dependent on farming: of the 3 billion rural people in developing countries, 2.5 billion are in households involved in agriculture, and 1.5 billion of them are smallholder farm households (Evans, 2009).

Poverty has many other implications; according to Batson (2008), there were protests over rising costs in many countries, from Vietnam, Pakistan, Indonesia and Haiti where fears of permanently higher prices for basic foodstuffs has been triggered. Food price inflation has been blamed for sparking protests in Egypt, shortages of government subsidized bread prompted strikes, demonstrations and violence and by February of 2010 their longstanding president was toppled. In addition in the longer term, food inflation could have additional spillover costs; overall health worsens and education levels decline as lack of nutrition affects academic performance of the students and, of course, the labor force and leads to much more long-term negative spiral effects for the country.

In particular, in countries with more severe socio-economic conditions the right to access sufficient food is more critical. In South Africa with high unemployment rate and poverty along with food inflation of 20 percent (Jensen, 2007) we could witness more adverse consequences than in other advanced countries. The majority of low-income families in Africa spend 30 percent to 50 percent of their disposable income on food. Thus, the continuing increase in the rate of inflation poses a greater challenge to all the stakeholders. The food inflation is much more severe in rural areas than urban areas due to transport cost, lack of competition and high cost of doing business. As a result food inflation affects the vulnerable more severely.

Here, we discuss the vulnerability of people in 121 countries. About 40 of the nations have been judged to be at risk of serious hunger, or already suffering from it. The criteria include: how much does the country rely on imported food; how large is the urban population; what is the current rate of inflation, and what portion of their income do families spend on food (in Burundi, for example, it’s 77 percent and in the U.S. it’s 13.5 percent). In response to this many importing countries have sought to tackle rising prices by reducing taxes on food grains (49 countries) or by introducing or extending economy-wide price control or consumer subsidies (46 countries). These actions in turn affected public-sector budget and significantly deteriorated their balance-of-payments position.

MAJOR CHALLENGES

High demands resulting from increasing affluence and growing population represent major challenges for global food security. Governments around the world are faced with the following challenges:

1. **Energy security:** affects food prices in multiple ways, from fertilizer prices, farm energy use and transportation costs to the more recent trend of using crops to produce biofuel as the most important driver of food price increase in recent years. While oil prices collapsed dramatically since the summer of 2008 (from the peak of $147 in July to around $40 in December 2008), the ongoing lack of investment in new oil fields suggest that prices are set to rebound sharply when the world emerges from the downturn- pulling oil prices up with it.

2. **Climate change:** will result in an increase of 40-170 million in a number of undernourished people worldwide, while higher average temperature may leads to yield increase in higher latitudes, lower latitudes-where most developing countries are located- will start to see negative impacts.

3. **Water security:** is already becoming a major problem as population grows and per capita consumption rises. Half a billion people live in countries chronically short of water, by...
2050, the number will rise to more than four billion, not only because of climate change but also as a result of unsustainable extraction from rivers, lakes and ground water. Agriculture, which accounts for 70 percent of global fresh water use, will be particularly vulnerable (Evans, 2009).

4. Competition for land: is likely to become a major problem in the future. To meet rising demand for food, yield increase alone may not be enough, increased acreage is likely to be needed as well. However, demand for land is also intensifying for other uses, and a significant portion of land used to grow food is already degraded.

5. Demand for food: will rise over coming decades as world population increases toward 9.2 billion in 2050 (Evans, 2009). The World Bank projects that by 2030 worldwide demand for food will increase by 50 percent and for meat by 85 percent. Therefore, there is a real risk of a “food crunch” at some point in the future, which would fall particularly hard on import dependent countries and on poor people everywhere.

Thus policy makers should use the current period of easing food prices as a moment of opportunity in which to identify and agree on the key elements of a global food security strategy. It is essential to make the world’s food production and distribution more resilient (to resist shocks), more sustainable (overgrazing, over-plaguing, inefficient water or fertilizers or energy, climate change), and more equitable (the billions of hungry people today are not due to insufficient food to go around, but lack of equitable distribution). To meet these objectives, a comprehensive global strategy for global food security is needed.

WHAT NEEDS TO BE DONE?

Government can scale up productivity of agribusiness, enhance safety nets and promote agricultural investment focusing on small holder farmers and rural development, which could turn agriculture into a vibrant economic sector with positive effects on poverty reduction. Realization of the right to food must be beyond the immediate emergency context; the global community must adopt a strategy on key issues that causes higher food price and tackle the food price volatility.

Since most analysts see the main reason for recent higher price of food is biofuel, they suggest that the divergence of corn to oil is not a great idea; Europe has already reduced the conversion and recently banned imports of biofuel that cause the environment more harm than good. The U.S. has been criticized for its lack of effort or unwillingness to reduce the amount of corn-based ethanol used to power vehicles and also its refusal to tackle the farm’s subsidies. Such policy affects the price of commodities and hence the price of food as discussed. Here are a few suggestions on what governments can do:

1. Higher agricultural productivity: is vital for economic growth and reducing poverty, especially in Africa, because of strong growth linkage and comparative advantage to trade. Agriculture can benefit from technological innovations, improved risk management and stronger producer organization. The future direction of world food prices will depend on whether research and development increase agricultural productivity faster than growth in world food demand.

We need a much greater investment on agriculture. Poor countries need more funds for infrastructures, irrigation, seeding, and fertilizers, tractors, new technologies and rural credit to enhance productivity of the agriculture industry and reduce dependency on corn. Farms in developing countries need access to five key resources such as assets (land, machinery, renewable resources), markets (adequate infrastructure and communication networks that give farmers access to up-to-date price information, or the capacity to meet supplier standards for supermarkets), credit (to improve access to inputs and also prevent small farmers from falling to predatory lending), knowledge (to help disseminate research and development findings in the field, and negotiation skills and risk management tools such as social protection systems, mechanisms to hedge against bad weather, and improvements in crop storage systems.

Focusing on small farmers, as 1.5 billion people live in households that depend on small farms, can be a vital route out of poverty. In Vietnam, for instance, small farmers have been able to benefit from high food price through accessing exports markers and thus sharing in the country’s impressive growth. Technical assistance on long term security of supply agreements must be understood by the farmers in order to be able to negotiate a fair deal.

Poor countries that lack capacity to negotiate a fair deal could become dependent countries with lack of such knowledge. The trend for major food importers in growing countries such as China, South Korea and Gulf countries is to seek long term food purchase agreements, land leases or land purchases in other countries in order to secure future demand.

This attempt adds risks to poor countries that lack the negotiating skill to receive fair deals. Yet such agreements could, in principle, provide a benefit for both sides, as know-how and capital can transfer to those countries and as a result provide more food than otherwise. But in order to move forward to a better scenario, developing countries need better technical assistance in negotiating these complex and innovative deals. International donors should gear up to provide such advice as a matter of urgency.
This cannot be accomplished without cutting subsidies of farmers in advanced countries. In this context, however, it is notable to recognize projects by Bill Gates and Howard Buffett, because their foundations are providing $75 million to small farmers in Africa and Latin America so they can sell food to the U.S. World Food Program. Much of the money will go into better farming methods; high-yield seeds and other infrastructure areas in severe need of help.

2. Donor countries: must act fast to avert the hunger crisis and increase funding to the World Food Program (WFP) and any other related programs. In the long term, UN agencies need more reliable funding. Governments in poor countries must also take action to alleviate hunger. Already, some governments are increasing their financial support to the poorest consumers. Others are introducing food-rationing systems, price controls and export bans. In the medium and long term, increased international aid can help these governments to invest in sustainable agriculture and rural development in such a way as to become independent gradually.

Although World Bank lending for agriculture has risen recently, the overall donor support for agriculture has had a declining trend. The need to increase spending on agriculture also applies to developing country governments, which have overlooked rural sectors in recent years (despite the fact that three quarters of the world’s people live in rural areas). In Africa governments spend only 4.5 percent of the budget on agriculture despite an African Union target of allocating 10 percent of public spending to agriculture by 2008.

The United States is the world’s largest provider of international food aid, supplying more than half of all food aid designated to alleviate hunger, about four million metric tons of food per year (Mahony, 2009). As currently implemented, under existing rules, at least 75 percent of food aid has to be grown and packaged in the United States, and shipped using U.S. flag-bearing vessels. Unlike most countries that donate food, the United States sells a portion of its food aid, either by selling it to recipient governments, or allowing it to be monetized, a process where food aid is sold to generate cash for development projects.

While most donor countries provide cash as food aid, the United States insists on giving in-kind donations. Because most of the food aid must originate from the United States, it can take months to reach populations in crisis, sometimes too late, or as Murphy warns in Tady, 2007, at a time that can “clash with a local harvest instead of bridging a gap between harvests.” The ties to U.S. shipping companies also increase the costs of food aid.

3. World leaders must reform the global system of agricultural production and trade, which currently favors large corporate agriculture and export-oriented crops while discriminating against small-scale farmers and agriculture oriented to local needs (Wahlberg, 2008).

4. Another suggestion to improve the crop production is more research and development funding on the Green Revolution as the first round of funding in the mid-twenty century movement was quite effective in boosting crop yields by taking advantages of innovation in seeds sharing, irrigation and pesticides. Now we are in critical need of another such revolution as the world population is poised to reach 10 billion by 2050 from 6.7 billion today.

At the same time, with global warming and change of climate, water shortages are expected. Over the last 50 years, demand for fresh water has tripled and the number of people chronically short of water is expected to rise from half a billion to 4 billion by 2050 (Clarke and King, 2004). A twenty-first century solution for this shortage is urgently needed – one that not only increases yields, but also moves from an agricultural model that is input-intensive (in water, fertilizer, pesticide and energy) to one that is knowledge intensive.

Approaches such as pest management, drip irrigation, soil fertility management and minimum tillage methods all score higher in terms of resilience and equitability as they put power in hands of farmers rather than in the hands of seed companies. Additional funding for public research and development is also vital.

5. Some argue in support of growing genetically modified crops (GM) as a solution. The U.N. and the World Bank found report endorsing that some GM crops demonstrated yield increases of 10 percent and 33 percent in some places with another such revolution as the world population is poised to reach 10 billion by 2050 from 6.7 billion today.

6. Increased investment and R&D in alternative fuels: The World Bank and IMF now agree that biofuels have been the major important driver of rising food prices in recent years. Thus as oil price increases, food prices will go up with them. The best way to avoid this scenario is through greatly increased investment in new oil production infrastructure, which in turn depends on more stable and predictable outlooks for oil prices.

7. Additional suggestions have been to reduce oil consumption in industrial countries, not only in the U.S, but globally. Changing of consumption behavior globally is
very challenging because global coordination and collaboration have weakened over time. The U.S. has spent $700 billion on oil imports in the last two years of 2007 and 2008. That is more than is being spent annually on defense. If that money stayed here, it would generate $7 trillion in economic activity (Totty and Swartz, 2009). Clearly lower prices of energy are better for Americans and worse for the government of OPEC countries. Less reliance on oil can potentially contribute to greater economic prosperity and national security.

CONCLUSION

Inflation poses a headache for policy makers globally, but far more in developing countries, where households spend as 75 percent of their budget on food, compared with 10 percent to 12 percent in Europe and the U.S. The World Bank estimates food costs have pushed 44 million people into poverty since June of 2010 (Henshaw, 2011). Food price inflation has been blamed for sparking the protests in North Africa that toppled longstanding presidents in Tunisia and Egypt. To prevent a repeat of the widespread unrest of 2007-2008 food crisis, government in some importing countries began to build up grain stocks while others have boosted food subsidies.

To solve the world hunger crisis, it is necessary to do more than send emergency food aid to countries facing famine. Leaders must address the globalized system of agricultural production and trade that favors large corporate agriculture and export-oriented crops while discriminating against small-scale farmers and agriculture oriented to local needs. The key point is hunger is not caused by scarcity in terms of production capacity (actual or potential supply). If the world’s food production were added up and then divided equally among the world’s populations, then each person would consume 2,700 calories a day – an average easily sufficient to eradicate hunger. In reality, the number of undernourished people is almost perfectly mirrored by the billion who are overweight or obese.

Hunger is due to poverty in terms of income or assets, which mean some people cannot neither effectively demand the necessary food nor feed themselves through their own efforts. The fact that many are hungry in spite of sufficient production capacity means that insufficient measures have been taken to protect and ensure assets or income for food-insecure people. Had resources and income been more evenly distributed (land for small farmers, fair trades, no subsidies for large agribusinesses), there would have been, even under present circumstances, enough food for all.

In short, the international community should choose to move forward and fast. As Thomas Friedman, well-known New York Times columnist said in his book, “Hot, Flat and Crowded: Why We Need a Green Revolution—and How it Can Renew America,” the change will have to come fast: “this is not about the whales anymore, it’s about us.” (Friedman, 2008).

REFERENCES


**TABLE 1: FOOD AS A SHARE OF TOTAL EXPENDITURES (IN PERCENT), 2006-08**

<table>
<thead>
<tr>
<th>Group</th>
<th>Food as a share of total expenditure</th>
<th>Food consumed at home</th>
<th>Food consumed away from home</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>13.5%</td>
<td>54.5%</td>
<td>45.5%</td>
</tr>
<tr>
<td>Bottom income quartile</td>
<td>14.9</td>
<td>66.4</td>
<td>33.6</td>
</tr>
<tr>
<td>Second income quartile</td>
<td>14.7</td>
<td>57.2</td>
<td>42.8</td>
</tr>
<tr>
<td>Third income quartile</td>
<td>14.1</td>
<td>53.8</td>
<td>46.2</td>
</tr>
<tr>
<td>Top income quartile</td>
<td>12.1</td>
<td>46.8</td>
<td>53.2</td>
</tr>
<tr>
<td>Elderly</td>
<td>11.7</td>
<td>60.5</td>
<td>39.5</td>
</tr>
<tr>
<td>Food Stamp recipients</td>
<td>17.8</td>
<td>74.8</td>
<td>25.2</td>
</tr>
</tbody>
</table>

Source: U.S Department of Labor, 2010
FIGURE 1: LOG COMMODITY PRICES (BLUE), AGRICULTURAL RAW MATERIALS (RED), ENERGY (GREEN)
AND FOOD (BLACK), 2000=1.
NBER DEFINED RECESSION SHADED GRAY

ABSTRACT
In recent years, the advent of Web 2.0 technologies has changed the way in which companies communicate with their customers, influencing market trends and demand. Therefore, economics educators should consider implementing new means of instruction in order to address recent developments in Internet communication. This paper reviews the use of Web 2.0 and the skills necessary for instructors to keep pace with technological and economic innovations resulting from the proliferation of social networking and Internet communication. Furthermore, it concentrates on means of addressing the economic influence of social networking in the secondary and undergraduate economics classroom and provides sample lessons.

INTRODUCTION
Economics educators should be supportive, curious, and cautiously enthusiastic about Web 2.0 technologies. They need to explore and experiment with new and creative ways these technologies can assist them in their professional development and in creating a more student-centered learning environment. According to Walters and Kop (2009), educators find themselves in a world undergoing profound changes; “the organization, access, and distribution of knowledge are being transformed in a way unparalleled since the advent of printing” (p. 281). With the promulgation of these profound changes, economics educators should consider integrating Web 2.0 technologies into their classrooms.

WEB 2.0
Defining Web 2.0
Web 2.0 has many definitions, depending upon who is asked to define the term. Anderson (2007) notes, “Web 2.0 is a slippery character to pin down” (p. 5) but it is Harris and Rea (2009) who offer a comprehensive definition:

Web 2.0 technologies encompass a variety of different meanings that include an increased emphasis on user generated content, data and content sharing, collaborative effort, new ways of interacting with web-based applications, and the use of the Web as a social platform for generating, repositioning and consuming content. (p. 137)

Many researchers agree on the basic characteristics of Web 2.0 such as users collaborating and contributing to the content of the information available on the Internet (Alexander, 2006; Berger, 2010; Criswell, 2008). O’Reilly (2005) held that the concept of Web 2.0 is attributed to a vice president at the O’Reilly Corporation, Dale Dougherty, who used the term at a conference in 2004 to describe emerging applications becoming available on the Internet.

Researchers see Web 2.0 technologies as having the ability to change, even democratize, the way knowledge is shared and improved. Nelson, Christopher, and Mims (2009), state that “Web 2.0 technologies support creative and collective contribution…any individual with an Internet connection may utilize collaborative technologies” (p. 80). Harris and Rea (2009) categorize the technologies that constitute Web 2.0 in the following groups; Wikis, Blogs, Podcasts, Social Networks, and Virtual Worlds. Wikis are web pages where multiple users can modify content, the Wikipedia website (http://www.wikipedia.com) is a well-known example of a wiki. The term now commonly used for weblogs is blog, which Merriam-Webster Online Dictionary (2009) defines as “a website that contains an online personal journal with reflections, comments, and often hyperlinks provided by the writer.” Blogs are essentially websites where users place updated comments on any topic or topics they choose. One example of a free popular blog site is LiveJournal (http://www.livejournal.com) where users can create a blog on the Internet free of charge in order to express their ideas on a topic of their choice. Podcasts can consist of audio or video files that can be downloaded and listened to or watched on personal computers or on a wide variety of portable media devices. Social networks like Facebook (http://www.facebook.com) are websites that provide the user with a page they can claim as their own space on the web and interact with other members of the network in a variety of ways by posting comments, videos, and other content. Virtual worlds are online environments where users can interact with one another, and with the simulated environment itself, in a computer generated online three-dimensional setting; Second Life (http://www.secondlife.com) is a popular virtual world.

Microblogging
Web 2.0 technology has also afforded people the ability to instantly message multiple people from an increasing number of devices from anywhere in the world through microblogging. The idea of microblogging came from a perceived need for short messages to be posted on the Internet to let people know what you were thinking about or working on at any time during the day or night. The prefix micro is used to signify that these posts will not be as extensive as blog entries, but can resemble them in content. A microblog post can contain elements similar to blogs as well; however, the writer of a microblog post is limited in the number of characters that can be posted. In the case of one of the most popular microblogging platforms, Twitter, the limit is 140 characters. Microblog posts can be sent and read on Twitter from multiple devices. According to Harris (2007) “you can follow Twitter feeds on your phone, on the Twitter site, via Really Simple Syndication (RSS) in your favorite feed reader, or even via email” (p. 24). While Merriam-Webster’s online dictionary has published a brief definition of what a microblog is, PC Magazine Encyclopedia (2009) offers a more comprehensive definition online for the term microblog:

A blog that contains brief entries about the daily activities of an individual or company. Created to keep friends and colleagues up-to-date, small images may be included as well as video and audio clips, which are typically short and limited.

Hargadon (2009) argues that there are several microblogging sites for these short posts, but Twitter has grown to be the predominant microblogging service currently in use. Hargadon (2009) also points out that there are several other microblogging sites; these include Plurk, Jaiku, Utterli, Shout’em, and Indenti.ca. However, Ritchie (2009) highlights one microblogging site, Edmodo, which is specifically designed for use with minors in schools as the site enables educators to create accounts specifically for a class, not permitting any public access. Only registered members of the class can post or read other students’ posts. The microblogging service Yammer also offers similar closed-site microblogging capabilities. One site, called GroupTweet, piggybacks on the actual Twitter service that offers users the ability to create closed groups. According to GroupTweet (2009), “all [users] can send messages via Twitter that are instantly broadcasted privately to only the team members” (para. 2).

Twitter (2011) defines itself as a “real-time information network” permitting users to “get the latest information on their interests” and allows “businesses to connect to customers in real-time” so businesses can “share information with people interested in their products and services” (para. 2). The simplicity of Twitter is exhibited in the prompt, what’s happening?, placed at the top of the Twitter page that displays users’ brief posts in real-time and provides an area to enter a new microblog post, or tweet.

The world of education has cast an eye on this idea of microblogging and early adopters are using it in a variety of ways. Some have been slow to come to the idea of microblogging. Bell (2008) writes that “to me Twitter was little more than a diversion and not something I could see use of professionally” (p. 36), but goes on to state, “then something happened to change my mind completely” (p. 36). She signed up for a conference and, through Twitter, was able to meet other people attending prior to her arrival at the conference and developed a rapport with attendees by posting thoughts and ideas before, during, and after the event. Bell (2008) believes that the sense of community that Twitter affords users is one of its best features. Another educator had a similar experience with Twitter. Kroski (2008) was also attending a conference and writes that while she was there she was able to “broadcast her whereabouts, her mood, and her desire to connect with friends for dinner with over 150 conference attendees simultaneously, using her mobile phone” (p. 31). There are similar anecdotal experiences with Twitter that have convinced educators of the value of a microblogging service; many feel that the ability to connect with others at conferences and keeping in touch while collaborating on projects are exciting reasons for educators to begin using microblogging (Bell & Kuon, 2009; Gill, 2009; Haight, 2009; Walker, 2009; Whittick, 2009). Young (2009) aptly describes the use of Twitter; “once you find interesting people to follow, you can order up Twitter anytime, and dip into a rich soup of thought … a soup made by short-order cooks” (p. 10).

Some educators have gone beyond collaboration with colleagues and have actually incorporated microblogging into their class instruction. This real-time information, made available through microblogging by a teacher in a classroom with relatively inexpensive technology such as a cell phone, allowed his class to better understand the lesson. Any technology that helps students meet their learning objectives is worth exploring further. Many people are recognizing the speed and ability to connect in real time through microblogging. Sonwalkar (2009) points out that during the 2008 terror attacks in Mumbai India the “postings on Twitter … were ahead of the coverage by the mainstream news media” (p. 379). Furthermore, this type of widespread instant communication using Web 2.0 technologies has been associated with the recent popular movements taking place in countries in the Middle East and North Africa (Atari, Stewart-Weeks, & McCullen, 2011; BBC News, 2011; Denn, 2011; The Wall Street Journal, 2011).

Use of Web 2.0 in the Classroom

There are classroom practices now being experimented with, which are meant to take advantage of this ability in an effort
to improve instruction in all subject areas. Ritchie (2009) explains that in one English class, a teacher begins a story by posting on Twitter and each student adds a well-structured sentence to that opening post. The cycle continues with all of the students posting additional sentences to the story until the teacher feels the story has concluded and then the students’ work is evaluated. Smith (2008) documents a history class at the University of Texas at Dallas, where Dr. Monica Rankin conducted an experiment with her class in a video entitled The Twitter Experiment. In the video, Rankin describes how she incorporated the use of microblogging for the purpose of increased class discussion and participation. While she lectured on a topic, she would pause and ask the class to post a response to a question using Twitter. Once student responses were posted, everyone in the class was able to see and comment on the other posts either orally or by posting again on Twitter. Further class discussions continued in the same manner with all of the posts recorded on Twitter for later review and evaluation by Dr. Rankin. This technique gave everyone in the class the ability to put forth their thoughts on the topic, not just a few outspoken students who might normally participate in discussion. Dr. Rankin discusses this in the video and believes that having more students involved in a simultaneous discussion is beneficial for everyone. She feels that using Twitter allows for more widespread participation than she would normally see in a class of close to 100 students. Microblogging also allows her to get back to some of the students after class on their points that were not addressed during class time. She described that when she was absent from class once due to a conference, she was able to keep in touch with the teaching assistant overseeing the class by using her cell phone. This enabled her to fully participate in the class discussion, reading student posts and posting her responses to students on Twitter. Student interviews contained in the video on the experiment conveyed a very positive feeling regarding the experience. Additionally, Smith (2008) explains that many students thought having the ability to go back and review all of the discussion posts via Twitter was a helpful study aid and most thought that more students participated in class discussions, because Dr. Rankin incorporated microblogging into the class.

While some educators have been using microblogging since its inception, others have taken longer in coming to use the new media. There are many reasons for educators not adopting new technologies. As Bell and Kuon (2009) write, “to incorporate a new tool into your repertoire as an instructor, you must evolve as a user and devote yourself” (p. 54). Not everyone feels they have the time to devote him or herself to learning new technology and must first be shown how useful that technology can be to them. Some see potential downsides of the widespread use of microblogging in education and may never come to use the technology. Many of these concerns seem centered on the potential for microblogging to waste an educator’s valuable time (Bell, 2008; Farkas, 2008). There are also those who feel that microblogging encourages social conversation, but is not capable of offering any real content; moreover, Miller (2008) writes that Twitter is “almost completely devoid of substantive content” (p. 396). However, Young (2008) highlights that strong opinions fall on both sides of its use, as seen in the comments of David Parry, an assistant professor of media and communications at the University of Texas at Dallas, when he states that “Twitter is the single thing that changed the classroom dynamics more than anything I have ever done teaching” (p. 15). As long as people and organizations continue to use microblogging to exchange thoughts and ideas, there will be an increasing number of innovative uses found for it by educators. According to Walker (2009), microblogging can be thought of as a “virtual staff room, where teachers can access in seconds a stream of links, ideas, opinions, and resources” (p. 50).

Students and Web 2.0

Web 2.0 is used outside of education by millions of people everyday for business related activities, pursuing topics of interest, gaming, staying in touch with family and friends, and to meet other people socially. The uses for Web 2.0 technologies are as unique and varied as the users themselves. Due to the popularity of Web 2.0 technologies and the ubiquitous presence of the Internet in everyday life, many educators assume that students enter classrooms excited about their application in education and completely familiar with the technologies. Moreover, Levin and Arafef (2002) argued there is often a popular belief in society, creating no small amount of anxiety with many educators, that students are more informed than they are on the use of technology. Williams and Chin (2009) found that most students were not familiar with the term Web 2.0 and that their technological skills were centered upon a small range of applications used primarily to keep in touch with friends. However, Greenhow, et al. (2009) counter this finding and support the popular belief that tech-savvy students are entering classrooms ready to use technology for learning when they state, “contrary to most assumptions, youth’s online activities are not devoid of substantive intellectual activity” (p. 247). Clearly more research needs to be done on students’ abilities with technology; however, it may be found that there is a wide range of ability present in today’s students. Burhanna, et al. (2009) have recently found that in looking at the responses from focus groups convened at Kent State University, undergraduate students did in fact primarily make use of Web 2.0 technologies in the form of social networking sites and that few students actually created and posted content to Web 2.0 sites. A finding in the study of particular interest to educators was that students are protective of the Web 2.0 sites they use socially and are not as excited about their use in education as some educators may assume. Furthermore, Burhanna et al. (2009) find that
study, the dangers of electronic engagement, and the "decline in reading whole books, in-depth sustained educators have regarding new and emerging technologies, same researchers go on to summarize the concerns many disconnected, unlike the more traditional book-based "knowledge that may not be internalized and may well be concern that student inquiry using the Internet may result in reason. Moreover, Walters and Kop (2010) argue there is a potential pitfalls. Walters and Kop (2010) hold that educators to stay current on the latest technologies so they may wisely choose which ones will best serve them in their pedagogy. Today’s educator must offer students the advantages that technology can afford their learning, but they need to do so in an environment that encourages the student’s appreciation of the guidance that a qualified instructor can provide in the acquisition of new knowledge.

CLASSROOM IMPLEMENTATION OF WEB 2.0

Hybrid Web 2.0 Assignments

In order to incorporate Web 2.0 technologies into the secondary and undergraduate economics classroom, it is firstly imperative for instructors to devote a portion of their professional development time to familiarizing themselves with new ways of communication. The most effective means of doing so is tackling these technological mediums one at a time, with the purpose of gaining a working knowledge of the means of communication. Instructors should select one medium, such as Twitter, and begin to use it as any other member would. As these Web 2.0 mediums are often user-friendly in their design, obtaining a working knowledge of the technology can be accomplished in a relatively short period of time compared to other avenues of professional development. Once a working knowledge of the Web 2.0 technology is gained, instructors can add it to their proverbial classroom toolbox.

Once instructors are accustomed to the technology, their implementation into the classroom is straightforward; either instruct students to use the technology as a research tool, communicate with students via the medium, or a combination of both. However, Harris and Hofer (2009) argue that implementation of technologies must come after specific learning goals are set by the instructor. Therefore, the next step in Web 2.0 implementation in the economics classroom should be to determine what students are expected to learn from the lesson and not what students may learn via a Web 2.0 medium. Badgett and Christmann (2009) argue that learning goals at the secondary level should be specific and quantifiable. For example, a well-stated learning objective would read: students will be able to identify at least five aspects of Twitter that can have an affect on market trends and demand. Whereas a poorly worded learning objective might read: students will understand how Twitter affects the market. The former is quantified and specific, while the latter
is neither. While the quantifiable nature of learning goals may not be mandated at the undergraduate level as they are at the secondary level, writing quantifiable learning objectives provides a justifiable basis for objective assessment.

After specific learning goals are set, the next step of Web 2.0 implementation is to determine which Web 2.0 medium is most appropriate in facilitating the learning goal. Instructors should select from those Web 2.0 technologies of which they have gained a working knowledge. Twitter or Facebook would be an appropriate selection as a Web 2.0 technology for use in the economics classroom, because of their extensive use by Fortune 500 companies. For instance, Horovitz (2011) reports Starbucks has 20 million domestic fans on Facebook and some 1.3 million people follow the company on Twitter. Additionally, instructors need to determine if the Web 2.0 medium will be used as a research tool for the students or as a means to communicate with students. The former is easier for the instructor to implement and avoids crossing any social barriers of the instructor/student relationship found at both the secondary and undergraduate level. Therefore, the lesson examples found in the appendices of this article use Web 2.0 technologies only as a student research tool.

Following the selection of a Web 2.0 technology, instructors should create student-centered assignments in order to achieve specific learning objectives. By creating a hybrid assignment that integrates both traditional forms of classroom assessment, such as written papers and oral presentation, with the implementation of the Web 2.0 technology the academic dangers put forth by Walters and Kop (2010) can be avoided. Students can create a Facebook page online, but give an oral presentation in class summarizing its economic implications. Alternatively, in following with the learning objective of students identifying at least five aspects of Twitter that can have an affect on market trends and demand, students can follow companies, organizations, or economists on Twitter and then write a paper in which they identify, analyze, and evaluate five ways in which Twitter can affect market trends and demand. Furthermore, this hybrid assignment provides for both constructivist learning, in that students learn through discovery, and traditional objective assessment and evaluation. Appendices one and two provide an example lesson in which students will follow at least ten companies, organizations, or economists on Twitter and write a paper analyzing Twitter’s affect on the companies’ performance.

The implementation of Web 2.0 technology into the economics classroom is not something instructors at the secondary and undergraduate level should fear. The steps of this technology’s successful implementation in the classroom are simple. First, obtain a working knowledge of Web 2.0 technologies at the pace of any average user as a means of professional development. Second, set specific and quantifiable learning objectives for students. Next, select a medium that is appropriate for the specific learning goal and determine how the Web 2.0 technology will be best used. After that, create a hybrid assignment that combines both Web 2.0 and traditional academic work. Finally, assess the outcome of the learning goal using the traditional aspects of the hybrid assignment. Through this combination of professional development in Web 2.0 technologies and traditional learning-goal-oriented planning, new forms of communication transform into powerful tools in the instructor’s toolbox.

Simulated Web 2.0 Assignments

As any experienced classroom instructor knows, technology does have the uncanny habit of failing when it is most needed. Additionally, many instructors find themselves in environments where access to technology is limited. Thus, assignments involving Web 2.0 technologies can be easily adapted by simulating Web 2.0 technologies in any classroom. Appendices six and seven show how a Web 2.0 assignment can be altered to accommodate either a lack of Internet access or a failure of classroom technology.

Appendices four and five provide an example lesson of a hybrid Web 2.0 assignment that combines the use of Web 2.0 technology with traditional academic work. The lesson objectives are to have students create a Facebook page for an imaginary company, include five elements that will have an affect on the company’s performance, and give an oral presentation in which they summarize, analyze, and evaluate the elements’ effects. Students are then evaluated on their oral presentation. This assignment is an example of a hybrid Web 2.0-traditional assignment. Student evaluation is derived from a traditional oral presentation, but learning is achieved through a Web 2.0 medium. Yet, an assignment like this can be easily adapted for a classroom in which technology is limited or nonfunctional. An example of how this type of lesson can be adapted to a technology-challenged environment is provided in appendices six and seven. The learning objectives are the same. However, instead of students creating a real Facebook page online, students create an imaginary Facebook page on a paper template. Additionally, this simulated Facebook page can be enlarged to a poster-sized visual aid for use during the oral presentation portion of the assignment. This simulated form of Web 2.0 assignments can be an effective way to implement Web 2.0 technologies into a classroom environment where access to technology is limited or unavailable.

CONCLUSION

The proliferation and use of Web 2.0 technologies as a means of communication is changing the world of education. Economics instructors at both the secondary and undergraduate level should integrate these new technologies
into their pedagogy to further students’ understanding of economic concepts. Web 2.0 integration can be achieved through a combination of professional development and traditional classroom work enhanced by new technologies. Classroom materials have been appended to this article to help facilitate the integration of these new technologies in the classroom. Appendices 1, 4, and 6 offer example lesson plans and appendices 2, 5, and 7 are student assignment handouts that accompany the lesson plans. Appendices 3 and 8 provide rubrics for the evaluation of student work resulting from the lessons. The authors encourage readers to experiment with these lessons and modify them to meet the needs of their specific courses and classrooms.

**APPENDIX 1**

**Twitter and Market Trends Assignment Lesson Plan**

**Objectives:**
1. The students will summarize the ways in which media influence market trends and demand. (*PA secondary education PDE standard 6.2.12.C*)
2. In a five page written essay, the students will identify and analyze at least five ways in which the use of Twitter can influence economic market trends. (*PA secondary education PDE standard 6.2.12.C*)
3. In a five page written essay, students will evaluate at least five market effects that the advent of Twitter has had on market trends. (*PA secondary education PDE standard 6.2.12.C*)

**Procedures:**
1. Distribution of assignment:
   a. The instructor will distribute the Twitter assignment (Appendix 2) two weeks prior to class discussion on the assignment.
   b. The instructor will have the students create a Twitter account specifically for the class.
   c. The instructor will review the assignment and clarify students’ questions.
2. Lecture:
   a. The instructor will provide students with appropriate lecture, via student-teacher exposition, in order to meet the written lesson objectives.
3. Review and discussion of assignment:
   a. The instructor will read and evaluate the students’ papers using the Twitter assignment grading rubric.
   b. The instructor will lead class discussion in which the students will share how Twitter can affect market trends and evaluate those effects.

**Materials:**
1. Lecture notes on market trends and demand.
2. Computer with projector/promethean system and Internet connection.

**Evaluation:** Twitter and Market Trends Assignment Rubric (Appendix 3).

**Resources:** www.twitter.com

**Handouts:** Twitter and Market Trends Assignment Handout (Appendix 2) and Twitter and Market Trends Assignment Rubric (Appendix 3).

**APPENDIX 2**

**Twitter and Market Trends Assignment Handout**

**Introduction:**
The ways in which companies communicate with the public has changed dramatically over the last few years. In this assignment you will identify, analyze, and evaluate how the use of Twitter can affect market trends and demand.

**Procedures:**
- Create a Twitter account solely for use in this class at www.twitter.com. This account may be used later on in the course, so keep all tweets class appropriate.
- After creating the account:
  o Click the “Who To Follow” tab at the top of the page.
  o Select “Browse Interests”.
  o Select “Business”.
  o Add at least 10 companies, charities, organizations, or economists.
- Follow these tweets for at least four days and make a record of the content posted in the tweets.
- Identify five (5) ways the tweets can affect market trends and demand.
- Write a paper in which you identify these affects. Provide an analysis of each aspect and evaluate them, i.e., provide a judgment of their effectiveness.
  o Papers should be at least 5 pages.
  o Properly cited.
  o Standard 1-inch margins, 12 point font, Times New Roman.
- Papers due no later than (insert appropriate date).
- Be prepared to discuss your findings in class.
Grading Rubric: Twitter and Market Trends Assignment
Rubric (Appendix 3).

APPENDIX 3

Twitter and Market Trends Assignment Rubric

Number of Twitter Elements:

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<th>Elements Identified</th>
<th>5 - Excellent</th>
<th>4 - Good</th>
<th>3 - Satisfactory</th>
<th>2 - Poor</th>
<th>1 - Unsatisfactory</th>
<th>0 - Incomplete</th>
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<th>Elements Analyzed</th>
<th>5 - Excellent</th>
<th>4 - Good</th>
<th>3 - Satisfactory</th>
<th>2 - Poor</th>
<th>1 - Unsatisfactory</th>
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<table>
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<tr>
<th>Elements Evaluated</th>
<th>5 - Excellent</th>
<th>4 - Good</th>
<th>3 - Satisfactory</th>
<th>2 - Poor</th>
<th>1 - Unsatisfactory</th>
<th>0 – Incomplete</th>
</tr>
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___/15 Total Points Achieved

APPENDIX 4

Social Networking and Market Performance Assignment Lesson Plan

Objectives
1. On a newly created Facebook page, the students will synthesize an online profile for an imaginary company and include at least five (5) elements that will have an effect on the company and its market performance. (*PA secondary education PDE standard 6.2.12.C.*)

2. In an oral presentation, the students will summarize, analyze, and evaluate at least five (5) elements of their synthesized Facebook page and the effects those elements will have on the company’s market performance. (*PA secondary education PDE standard 6.2.12.C.*)

Procedures:
1. Distribution of assignment: The instructor will distribute the Facebook project assignment procedures and grading rubric.

2. Implementation of assignment:
   a. The instructor will direct each group to create a free email account address, using gmail.com, yahoo.com, or hotmail.com.
   b. The instructor will direct the students to use their new email address to create a new Facebook account.
   c. The instructor will allot an appropriate amount of time for students to complete the assigned project.

3. Presentation and Evaluation of assignment:
   a. The instructor will direct the students to present their synthesized Facebook page in accordance with the written lesson objectives.
   b. The instructor will evaluate the students using the written grading rubric.

Materials:
1. Computer with Internet connection.
2. Projector/Promethean System.

Evaluation: Social Networking and Market Performance Rubric (Appendix 8).


Handouts: Social Networking and Market Performance Assignment Handout (Appendix 5) and Social Networking and Market Performance Assignment Rubric (Appendix 8).

APPENDIX 5

Social Networking and Market Performance Assignment Handout

Introduction:
With the advent of social networking as a means of communication, the ways in which companies affect market performance and demand are changing. In order to better analyze this change, you will synthesize a Facebook page for an imaginary company.

Procedures:
- Create a group.
- Brainstorm an imaginary company as a group.
- Create a free email account address using gmail.com, yahoo.com, or hotmail.com.
- Use your new email address to create a Facebook page for your imaginary company.
  - Include at least 5 elements that will affect market performance for your company.
- Present your Facebook page to the class.
All group members should participate.

Summarize, analyze, and evaluate how each of the 5 of the elements will affect market performance for your company.

Grading Rubric: Social Networking and Market Performance Rubric (Appendix 8).


APPENDIX 6

Simulated Social Networking and Market Performance Lesson Plan

Objectives:
1. On a paper template of Facebook page and poster, the students will synthesize an online profile for an imaginary company and include at least five (5) elements that will have an effect on the company and its market performance. (PA secondary education PDE standard 6.2.12.C.)
2. In an oral presentation, the students will summarize, analyze, and evaluate at least five (5) elements of their synthesized Facebook page and the effects those elements will have on the company’s market performance. (PA secondary education PDE standard 6.2.12.C.)

Procedures:
1. Distribution of assignment: The instructor will distribute the Facebook project assignment procedures and grading rubric.
2. Implementation of assignment:
   a. The instructor will distribute a paper template of a Facebook page and a poster board to each group.
   b. The instructor will allot an appropriate amount of time for students to complete the assigned project.
3. Presentation and Evaluation of assignment:
   a. The instructor will direct the students to present their synthesized Facebook page in accordance with the written lesson objectives.
   b. The instructor will evaluate the students using the written grading rubric.

Materials:
1. Paper template of a Facebook page.
2. Writing utensils: pencils and markers.

Evaluation: Social Networking and Market Performance Rubric (Appendix 8).


Handouts: Social Networking and Market Performance Assignment (Appendix 7) and Social Networking and Market Performance Assignment (Appendix 8).

APPENDIX 7

Simulated Social Networking and Market Performance Assignment Handout

Introduction:
With the advent of social networking as a means of communication, the ways in which companies affect market performance and demand are changing. In order to better analyze this change, you will synthesize a simulated Facebook page for an imaginary company.

Procedures:
- Create a group.
- Brainstorm an imaginary company as a group.
- Create a Facebook page on a paper template and poster board for your imaginary company.
  o Include at least 5 elements that will affect market performance for your company.
- Present your Facebook page to the class.
  o All group members should participate.
  o Summarize, analyze, and evaluate how each of the 5 of the elements will affect market performance for your company.

Evaluation: Social Networking and Market Performance Assignment Rubric (Appendix 8).

APPENDIX 8

Social Networking and Market Performance or Simulated Social Networking and Market Performance Assignment Rubric

Number of Facebook Elements:

Elements Summarized
5 - Excellent
4 - Good
3 - Satisfactory
2 - Poor
1 - Unsatisfactory
0 - Incomplete

Elements Analyzed
5 - Excellent
4 - Good
3 - Satisfactory

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